

# PROSPECTUS 2021

- + Engineering
- + Information Technology
- + Computer Science

This prospectus contains basic information about the undergraduate, masters, and PhD programmes, life at the University, learning resources and advice to local and international students who wish to join the University in Fall 2021. It also shows the fee structure, funding modes (financial assistance), procedure for applying for admission and criteria for entry. Information about the constituent institutions, teaching faculties along with their expertise, and courses offered is also given. Brief descriptions of degree programmes and curricula details are listed with course titles, codes and credit hours.

### **Disclaimer**

The information in this prospectus is correct at the time of its publication. Whilst every effort is made to ensure accuracy of information, the University does not accept liability for any inaccuracy or change outside reasonable control of the University. It is issued for general guidance of public and candidates wishing to enter the University in Fall 2021 and does not form part of any contract. The University intends to provide the courses and facilities described in the prospectus, but reserves the right to withdraw or make alterations to these courses or facilities if found necessary, without any prior notice. Likewise, fees for the programmes starting in 2021 are provisional and subject to change.

## *Welcome from the Rector*

I am indeed privileged to assume responsibility as Rector NUST. In a short span of 3 decades, the university has become a benchmark for other Pakistani Higher Education Institutions (HEIs). It has done so through its commitment to academic excellence and market-driven curricula in tandem with an aggressive R&I portfolio and industry linkages. The university has a broad-based alumni network of 38000+ individuals either adding value to national and international corporates in sectors such as Software, Telecommunication, Power, Banking, infrastructure, etc., or pursuing further higher studies and research in some of the most renowned HEIs around the globe.

Being a proud alumnus of one of NUST's long-established Colleges, I take pride in witnessing the university making quantum leaps in the realms of higher education and research. Today our knowledge ecosystem thrives upon intellectual prowess of our academicians and researchers supplemented by state-of-the-art infrastructure to facilitate fast-paced socio-economic development of the country. For instance, the implementation of Quadruple Helix Model has paved the way for initiatives such as establishment of Pakistan's first Science & Technology Park – the NSTP – and the country's first facility for indigenous production of heart stents and life-supporting medical devices, to name a few.

We at NUST recognise the value of internationalisation and the power of globalisation, and invest greatly in establishing international linkages that have proven critical to our growth. It is with this realisation that NUST has forged meaningful partnerships with as many as 170 universities from 35 countries, thus facilitating the exposure of its students and faculty through opportunities of exchange and collaboration.

Evolution of NUST into a comprehensive HEI offering undergraduate and graduate programmes in a myriad of disciplines, and its innumerable educational, research and social contributions, are a tribute to the commendable achievements of my predecessors. My sincere compliments to the people who have invested their time and intellect towards building the institution's reputation as a research-oriented, entrepreneurial and engaged university that aims to serve the nation and humanity. As we feel pride for their achievements, it is the responsibility of the current and future generations of NUST to uphold this reputation and add to its values.

This year presented a renewed set of challenges for the academic world with the onset of COVID-19 and subsequent shift to Distance Learning. In a time of such disruption and uncertainty, it is the collective efforts of NUST fraternity – its students, faculty, administration and auxiliary staff – that have allowed the university to preserve its commitment to quality education and deliver on its promise of excellence even during the pandemic.

As I step into my role as the Rector of this prestigious institution constituted of academically competent, culturally enlightened, technologically equipped and socially responsible individuals, I hereby invite students, academics and educators alike to vie for a place at NUST and play their part for the society at large.

Engr Javed Mahmood Bukhari  
Rector NUST



Ranked **358**  
QS World University  
Ranking 2022

QS world university  
rankings 2020

Ranked  
**214**  
worldwide  
Engineering &  
Technology  
#1 in Pakistan  
QS world university  
rankings 2021

Ranked  
**76**  
among  
Asian Universities  
QS Asian university  
rankings 2021

Ranked  
**801-1000**  
among THE  
World University Rankings  
2021

Ranked  
**41**  
Young University  
QS World Ranking  
Ranking 2021

Ranked  
**251-300**  
amongst Asian  
Universities Time Higher  
Education (THE)  
Rankings 2021

Ranked  
**251-300**  
in the subject of  
Chemical  
Engineering  
#1 in  
Pakistan

Ranked  
**201-250**  
in the subject of  
Electrical & Electronics  
Engineering  
#1 in Pakistan  
QS world university  
rankings 2021

Ranked  
**301-350**  
in the subject of  
Mechanical &  
Aeronautical  
Engineering  
#1 in  
Pakistan

Ranked  
**143**  
in the subject of  
Computer Science &  
Information Systems  
#1 in  
Pakistan

NUST holds the singular honor of being the No. 1 university in Pakistan as per the latest Quacquarelli Symonds (QS) World University Rankings, Asian Rankings and Top 50 under 50 Rankings

**Excellent Performance Award**  
for scoring 100% in Yearly Quality  
Progress by Quality Assurance  
Agency, HEC at the Annual  
Progress Review Meeting on 4  
March 2021



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Civil Engineering

**MS in:**

- Disaster Management
- Structural Engineering
- Construction Engineering & Management

**MS and PhD:**

Mining Engineering

### Military College of Signals 48

**Bachelors in:**

- Electrical Engineering
- Software Engineering
- Information Security

**MS in:**

Systems Engineering

**MS and PhD in:**

- Electrical Engineering (Telecom)
- Software Engineering
- Information Security

### College of Electrical & Mechanical Engineering 69

**Bachelors in:**

- Electrical Engineering
- Mechanical Engineering
- Computer Engineering
- Mechatronics Engineering

**MS and PhD in:**

- Electrical Engineering
- Computer Engineering
- Software Engineering
- Mechanical Engineering
- Mechatronics Engineering
- Engineering Management

### Pakistan Navy Engineering College 103

**Bachelors in:**

- Electrical Engineering
- Mechanical Engineering
- Naval Architecture

**MS and PhD in:**

- Electrical Engineering
- Mechanical Engineering
- Manufacturing Engineering and Management
- Naval Architecture (MS only)
- Cyber Security (MS only)

### College of Aeronautical Engineering 135

**Bachelors in:**

- Aerospace Engineering
- Avionics Engineering

**MS and PhD in:**

- Aerospace Engineering
- Avionics Engineering

**MS and PhD in:**

- Electrical Engineering
- Mechanical Engineering

### National Institute of Transportation 160

**MS in:**

- Structural Engineering
- Transportation Engineering
- Geotechnical Engineering

## School of Electrical Engineering & Computer Science 167

### Bachelors in:

Electrical Engineering  
Software Engineering  
Computer Science

### MS in:

Innovative Technologies in Learning  
Data Science

### MS and PhD in:

Information Technology  
Electrical Engineering  
Computer Science  
Information Security

## Research Institute for Microwave and Millimeter-Wave Studies 203

### MS and PhD in:

Electrical Engineering

## School of Chemical & Materials Engineering 210

### Bachelors in:

Metallurgy & Materials Engineering  
Chemical Engineering

### MS and PhD in:

Materials and Surface Engineering  
Chemical Engineering  
Nanoscience and Engineering  
Process Systems Engineering (MS only)

## School of Civil & Environmental Engineering 228

### Bachelors in:

Civil Engineering  
Environmental Engineering  
Geoinformatics Engineering

### MS and PhD in:

Transportation Engineering (MS only)  
Structural Engineering  
Geotechnical Engineering  
Construction Engineering and Management  
Environmental Science  
Environmental Engineering  
Remote Sensing & Geographical Information Systems  
Water Resources Engineering and Management  
Urban and Regional Planning

## School of Mechanical & Manufacturing Engineering 255

### Bachelors in:

Mechanical Engineering

### MS and PhD in:

Mechanical Engineering  
Design & Manufacturing Engineering  
Robotics & Intelligent Machine Engineering  
Biomedical Engineering  
Biomedical Sciences

## Research Center for Modeling and Simulation 278

### MS in:

Systems Engineering  
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### MS and PhD in:

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# About the University

National University of Sciences and Technology (NUST) was established in March 1991 for promotion of higher scientific education in the country, especially in the fields of science and technology by providing stable and disciplined academic environment together with need-based research, pertinent to industrial requirements. The University was granted its Charter in 1993. Over the years, the university has expanded in scope, services and stature and has emerged as a leading comprehensive University in the public sector.

Within two decades, NUST has achieved important milestones and gained immense significance as an institution of higher education in Pakistan. The University produces professionals and researchers of very high calibre, capable of developing indigenous technologies to meet the growing demands of the 21<sup>st</sup> century. It is envisioned to grow as a center of excellence for the country's scientific and technological progress. An outstanding feature of the University is that while maintaining traditional values of excellence in teaching and research, it challenges conventional practices and creates new ways of developing and delivering courses, pertaining to emerging and cutting-edge disciplines, on most modern lines.

NUST is a new-age university defining new frontiers in teaching and research. The programmes are distinctive for their high-quality research orientation. Notwithstanding the significance of undergraduate courses, there is ever-growing emphasis on postgraduate studies and research output. Creativity and innovation are embedded as core values in all scholastic activities. The conducive academic environment at the campuses facilitates educational pursuits.

NUST has developed linkages with international universities of repute to ensure two-way flow of knowledge and to be in step with modern trends. Split programmes and visits of eminent professors from reputed foreign universities is a regular feature of the academic activity. These eminent scholars deliver lectures on the latest developments in their respective fields and also help update and review the academic programmes.

# Defining Futures

## Vision

To evolve NUST into a world class Centre of Excellence among Higher Education Institutions, leading the transformation of Pakistan towards a rapidly developing Knowledge Economy to realize the national objective of a progressive and prosperous country among comity of nations.

## Mission

In pursuance of NUST vision, strive to achieve following mission goals:

- » To develop NUST as a Comprehensive, Academic and Research led university with a focus on Creativity, Innovation and Entrepreneurship so as to amicably negotiate Social, Economic and Environmental challenges faced by the country.
- » With foundations based on principles of Merit, Transparency and Fair Play, nurture talent by providing equal opportunity to all segments of polity.
- » Empower students to develop their full potential acquiring leadership and social skills, to act as agent of change within the society.
- » Improve global visibility by enhancing mutually beneficial linkages with international organizations and partner universities.
- » Strengthen NUST financially to enable the university achieve its goals by raising awareness amongst local and international Pakistani diaspora including Alumni base around the world.
- » Ensure conducive learning and working environment for students and staff at par with international standards.

## Strategic Thrusts

### Excellence in Teaching & Education

Provide high-quality education in sciences and technology while remaining accessible to all sections of the society.

### Focus on Research

Undertake high-quality yet relevant research to support the emerging knowledge-based economy and society.

### Spirit of Enterprise

Develop instruments and mechanism for promotion of enterprising spirit and entrepreneurial culture among NUST graduates and create strong linkages with industry.

### Internationalisation and Global Vision

Develop strong international linkages to ensure inflow of new knowledge and state-of-the-art technologies, while building a positive international image of the University and the country.

### Positive Social Impact

Structure curricula and programmes to influence a wider cross-section of the population in terms of education and absorption of new technologies.



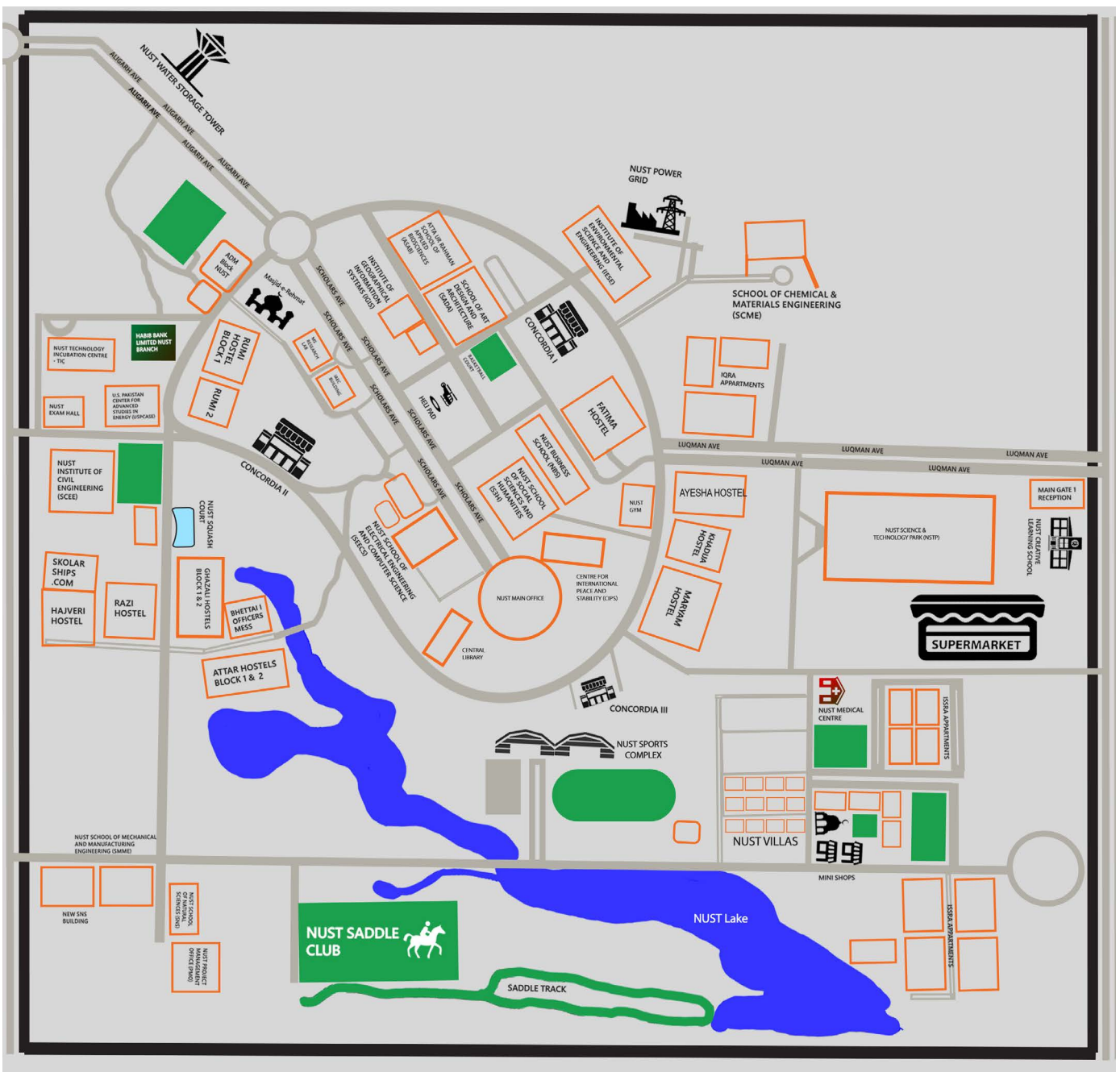


# Why Choose NUST?

Excellence does not grow in wilderness; it has to be pursued with singular zeal and commitment. National University of Sciences and Technology chronicles a tale of success inscribed with the galvanizing force of progressive vision and commitment par excellence. Although, barely two decades old, this premier national university, justifiably feels proud of its unprecedented success as a center of excellence.

- » National University of Sciences and Technology (NUST) is the dynamic face of higher education in Pakistan. Although, barely 29 years old, this premier national institution justifiably feels proud of its unprecedented credentials as a center of excellence.
- » NUST holds the singular honour of being the **# 1** university in Pakistan as per the latest Quacquarelli Symonds (QS) World University Rankings, Asian Rankings and Top 50 under 50 Rankings.
- » NUST is ranked **#358** in the world and **#1** in Pakistan in QS World University Rankings.
- » NUST is ranked **#76** worldwide and **#1** in Pakistan in QS Asian Rankings
- » NUST is ranked **#41** worldwide and **#1** in Pakistan in QS Young Universities (Top 50 Under 50) Rankings.
- » NUST also holds prominent position worldwide and in Pakistan in various subjects. NUST is included in top **150** world universities and is **#1** in Pakistan in Computer Science & Information Systems.
- » NUST is included in top **250** world universities and is **#1** in Pakistan in Electrical & Electronics Engineering.
- » NUST is included in top **350** world universities and is **#1** in Pakistan in Mechanical, Aeronautical & Manufacturing Engineering and Chemical Engineering.
- » With its galaxy of **20** constituent teaching institutions, NUST provides quality education to its students.
- » NUST's multi-disciplinary campuses offer undergraduate and postgraduate programmes in a wide range of fields, including Engineering & Technology, Life Sciences, Arts and Humanities, Natural Sciences, Social and Management Sciences.
- » NUST is competitive in engaging the best to serve as faculty members. NUST faculty of over **1200** highly qualified and capable men and women includes **600+** PhDs', mostly qualified from premier International universities.
- » NUST's high-profile international linkages for research and academic collaborations embrace over 130 celebrated centers of excellence in **32** countries around the globe.
- » NUST has few equals in generous funding for education of talented but financially challenged students. It also provides sponsored education to students hailing from economically backward areas of Pakistan.
- » Because of sound education and trusted skill levels, NUST graduates stay in demand for jobs, both in public and private sectors nationally and internationally. Several NUST graduates have launched their own business ventures.
- » Being a NUSTIAN is a great transforming experience.
- » NUST accepts and invests in the best-those with a passion to excel in life.





## Location

NUST is located in the heart of the Capital (Sector H-12) Islamabad, amid a hub of research organisations and institutions of higher learning. It is easily accessible from the Kashmir Highway. It is at 35-minute drive from Benazir Bhutto International Airport and 5 minutes from the Motorway (M1). Apart from fascinating tourist attractions in and around the city, some famous historical sites (like Taxila and Kittas Raj) and hill stations (like Murree and Patriata) are within easy access. There are museums, theatres, parks, shopping centers and a diplomatic enclave which houses the foreign missions. The city is also known for its universities, colleges and research organisations.

## Geography

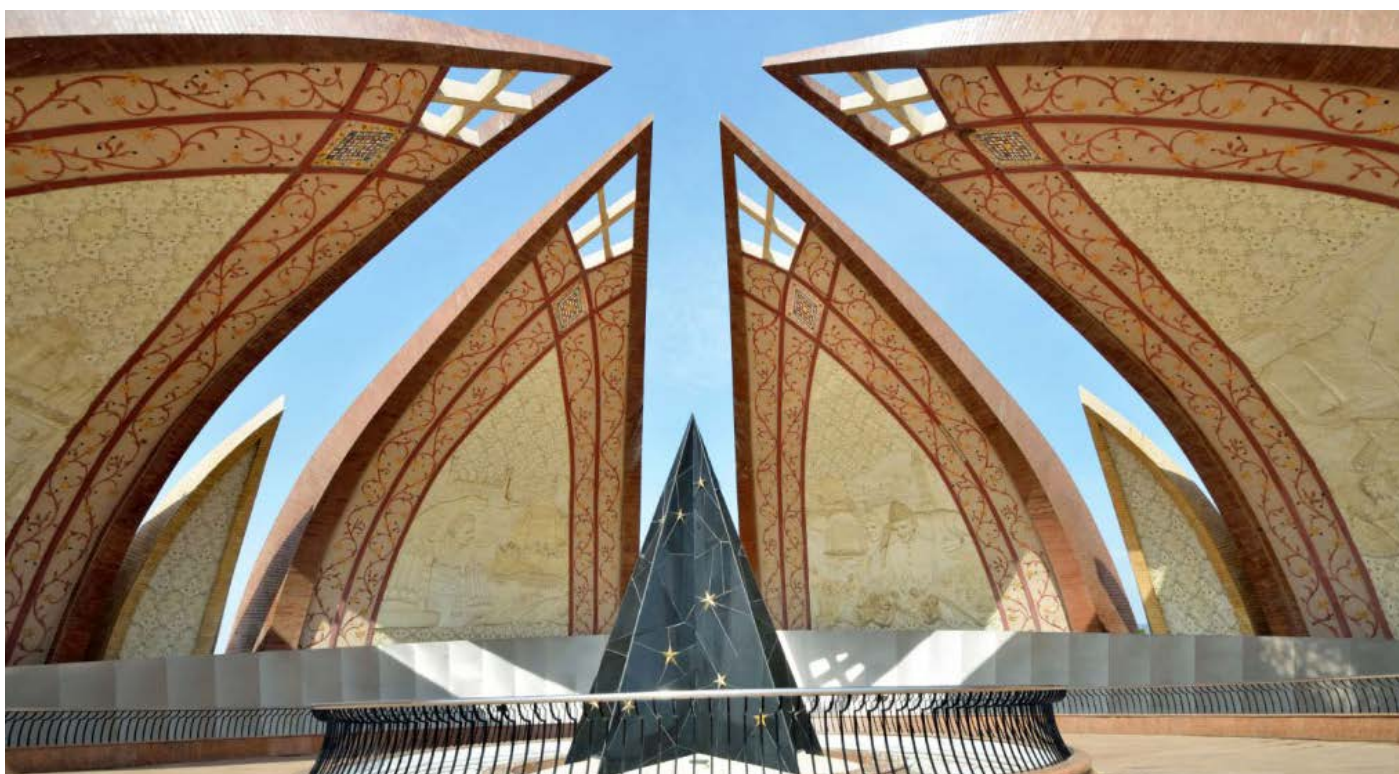
Islamabad is located in the backdrop of lush green Margalla mountains in the foothills of the mighty Himalayas, at the northern rim of the Potohar Plateau. The area is undulating, interspersed with mountain streams and rivulets. It is co-located with the historic Gakhar city of Rawalpindi; thus displaying a beautiful blend of the ancient and the modern.

## Climate

The city enjoys a continental climate with hot summers (May - June), rainy monsoons (July - August), fabulous fall (October - November), cold winters (December - January) and a blooming spring (March-April). The climate is regulated by alpine mountains in the vicinity and manmade lakes (Khanpur, Rawal and Simli) which are also the sources of potable water for the twin cities. The temperature ranges from 4° C in January to 46° C in June.

## Demography

The twin cities (Islamabad-Rawalpindi) have a population exceeding 4.5 million. There is a happy blend of different ethnic communities including members of foreign missions. Urdu is the lingua franca. However, English is also generally understood and spoken by the educated sections of the society. English is also the medium of instruction in the universities.



## Academic Structure

NUST is a public sector university which functions under the aegis of the Ministry of Science and Technology. There is a Board of Governors and an Academic Council which oversee academic matters. Rector is the Chief Executive Officer. He is assisted by three Pro-Rectors. The University comprises five colleges (located away from the NUST Campus, H-12 Islamabad) and ten schools, and three research centers at the NUST Campus, H-12 Islamabad.

## Academic Calendar

The academic year commences in September each year. There are two regular academic semesters of 18-20 weeks duration: September-January (Fall Semester), February-June (Spring Semester) and July-August (Summer Semester). Although summer semester is not a regular one but give the students

opportunity to clear their deficient courses. The University observes summer vacation from August to September. Admissions are offered in the Fall Semester. The University functions from 9am to 5pm, 5 days a week. However, laboratories and libraries remain accessible to the researchers till late at night and even on weekends.

## Transportation

Rent-a-car service is available at the airport, hotels and bus terminals. Radio cabs are also easily accessible. Public transport including Metro Bus Service plies on a number of routes in the twin cities besides yellow cabs (taxis) which ply round-the-clock. In case of yellow cabs, it is advisable to negotiate the fare in advance.



# Who to Contact

At NUST, a student enters a novel phase of life; one that requires continuous support for one's academic, physical as well as mental growth and well-being. Keeping this in mind, the University offices function in a student-friendly manner and remain accessible and helpful. You can directly contact the right department or office for all your queries. Shown opposite are various student-related offices and their functions for you to find the right contact.

## Pro-Rector (Academics)

Oversees all the offices which deal with academic and administrative issues of the students during their stay in the University.

## Registrar and Controller of Examinations

Deals with the entire life-cycle of the students--from applying to NUST and registration of undergraduate students to issuance of transcripts and degrees. He also deals with matters pertaining to scholarships, transfers, migrations, discipline, etc.

## Director Academics

Handles matters pertaining to academic regulations, programmes of studies and academic calendar.

## Director Admissions

Deals with matters pertaining to NUST Entry Test.

## Director Finance

Deals with matters pertaining to fee and finances of the students.





## Director Administration

Deals with hostel accommodation, messing, security, transport and sports.

## Director Postgraduate Programmes

Deals with matters pertaining to academic life-cycle of postgraduate students: from application, admission, registration, scholarship, academic progress to issuance of degree.

## Director Student Affairs

Oversees student-led activities including libraries, clubs and societies & discipline.

## Director Medical Services

Supervises health care and medical services.

## Office of Research, Innovation & Commercialization (ORIC)

Provides guidance and support to the institutions for activities related to research and development.

## Career Development Center

Helps the students in placement and job opportunities, guiding them in preparing resumes and learning interview techniques.

## Center for Counseling and Career Advisory

Staffed with professional counselors and psychologists, the Center provides personalised counselling services to students to help them cope with adjustment problems and issues affecting their studies. They also conduct aptitude and psychological tests.

# Developing Careers

## Career Development Center (CDC)

Career Development Centre (CDC) has formulated nationally recognized Career Programmes for undergraduates of all disciplines equipping them with Market essential skills to evolve as professional assets for both national and multinational firms. The aim and objective is to develop and train human resource in accordance with evolving Market Trends through individually-focused approach to career planning and addition of career development workshops in credited courses accompanied by trained professionals with industrial experience to fill the skills gap inline with our industrial partners demand. CDC believes on constant change and up gradation through introduction of automated tools to develop a state of the art centre aligned with International Market needs for human resource development. The Centre provides an exclusive Mock Interview Programme (MIP) across all its Institutions for 7th Semester students by training its graduates through experienced faculty and Market experts to attain requisite transitional skills for appropriate employment opportunities.

The programme is based on 2 tier cycle mandatory training.

- » Career Development Workshops - (1<sup>st</sup> to 3<sup>rd</sup> Years)
- » Mock Interview Programme - (7<sup>th</sup> Semester)

### Career Development Services:-

#### 1. Career Development Workshops:-

Career Development Workshops are part of credited courses implemented across all its disciplines to reinforce career skills as part of learning as opposed to any extracurricular activity. The following core training areas are covered across 16 Schools and Colleges for its entire undergraduate Programme.

- » Career Development Plan - 1<sup>st</sup> Year
- » Professional Employability Skills - 2<sup>nd</sup> Year
- » Resume Writing - 3<sup>rd</sup> Year
- » Interviewing Techniques - 4<sup>th</sup> Year

#### 2. Mock Interview Programme:

A comprehensive Mock Interview programme 2020 has been initiated across all Schools & Colleges with specialized focus on individual Interview training before the recruitment season in 8th semester. This programme enables all final year graduates to specialize in interviews according to the latest Market trends to maximize employability opportunities.

### Contact Us:

RIC Building, NUST H-12,  
Islamabad.  
ddcdc@ric.nust.edu.pk  
051-90856270



## NUST Alumni Network

NUST's commitment to making an impact in the world is demonstrated in the vast range of opportunities our graduates have gone on to enjoy. NUSTIANS are synonymous to leaders, opinion makers, and change agents in their rewarding careers.

NUST Alumni Network is 32,330 members strong, and spread across 64 countries. The alumni network enhances the student lifecycle via numerous activities that include webinars, mentorship, internships, projects and contributors to the need based financial assistance programme.

Every student who graduates from NUST Schools/Colleges automatically becomes a part of this network, and can stay connected through the NUST Alumni web portal ([www.alumni.nust.edu.pk](http://www.alumni.nust.edu.pk)).



# Research and Development

Research is the focal point of university education all over the world. Universities significantly contribute towards creation of new knowledge and discovery of fresh frontiers of creativity and innovation.

## Contribution to Research

NUST aims at emerging as a leading research-intensive university in Pakistan, comparable to the best in the world within the next 10 years. Our main thrust is on high-quality teaching and goal-oriented research and development (R&D). The University's PhD programmes help create the requisite research culture duly supported by well-qualified faculty and need-based research. In order to accomplish the requirements of research and development, high-quality laboratories and research facilities are made available to the faculty and students round-the-clock.

"In the last 5 years, the faculty members completed 381 sponsored R&D projects, and these included 06 projects sponsored by the university per se. Concurrently, during the same period, NUST students and faculty also published 5697 research papers in journals of repute and presented 2099 research papers in conferences, workshops, symposia etc. around the globe.

## Research Collaborations

NUST seeks to garner expertise from a wide variety of sources (within/outside the country) in order to boost its academic & research activity. This in turn helps create deeper impact on the world of science and technology. Consequently, the University collaborates with leading international universities, professional organizations, commercial ventures, talented professionals and scholars to pursue its academic and research goals. Our faculty, researchers and students are constantly adding value to NUST by remaining actively engaged with professional groups and individuals in research, review of academic papers and organization of conferences, seminars and workshops etc. NUST has developed linkages with as many as 134 international universities and organizations of 32 different countries. These collaborations help our faculty remain up-to-date with current knowledge and ensure a two-way flow of knowledge.

Research is the focal point of University education all over the world. Universities significantly contribute towards creation of new knowledge and discovery of fresh frontiers of creativity & innovation.





## Office of Research Innovation and Commercialization (ORIC)

The role of ORIC is to facilitate and co-ordinate research activities of NUST constituent institutions and to liaise with other national as well as international academics, research and industrial organizations to facilitate research at NUST. It also encapsulates NUST's research and intellectual property opportunities at the earliest stage, and translates these benefits to industry by working closely with industry through partnerships, collaborations and licensing. It also acts as a conduit to facilitate NUST graduates towards employment and internship in these industries with the focus on promoting and making NUST graduates the premium choice for the employers.

» **Research Projects Coordination Office:** The Office promotes, facilitates, and monitors cutting-edge research activities, including collaborative and inter disciplinary research, in areas related to the goals of the University. It gauges industry needs and process match making with NUST institutions to solve industrial problems. It also provides support for building research capacity and capability of the University. The core functions of the office are:

- » Maintaining an effective liaison with the funding agencies and helps the faculty members and students to tap several national and international funding opportunities.
  - » Facilitation of faculty members/researchers in preparation of high-quality proposals and necessary documentation for subsequent steps as per the requirements of the funding agencies
  - » Coordination with the faculty members/researchers and various administrative functions to ensure the achievement of major milestones of the project as per the proposed schedule.
  - » Preparation and revision of policies for effective management and facilitation of activities related to research projects.
  - » Continuous effort to align research projects/activities with the thematic research areas with the help of R&I steering committee.
  - » Evaluation of the university level and school level best researcher award nominations received from all the constituent schools, colleges, institutes, and research centres of the university.
  - » Facilitation of student teams and faculty members for nomination and participation in the research related competitions
  - » The office maintains a regular communication with the Higher Education Commission,
  - » Ministry of Science and Technology (MoST), Ministry of Foreign Affairs (MOFA) and Ministry of Information Technology and Telecommunication (MoITT) for the ongoing research and PSDP projects as well as input and role of NUST for future science and technology initiatives.
  - » Facilitation of other Dtes/functions of the university regarding research projects activities and data.
- » **NUST Intellectual Property Office (IPO):** In the increasingly knowledge-driven economy, Intellectual Property (IP) is a key consideration. Keeping in view its importance, the University established NUST Intellectual Property Office

with the following objectives.

- » Offering Intellectual Property protection to innovators/researchers by filing of Patents, Copyright, Trademarks, and Design Rights, etc.
  - » Facilitating the commercial interests of and due rewards to innovators/researchers
  - » Establishing a national network of Intellectual Property Rights related services.
  - » Collaborating with International Organisation such as WIPO to facilitate the filing of Patents at international level
  - » Intellectual Property Management
- » **Research Publications Coordination Office:** Research publications through-out the previous decades and centuries have played a vital role in the dissemination of new knowledge created by scientist and scientific organization. For School, Colleges and Faculty members, it is therefore important that a particular administrative office manages and promotes their research publication. The Publications Office at the Research Dte performs the following functions:
- » Management of cutting-edge research published at NUST in the form of articles and conference papers in journals and conferences of international repute respectively.
  - » Creating research policies for the promotion and enhancement of quality research at NUST.
  - » Sponsorship of NUST based national and international conferences.
  - » Management of 5x NUST own research journals with 3x categorized as "Y" category by HEC in 2021.
  - » Liaising with research journal publishers (Elsevier, MDPI, Springer etc.) and indexing agencies (such as Scopus, Web of Science etc.).
  - » Maintaining and updating the publications databank known as the NUST Research Portal (NRP).
  - » Liaising with Faculty and reporting of various research indicators to international ranking agencies (via QA Dte).
  - » Vetting of Faculty and PhD students publications for their promotion and graduation respectively
  - » Tracking Research Performance of Schools and Colleges as a whole and faculty members/post graduate students in general.
  - » Processing the appointment of Adjunct Faculty Cases.
  - » Marketing and Promotion of Research Conducted at NUST through social media platforms.
- » **NUST Office of Sustainability:** NUST established the "Office of Sustainability" as per international practices, to pledge the organization's commitment to sustainability and establish institutional platform for effective collaboration with national, regional, and international stakeholders on sustainability initiatives. The mandate of Office of Sustainability is to adopt UN SDGs framework to align core functions of NUST i.e Academics and Students' engagement, Research and Innovation, Operations and Governance, and Stakeholders Management with the UN SDGs and global agenda 2030. This would be the first office of its kind in any university in Pakistan, approaching towards transforming NUST into SDG-engaged University. The office plans to establish cross-sectoral national and international partnerships to develop indigenous solutions, through interdisciplinary research and innovation, to address the impending challenges faced in achieving the

SDGs, and simultaneously work on developing a model to test NUST as a Living Lab for sustainability to test and co-create innovative technologies developed in-house, to ensure socio-economic impact of the research and innovation outcomes. The office would also overlook carbon footprint assessment, climate mitigation, and development of a cross-sectoral Climate Action Plan for the university and local community. NUST Office of Sustainability also aims to engage and mobilize students on sustainability initiatives through student-run clubs like NUST Community Service Club, which completes 80,000 hours of volunteer work on average every year, and NUST Environmental Club, which holds awareness events on environment and Climate Crisis.

- » **Technology Transfer Office (TTO):** The mission of TTO is to encapsulate NUST's research and intellectual property opportunities at the earliest stage, and to translate these benefits to industry by working closely with CIE constituent entities, as well as industry; through partnerships, collaborations, licensing and formation of spin-off companies. It is responsible for moving research results and discoveries from the laboratory to the marketplace. It does so by being fully aware of the university R&D activities, invention disclosures and market needs. It assesses commercial potential and successfully transfers technology for commercial applications. It also creates and manages synergies and collaborations with other research entities and organisations to facilitate commercialisation.
- » **Career Development Center:** CDC provides programmes and services to students and alumni in exploring and making effective career choices. The programmes and services provide opportunities for NUST students and alumni to foster professional networks with employers and also assist employers in meeting their recruitment needs. The Industrial Liaison Office (ILO) is part of CDC.
  - » **Industrial Liaison Office (ILO):** It predominantly maintains strong Academia Industry Linkage and facilitates students with the focus on promoting and making NUST graduates the premium choice for the employers.

### Technology Incubation Center (TIC)

The Center has been established to facilitate and support the innovation engine of the University. It is the first model technology business incubator of Pakistan established under the academia. The objective is to provide an environment that attracts and nurtures technology based start-up companies, and transforms them into commercially viable enterprises. TIC provides a platform for NUST faculty/students and other entrepreneurs having commercially viable R&D output, to establish their own start-up companies in order to commercialise their R&D work as entrepreneurs.

The objectives of TIC include fostering an entrepreneurial culture, by providing the students and faculty of NUST, an opportunity to transform their technology-based business ideas to reality. These facilities are also open to the general public, provided they contribute to NUST knowledge base. It further aims to facilitate the availability of NUST resources to the incubatees in a mutually beneficial way by liaising with private/public sector funding sources, government agencies, industrial associations, chambers of commerce and industries to provide facilitation and networking for Incubatee companies. TIC has now also started offering services including pre-incubation, virtual Incubation and consultancies through Catalysts to

incubatee companies, apart from its other business support services.

### Professional Development Center (PDC)

NUST established Professional Development Center (PDC) in July 2007 under an initiative of Higher Education Commission (HEC) to provide continued education and professional development services to industry so that industry could acquire state of the art knowledge to maximize its productivity and efficiency. PDC leverages NUST technology base and faculty through its training events for creating industry academia linkages. Besides this, PDC also provides knowledge and training to NUST faculty and staff regarding best practices in managing a 21st century institution. It engages highly experienced trainers both from NUST and outside of NUST to conduct hands on exercise/case study based industry problem specific trainings. PDC has conducted hundreds of industry-focused workshops and has trained more than 11,200 professionals from about 850 organizations. It uses state of the art information, communication and learning technologies to deliver highly professional trainings. PDC also creates training partnerships with different organizations. Currently, PDC is the Professional Engineering Body of Pakistan Engineering Council (PEC) for carrying out continued professional development of PEC registered and professional engineers. PDC is also the official preparatory and exam center for Chinese Language test HSK ( all levels ). Professional Development Center of NUST is considered one of the most sought after institutions of Pakistan for short term courses in Engineering, IT and Management. PDC has maintained a tradition of excellence since its inception in 2007 as we cherish new standards in designing and delivery of our seminars, short courses and workshops. It is a promise to our participants that "We don't teach you, we provide you with an environment that makes you learn and discover yourself". PDC also offers Business English Language certification in collaboration with Cambridge University.



## Science and Technology Ventures (STV)

ST Ventures is a project of NUST primarily established to commercialize NUST research output and to undertake business ventures. It is also required to promote R&D and technological innovations through marketable products and technologies.

ST Ventures is also working in different fields of Renewable Energy Technology such as Solar Photovoltaic (PV), Solar Thermal and Bio-diesel with in-house available manpower and NUST resource persons.

It acts as one window facilitator for the NUST Institutes and Colleges for acquiring consultancy services. Based on the requirement of Industry/different organizations against their problems/issues, the relevant NUST Institutions are utilized for provisioning of resource persons (PhD/MS faculty or students doing their PhD or MS) depending upon the requirement and nature of a project, and accordingly a complete team is formed for timely execution of the projects.

## University Advancement Office

University Advancement Office has been created with a mission to augment the efforts directed towards the realisation of the University's vision and strategic objectives. Its activities encompass resource generation and joint ventures by mobilising collective efforts and resources. The Office ultimately seeks to contribute towards self-sustenance of NUST.

## National Science & Technology Park

NUST aims to become a hub for public and private technological, financial and human capital through the establishment of a Technology Park at the NUST Campus, H-12, Islamabad. The project will encourage knowledge creation at the cutting-edge and develop organisational, human and social capital to compete in the global economy. It looks forward to building networks stretching far beyond major institutions to include entrepreneurs, investors, professionals and underprivileged communities for mentoring and learning.

The Park will promote interaction between institutional elements, i.e., universities, research parks, large companies, venture funds, etc. and non-institutional elements, i.e., talent, bodies of knowledge and virtual communities to create job opportunities for the youth and link local assets to global markets in order to generate value. It aims to stimulate economic activity

in the country by developing a unique knowledge-based multi-industry cluster around the capital.

Based on the conviction that new research clusters in developing countries will capture an increasing share of global R&D investment and increase the volume added to technology innovations, NUST R&D initiatives will encompass an innovation center, an R&D center, a science center, a technology incubation center, a manufacturing resource center and a learning academy that will provide technical and vocational expertise, and entrepreneurship and leadership training. The expansive park will also host a research commercialisation center, university-industry liaison nucleus and event management and recreational facilities. The Park will have a distinctive knowledge brokering facility by means of which it will act as an information intermediary to provide advice on selection of goods or services, business intelligence or research data to interested parties.

## Strategic Planning and Management Office (SP&MO)

After shifting of its Main Campus from Lalkurti, Rawalpindi to Sector H-12, Islamabad, NUST has grown at a very rapid pace. Presently, the total student's strength is 16062, comprising of 535 PhD students, 5229 MS/MPhil students and 10298 UG students. Till now, the university has awarded 29778 degrees, out of which 237 are PhD, 6072 are MS/MPhil and 23469 are UG degrees. The faculty strength is 898 with 408 PhDs. During the Financial Year 2016-17, a project of national importance i.e. Medical Devices Development Centre (MDDC) was approved by the Government of Pakistan, which has also been successfully established. During the Financial Year 2017-18, two major projects approved by the Government were National Centre of Artificial Intelligence and National Centre in Robotics and Automation. In Financial Year 2018-19, the major under approval projects are NUST Campus at Quetta and Upgradation / Replacement of Existing Laboratory Equipment at all campuses of NUST.

NUST is establishing its campus in Quetta in order to provide quality education for youth of Balochistan in the field of Engineering & Technology. The ground-breaking ceremony of NUST Quetta Campus was held on May 08, 2018. NUST would be offering undergraduate and postgraduate degrees in the field of Civil Engineering, Water Resource Management, Tunneling / Mining Engineering, Computer & Allied Sciences.



## Student Support Services

NUST offers a broad array of resources that allow students to extend and deepen their learning through civic engagement and participation in, and leadership of an active network of student-initiated projects and organizations. Services have been established to address all issues of the students pertaining to their university life-cycle, from selection to graduation and alumni network management. The services include Center for Counselling and Career Advisory, IT Facilities, Clubs and Societies Office, NUST Archives, Sports Office, Hostels and Messing Office, Internship and Placement Office, Alumni Office and commercial Bank.

### Centre for Counselling and Career Advisory (C<sup>3</sup>A)

The Centre offers professional, psychological and educational assessment, guidance and counselling and related services to the members of NUST community with a view to advancing and enhancing the academic and personal growth of students and other members of the University in general. NUST is the only university in Pakistan having a dedicated team of trained Psychologists and Counsellors conducting aptitude and psychological testing coupled with Counselling and undertaking research projects at the same time.

The Centre also functions as a student/faculty support organization and strives to develop the students into wholesome and productive human beings. The testing facilities at C3A assist students in having a clearer understanding of their personality, their strengths and weaknesses and problematic areas of their lives, thus guiding the individuals towards best possible choices and better adjustment in everyday life.

Facilities available at the Centre are:

- » Individual Counselling
- » Group Counselling
- » Psychological Testing
- » Workshops and Trainings
- » Seminars and Lectures
- » Harassment Complaint Cell
- » Counselling Camps
- » Community Services
- » Psycho-educational programmes/seminars

Assessment and Measurement is conducted for the following:

- » Intelligence Quotient (IQ)
- » Emotional Quotient (EQ)
- » Achievement
- » Personality
- » Aptitude
- » Ability
- » Career-related issues
- » Interests, Values, Opinions and Attitudes
- » Anxiety and Depression
- » Examination Stress, Anger, Leadership Styles, Psychological Well-being and Social Skills

#### Contact:

**Call:** 051-9085-1571, 051-9085-1579

**Email:** c3a@nust.edu.pk



### IT and Computing Facilities Information and Communication Technologies (ICT) Facilities at NUST

Provision of ICT facilities and services to NUST faculty, students & administrative staff is the core functional role of ICT Directorate; this directorate provides facilities and services at NUST Main Campus, Sector H-12 Islamabad and support services to Schools and constituent Colleges. To provide Quality of Service (QoS) to our valued users, ICT Directorate is broadly providing following ICT facilities and services:- ICT Infrastructure. NUST offers most modern computing and networking facilities and has the distinction of providing Internet access since early nineties. These include:-

- » Main Data Center, which is acting as hub for dissemination of all ICT services to NUST community.
- » Campus Optical Fiber Network, connecting all buildings with Main Data Center.
- » Gigabit Local Area Networks (LANs) in all Schools
- » High-speed Internet facility to the users through Pakistan Education and Research Network (PERN) programme of Higher Education Commission (HEC).
- » Latest high-speed Wi-Fi connecting has recently been established in all boys and girls hostels under Smart University Project (SUP) through HEC.
- » Central Authentication of all hostel Wi-Fi users for secured Internet access.
- » Computing laboratories are equipped with state-of-the-art servers, computers, software and allied equipment, which are connected through high speed LAN.
- » NUST Intranet is in place connecting all remote Campuses with Main Campus for information and resource sharing.

#### Campus Management System

To automate student academic life cycle processes NUST has implemented Campus Management Solution (CMS) in Fall-2015. CMS covers whole spectrum of student life cycle

activities from student Admission till graduation. Following are the main modules of CMS:

- » Student Admission
- » Course Enrollment
- » Attendance
- » Gradebook
- » Student Financials
- » Research Thesis Tracking & Management (RTTM)
- » Financial Aid
- » Student Self Service: for (Attendance Monitoring, Fee Invoices, Courses Enrollment, Grades View, Un-official Transcript, Feedback & Notifications)

**Faculty Self Service:** for (Attendance Marking, Grading, Personal Profiles update, Advise Students)

- » Transcript Generation
- » Alumni
- » Feedback & Survey Forms

With implementation of CMS, students from anywhere can now view/monitor their Attendance, Assignments' marks, Grades, Fee invoices, Academic Progression, Notifications and generate their transcript on real time.

### NUST Mobile Application

NUST has launched its first official mobile application in Aug 2017, which is available at Google Play Store. Mobile Application targeting the NUST Students, Parents and Employees. NUST Mobile application contains information about Student's Profile, Attendance, Timetable, Exam Results, NUST Notifications, and Payroll etc. Parents and Guardians

are able to see the Attendance and Exam Results of their wards through a highly intuitive screen-design of the Mobile Application and employees have the capability of viewing their Payroll in addition to getting live notifications with the up to date happening in NUST.

### NUST Web Portal

An elaborate NUST Web Portal ([www.nust.edu.pk](http://www.nust.edu.pk)) build in Microsoft SharePoint Technology available for dissemination of vital information to general public, students and the faculty. It covers more than 40 NUST & its respective constituent schools/colleges/institutes domains, which provides information about the research, students clubs & societies, programmes and activities of those institutions, updated on regular basis. A complete online admission/registration system along with NUST Financial Aid Application Form has been provided to the prospective candidates to apply for NUST. Processes namely registration, filling application form, and discipline wise selections, online payment through credit card and result announcement are available online to the prospective students.

To promote paperless environment in the University, following computerized systems are also in place:

- » Electronic Inter Office Note (e-ION) system for official correspondence and task management.
- » Electronic Mail Tracking System (e-MTS) to maintain mail movement record and location of document (files, letters, faxes, etc.).

## Human Resource Management/Development

NUST is a multi-campus university employing faculty and staff from diverse disciplines. The HR Directorate recruits and retains the best workforce to contribute towards the continuing success of the University. It is actively engaged in development of faculty and staff to ensure high standard and quality of education.

The faculty at NUST is actively engaged in research activities and providing an environment of practical learning to the students. The HR Directorate supports such programmes for the faculty to keep their expertise up-to-date and develop their skills continuously. Eligible faculty is sent abroad for higher studies and research programmes, and is also assisted for placement in various schools on their return.

Career development is another notable function carried out by the HR Directorate. It has successfully carried forward the progress of the University to operate at an optimal level in times of financial crunch by exploring/offering fully funded scholarships.

## Faculty Development Programme

The programme was started in 2002. As many as 430 scholars have been sent abroad for higher studies, out of which 316 have joined back.



## Student Affairs

Students' Clubs/Societies were established in 2011 under Student Affairs Directorate. The purpose was to provide an opportunity to every student to join a club or society keeping in view his potential and taste to nurture his leadership and managerial abilities. Response of the students has been highly encouraging. Hundreds of events are planned every year by the students from the forum of clubs and societies sponsored by Student Affairs Directorate.

## Clubs and Societies

Clubs and Societies is a forum for grooming the students in leadership traits as per their peculiar aptitude and potential. It enhances their foresight and organizational abilities. They are expected to plan and execute their club activities as they perceive in consultation with the club members and Faculty Sponsors. It inculcates team spirit and ability to take everybody on board. It makes a person more responsible and mature.

Existing Clubs and Societies are allocated to institutions as under:

- » NUST Entrepreneurs Club (NEC)
- » NUST Science Society (NSS)
- » NUST Literary Circle (NLC)
- » NUST Book Club (NBC)
- » NUST Bazm-e-Pakistan (NBP)
- » NUST Adventure Club (NAC)
- » NUST Environment Club (NEC)
- » NUST Dramatic Club (NDC)
- » NUST Debating Society (NDS)
- » NUST Media Club (NMC)
- » NUST Community Service Club (NCSC)
- » NUST Fine Arts Club (NFAC)
- » NUST BioReach Society
- » NUST Leaders Society (NLS)
- » NUST Excursion Club (NEC)
- » NUST Digital Club (NDC)
- » NUST Water Sports Club
- » NUST Technical Amusement Club (NTAC)
- » NUST Paragliding Club (NPC)
- » NUST Quiz Club (NQC)
- » NUST Trekking Club (NTC)
- » NUST Archery Club (NAC)
- » NUST Cultural Club (NCC)
- » NUST Fitness Club (NFS)
- » NUST Robotics Club (NRC)
- » International Chapter (NMAC)
- » GeneUs
- » Physics & Astronomy
- » NUST Economics Society
- » Music Club
- » American Academy of Environmental Engineers & Scientists (AAEES)

## Administrative Aspects

All Clubs shall adhere to the following approved appointments:

- » Faculty Sponsor
- » President
- » Secretary
- » Press Secretary
- » Treasurer

Half the Office Bearers must be from institutions other than the sponsor institution.

## Scope of the Clubs & Societies

Every Club and Society has its own defined scope, aim and objectives which are in sync with the title of the society.

## NUST Archive

Publishing and Student Affairs Directorate is also responsible for managing NUST Archive. The section collects/conserves archival material of historical importance including policy decisions, MoUs, artifacts, rare photographs and other miscellaneous documents. Digitization of documents is also maintained by the section.

## National Level Visits

SA Dte is responsible for conduct of inbound and outbound national level visits of schools/colleges and universities. NUSTians eagerly wait for trips to Northern areas and other recreational spots.

## Summer School

SA Dte is starting its first summer school from July 2018. It will become a regular feature in future. It aims at providing pre-University experience to FSC/O level students who are preparing their mind to join university. Students of the age group of 16 years are eligible for the course.

## High Achievers Award

Student Affairs Directorate arranges a simple but impressive ceremony once a year to recognize and certify the students who win a position in International, National or Inter-university competitions.

## NUST Olympiad

Student Affairs Directorate arranges NUST Olympiad once in two year. It is a mega event of the Directorate and students eagerly await this event.

## Orientation Week

NUST arranges orientation week for the Freshmen in September every year. Student Affairs Directorate plays lead role in the conduct of this event.



## Healthcare Services

NUST is providing medical services to the entire NUST Campus, H-12, Islamabad through a purpose-built NUST Medical Center, while in institutions outside Islamabad the same are being provided through their respective medical outfits. NUST Medical Center has a team of qualified medical officers and trained paramedical staff, who provide services round-the-clock. The Center is supported with fully equipped ambulances to evacuate the serious patients to Armed Forces and other civil sector tertiary care facilities. With the establishment of NUST Medical Complex at NUST Campus, H-12, Islamabad, the services of a tertiary care hospital will be available on campus.

# Accommodation

The newly built campus at H-12, Islamabad is located in the serene backdrop of majestic Margalla Hills. The NUST Campus, H-12, Islamabad blends old and modern architecture. The Kashmir Highway, which leads to M-1 (Motorway) linking it to the rest of the country through a wide range of motorways network, coasts along the campus which is only at 20-minutes drive from all the main terminals-air, bus and railways.

NUST Campus, H-12, Islamabad provides well-furnished and equipped male and female hostels named after great Muslim Scholars as under:

## Girls Hostels

- » Fatima Hostels - PG Students  
(2 blocks) Single Occupancy with attached washrooms
- » Zainab Hostel UG Students
- » Ayesha Hostel Double / Triple Occupancy
- » Khadija Hostel UG/PG Students
- » Amna Hostel Triple Occupancy

## Boys Hostels

- » Rumi Hostels - PG Students  
(3 blocks) Single / Double Occupancy with attached washrooms
- » Zakariya Hostel UG Students
- » Hajveri Hostel Triple Occupancy
- » Ghazali Hostels\*
- » Razi Hostels\*
- » Attar Hostels\*  
\*2 blocks each

## Monthly Accommodation Charges (NUST Campus, H-12, Islamabad)

### Hostel Accommodation Charges for National Students

- » Single occupancy with attached bath Rs. 6500/-
- » Double occupancy with attached bath Rs. 5500/-
- » Double occupancy with community bath Rs. 4500/-
- » Tripple occupancy with community bath Rs. 4000/-

### Married Students

- » One bedroom apartment Rs. 9,000/-
- » Two bedroom apartment Rs. 13,000/-

### Note:

- Security Fee of Rs. 10,000/- (Refundable) will be charged at the time of allotment.



- Hostel includes accommodation charges only.

### Visiting Faculty Accommodation

A guest block has been created for visiting faculty in the married student's hostel. The block is fully furnished with attached dining facilities.

### Secure Environment

In addition to highly effective Campus security arrangements, all hostels have CCTV Cameras, protective boundary walls, security personnel and dedicated staff at each block.

### Hostel Management

A qualified and experienced management team, composed as under, looks after hostel affairs:

- » Deputy Director and AD Hostels with Office Staff, Manager (Hostels) and Caretakers.
- » Deputy Director Hostels and AD Hostels (Male & Female) with Office Staff, Managers (Hostel) and Caretakers

Manager (Hostels) with necessary staff remains available in each hostel round the clock.

## Facilities

Facilities provided in the hostels include:

- » Attached / Community washrooms
- » Fully furnished rooms
- » Central heating system
- » High Speed internet connectivity
- » Telephone
- » Gymnasium, Billiard Table, Table Tennis
- » TV lounges with Cable TV
- » Dining Halls with attached kitchens and service areas
- » Standby Generator
- » Laundry Service (Free of Cost)
- » Medical Care
- » Prayer Area
- » Vending Machine

## Allotment Procedure

Hostel accommodation in the relevant category is allotted as per Hostel Allotment SoP's. Students are required to apply on available online google docs form on NUST website <http://nust.edu.pk/Campus-Life/Pages/Amenities-Facilities.aspx>.

## Messing

The hostels provide catering services and the boarders have a choice to enjoy a variety of wholesome food, prepared under hygienic conditions.

## Charges

Mess Security Rs. 9,000/- (Refundable)

Monthly Charges Rs. 6750 /- (Rs. 225/- per day)

## Cafeteria and Shopping Complex

Aesthetically designed cafeterias and shopping complexes, called Concordia I and Concordia II, have been constructed in the northern and southern wings of NUST Campus, H-12, Islamabad. Concordias offer the following services:-

### Concordia-I

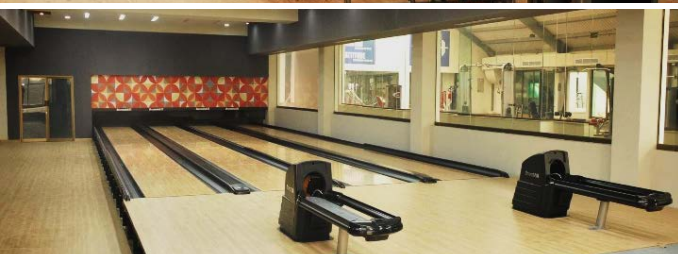
- » Cafeteria
- » Mini Mart (Artizm)
- » Refreshment Corner
- » Stationery Shop
- » Photo State / Computer Shop

### Concordia-II

- » Cafeteria
- » Mini Mart
- » Stationery Shop
- » Photo State / Computer Shop
- » Gents Tailor
- » Ladies Tailor
- » Barber Shop
- » Souvenir Shop
- » Photocopier Shop

A new shopping complex opposite MI Room, near Gate – 10 has been added which include a full-fledged branch of CSD Store and following shops:-

- » Beauty Parlor
- » Meat, Chicken, Fruit & Vegetable
- » Gents Tailor
- » Ladies Tailor
- » Cobbler Shop
- » Pharmacy & Cosmetics Shop
- » Stationery, Photocopy & Scanner
- » Barber Shop
- » Dry Cleaner Shop
- » Bakery Shop



- » Mobile Shop

## Shuttle Service

NUST has a very elaborate and very well organized transport system to cater for the needs of students, faculty and staff alike. Special emphasis is on environmental friendly transport system. NUST runs a fleet of Electric Cars within Campus to minimize carbon emission. Electric Cars are utilized to shuttle between various locations within the campus i.e. Hostels to various School/Offices and from Gates to Schools/Hostels/Offices. NUST also has a very well organized mass transit transport system for pick and drop of students, faculty and staff from all localities of twin cities with variable timings. Transport is also made available to facilitate students for industrial visits, research projects, club activities, society/community initiatives, awareness walks and for excursion trips.



## Sports and Recreation

NUST offers a wide variety of sports activities. All Colleges have elaborate sports infrastructure. The NUST Campus, H-12, Islamabad is developing at a fast pace and have the following facilities of international standard:-

**Indoor Facilities:** 2x Multipurpose hall, 2x Basketball, 1x Volleyball, 6x Badminton, 6x Table Tennis, 2x Snooker, 1x pool table, 4x Fitness Gyms, 2x Squash Courts, 1x all weather Swimming Pool, 1x Bowling Alley.

**Outdoor Facilities:-** 2x Football fields, 5x Cricket grounds, 1x hockey ground, 9x Futsal grounds, 5x Basketball courts, 1x Handball court, 1x Netball court, 9x Volleyball Courts, 4x Badminton courts, 5x Tennis courts, 1x Skating Rink, 1x Climbing Wall, 1x Athletic ground, 1x Hiking Trail (1.5 Km).

**Hostels Facilities:-** 10x Fitness gym, 4x Table Tennis, 4x Pool Tables, 2x Basketball courts, 1x Volleyball court and 17x Badminton courts.

NUST has established a Riding Club in H-12 Campus being the pioneer University in Pakistan to have such a facility. Regular Inter-College/School Sports Competitions are held every year at the University. NUST teams have been participating and performing well in HEC Intervarsity Sports Competition both at the Zonal and National levels. No of our players have represented Pakistan in different Sports and achieved good positions at National Levels.

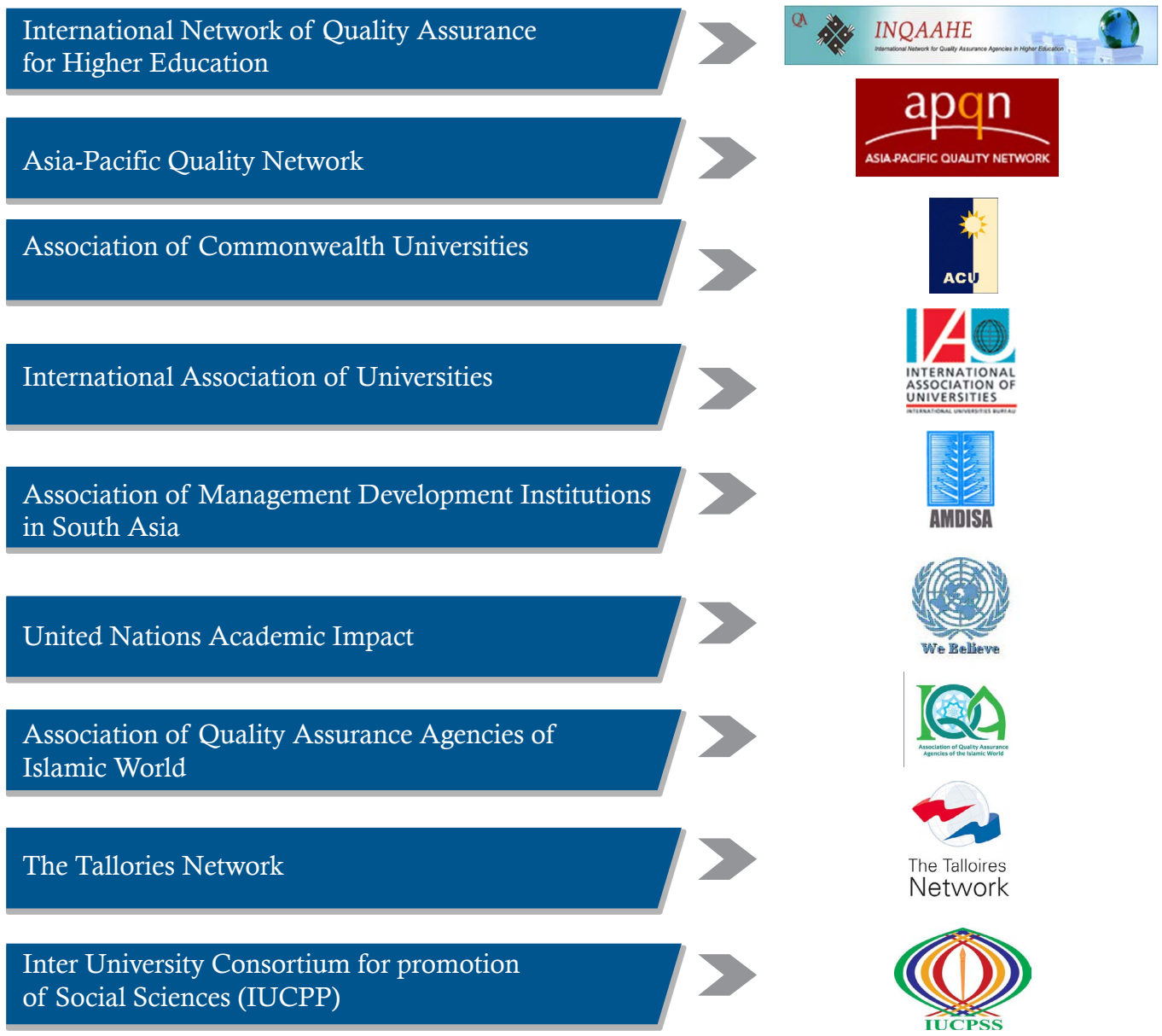
NUST also has a well qualified and very experienced team of sports coaches. They impart the sports coaching to students and supervise all the sports activities in the University.





## Membership of Quality Assurance Associations/Networks

NUST has actively been playing a role of assuring and enhancing the quality of education since its inception. For the purpose of learning, knowledge sharing of good practices, global networking and co-organizing international seminars and networks, NUST is an active member of following international associations / networks



# NUST Campuses

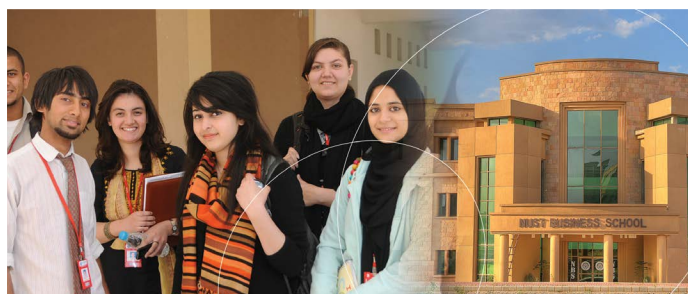
## H-12, Islamabad Campus

### School of Electrical Engineering and Computer Science (SEECS)



NUST School of Electrical Engineering and Computer Science (formerly NIIT) chronicles an incredible tale of what focused efforts with a clear vision, singular commitment and a passionate quest for excellence are capable of achieving within the span of a decade. From its embryonic appearance in 1999 as a tiny IT wing of NUST, this school has blossomed into one of the finest seats of higher education. The philosophy of education at SEECS puts due premium on an essential blending of engineering and computing education with a sound orientation of social and humanitarian interests of the society. With the relocation of SEECS to the idyllic setting of NUST Campus, H-12, Islamabad, it is destined to set a new pace for cultivation of wholesome social and moral values in the students who are privileged to enter its portals.

### NUST Business School (NBS)



NBS has evolved and emerged as a well established institute from NUST Institute of Management Studies NIMS. In the recent past it has proved itself as one of the finest and prestigious management schools of Pakistan offering both the UG and PG programmes with state-of-the-art learning infrastructure which includes well equipped class rooms, lecture and seminar halls, language and research labs, a fully functional library that offers both physical and digital sources of information along with top-of-the line teaching faculty with years of research and professional experience. NBS employs result based teaching methodology through its close liaison with the industry. Several initiatives such as joint field projects, research activities, workshops, seminar and lectures from professionals enrich the professional learning of the students. Its recent accreditation with the NBEAC has enhanced inter and intra-institutional cooperative practices as well as ensured professional mobility and employment opportunities for its graduates. We at NBS believe in continued improvement mechanism through periodic students' surveys, faculty and curriculum evaluation.

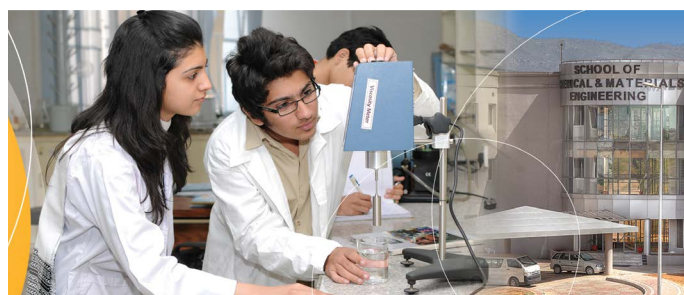
Our increasing focus on research together with the initiatives to develop synergies with other centers of excellence within NUST will enable us to become business school par excellence.

### School of Social Sciences and Humanities (S<sup>3</sup>H)



The discipline of social sciences plays a vital role in understanding the function of society, studying individual behavior and evaluating social problems and their impact on society. Taking cognizance of the significance of social sciences and humanities discipline, NUST has recently established the School of Social Sciences and Humanities (S<sup>3</sup>H). Founded in 2013, the history of the school can be traced back to 1999 when its seed began to germinate in the form of establishment of NUST Institute of Management Sciences (NIMS) which was renamed as NUST Business School (NBS) in 2008. Later, three social sciences departments namely Department of Economics, Department of Government and Public Policy, and Department of Mass Communication were launched and initially housed under the umbrella of NUST Business School. These three departments together with Department of Behavioral Sciences and Department of Career Counseling & Education converged into the School of Social Sciences and Humanities in the year 2013. A brand new state-of-the-art building of S<sup>3</sup>H has been constructed and the school has shifted to new building in 2015.

### School of Chemical and Materials Engineering (SCME)



The School of Chemical and Materials Engineering (SCME) became functional in 2006 as a research-oriented school of NUST and is currently offering two undergraduate and three postgraduate degree programmes in the twin disciplines of Chemical Engineering, Materials Engineering and Nanoscience & Engineering. Setting up an educational institution in unique and highly specialised areas is a great challenge. It is very satisfying that within four years, the postgraduate programmes

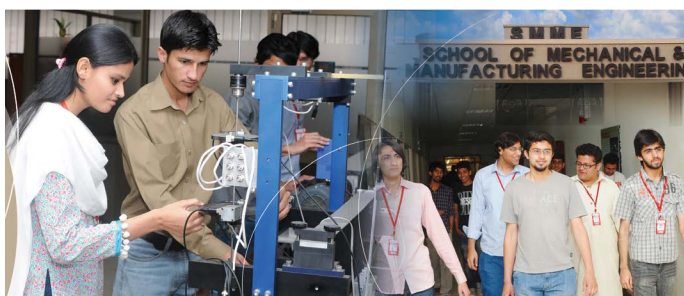
stand fully established. The School has acquired the services of one of the best faculty in the country, besides establishing a rigorous self-assessment Quality Assurance process to ensure that our graduates get the best education possible. An equal emphasis is laid on development of their character and personality.

## School of Civil and Environmental Engineering (SCEE)



School of Civil and Environmental Engineering was established in November 2008. It comprises four vibrant institutions namely National Institute of Transportation (NIT), Institute of Environmental Sciences and Engineering (IESE), Institute of Geographical Information Systems (IGIS) and NUST Institute of Civil Engineering (NICE). SCEE is a modern and progressive engineering school of the country, the first of its kind that offers a wide choice of BE programmes in Civil, Geoinformatics and Environmental Engineering. In BE programmes, the students are given the option of selecting elective majors. SCEE has very strong postgraduate programmes (MS/PhD) in Structural Engineering, Geotechnical Engineering, Transportation Engineering, Water Resources Engineering, Environmental Engineering, Environmental Science, Geographic Information Systems, Urban & Regional Planning, Geotechnical & Tunneling, Remote Sensing and Construction Engineering & Management.

## School of Mechanical and Manufacturing Engineering (SMME)



The School of Mechanical and Manufacturing Engineering (SMME) was established in 2008. SMME was set up to prepare human resource with essential skills in Mechanical Engineering and allied renewable technologies, with specific emphasis on manufacturing, automobile, power/energy and biomedical sectors to perform effectively in the technological world. The School has state-of-the-art laboratories related to mechanical, manufacturing, robotics and biomedical fields.

The School is offering an undergraduate programme in Mechanical Engineering and postgraduate programmes (MS and PhD) in Mechanical Engineering, Design and Manufacturing Engineering, Robotics and Intelligent Machine Engineering, Biomedical Sciences and Biomedical Engineering.

## School of Art, Design and Architecture (SADA)



The School of Art, Design and Architecture is an addition to the elite league of NUST constituent Schools and Colleges. SADA was established in September 2010. The school now in its eight year is continuously working towards establishing one of the most modern and competitive schools of Architecture in the country. The School is all set to bring a truly world-class dimension to the field of education in art, architecture and design by collaborating with the world-renowned Department of Architecture of the Middle East Technical University (METU) Turkey, the first department established at METU in 1956, which is affiliated with various international bodies of architecture. This collaboration will be instrumental in combining the strengths of both world class universities, that collectively hold over seven decades of experience in creating, disseminating and re-inventing knowledge. This collaboration will go a long way in imparting a truly global perspective to our programmes; thereby amalgamating the best of both cultures in order to produce strikingly creative work by students and faculty alike. The school is presently offering a Bachelor of Architecture and Industrial Design Degree. It has well equipped studios, labs and workshops.

## Research Center for Modelling and Simulation (RCMS)



Research Center for Modelling and Simulation was established at NUST in 2007 to set up Modelling and Simulation facilities for design and development in various disciplines through education, training and research, and to act as a platform to integrate these efforts by the government, academia and industry. The Center focuses on mathematical modelling and simulation of structures, fluids, electrical systems, communication systems, computer and network architecture, operations management, human behaviour and war scenarios. RCMS started its first MS degree programme in Computational Science and Engineering in Fall 2008 has been upgraded to PhD with specialisations in Fluid Flow and Structures and Computational Infrastructures and Visualisation. The curriculum has been structured to impart students with solid M&S foundational knowledge and skills. The Center also offers MS in Systems Engineering and Bioinformatics.

## School of Natural Sciences (SNS)



Established in May 2004, School of Natural Sciences (SNS) formerly known as Centre for Advanced Mathematics and Physics (CAMP), is a young and thriving school that contributes vitally to the research output of not only NUST but also of the country. The research carried out at SNS is regularly published in international journals of repute. SNS offers MS and PhD programmes in the fields of Mathematics, Physics and Chemistry and, an exciting four-year undergraduate programme leading to the Bachelor of Science (BS) in Mathematics, Physics and Chemistry. Our postgraduate programmes emphasize breadth of understanding the core areas of Mathematics, Physics and Chemistry in addition to culminating in these demonstrating mastery in one of the many research directions that are pursued at SNS. The total number of papers published by the faculty at the start of SNS was about 330 of which 200 were in ISI listed journals with an impact factor of about 292 and impact factor per faculty of about 32.5.

## Centre for Counselling and Career Advisory (C<sup>3</sup>A)



Centre for Counselling and Career Advisory (C<sup>3</sup>A) is a unit of NUST that provides primary mental health services. C<sup>3</sup>A is offering this service, to all the NUST students, faculty, personnel and families of those associated, within and outside the NUST Campus, H-12, Islamabad. The core objective of C<sup>3</sup>A is to provide professional counselling services, for educational, social, emotional and psychological issues that may inhibit personal or professional performance and advancement. The Centre also offers workshops, seminars and lectures to augment the counseling process apart from carrying out research on a variety of psychological and educational issues.

## Atta-ur-Rahman School of Applied Biosciences (ASAB)



The School was initially established as Centre of Virology and Immunology in October 2007, to provide research and teaching facilities in the field of Virology and Immunology. Recently, it has been named after the eminent scientist, Dr Atta-ur-Rahman, who has very graciously accepted to be its patron and advisor. The School provides excellent research and teaching facilities in the field of applied biology in Pakistan. ASAB has dynamic interdisciplinary undergraduate and graduate programmes which prepare the students for pursuits in research and teaching in pure molecular as well as applied biology. The faculty includes members of Health, Plant and Industrial Biotechnology, Virology, Molecular Biology, Plant Biology, Biochemistry, Medicine, Neurology, Rheumatology, Immunology and Oncology. The research and training programmes have collaborations with other institutions in Pakistan and abroad. The School offers MS Healthcare Biotechnology, MS Plant Biotechnology, MS Industrial Technology and PhD Applied Biosciences.

## US-Pak Center for Advanced Studies in Energy (USPCAS-E)



US-Pak Center for Advanced Studies in Energy (USPCAS-E) was launched in June 2011 to provide impetus to energy sector programmes and support and consolidate related activities/projects with a view to contributing to national economy in times of energy crisis. It was inaugurated on January 9, 2012. Collaborating partners from Canada, USA, UK, RSA and KSA warmly participated in the event. The Center aims at providing sustainable supply of energy at affordable rates with greater share of renewable in the energy mix to reduce environmental footprint. The center's vision resides in setting up pilot plants to demonstrate the feasibility of specific programmes in the various energy sectors. Thus, takes the lead in moving from research and development to demonstration; a step that is considered vital for meaningful academia-industry collaboration. The Center offers MS and PhD in Energy Systems Engineering, MS in Thermal Energy Engineering and Electrical Engineering (Power) programmes.

### Military College of Signals (MCS)



Since its inception, the Military College of Signals (MCS) has matured into a premier college of NUST and a center of professional excellence. MCS was established in 1947 as School of Signals. In 1960, it was affiliated with Royal School of Signals to fulfil the requirements of Pakistan Army in the field of Telecommunication Engineering. In 1977, it was affiliated with University of Engineering and Technology, Lahore for award of Telecommunication degree, thereby gaining its elevation as Military College of Signals. In 1991, MCS became a constituent college of National University of Sciences and Technology (NUST). The College also started undergraduate and postgraduate programmes in Software Engineering and postgraduate programme in Telecommunication, System Engineering and Information Security. In 2001, the College introduced PhD degrees in all its programmes.

### College of Electrical and Mechanical Engineering (C of E&ME)



C of E&ME is situated along the Grand Trunk Road, at Rawalpindi-Islamabad nexus. Fascinating locale and congenial environment are indeed the hallmarks of this institution. It enjoys the distinction of being the largest constituent college of NUST in terms of doctoral positions in the faculty, student enrolment, diversity of training programmes, research and higher education, infrastructure and facilities. The College attained ISO-9001 certification in 1999; 9001-2000 in 2003 and 9001-2008 in 2009. It has been earning distinctions and acknowledgement in quality assurance and PEC accreditation evaluation. It offers a rich assortment of degree programmes ranging from undergraduate to postgraduate programmes in diverse disciplines, the main fields being Electrical, Mechanical, Software, Computer and Mechatronics Engineering as well as Engineering Management.

### NUST Institute of Peace and Conflict Studies (NIPCONS)



NIPCONS was established at the NUST Campus, Tamizuddin Road, Rawalpindi in December 2009, with the primary mandate to plan / organize the system of education for Army cadets / Young Officers (YOs), compatible with the academic syllabus / standards of NUST and award UG degree (Bachelors of Military Art and Science [BMAS]) on completion of specified syllabus / credit hours. Additionally, the Institute is envisioned to grow as a Center of excellence in the field of Peace and Conflict Studies (CIPS). CIPS was established on 1st March 2013. Later, it was inaugurated by UNSG Ban Ki-moon on 13th August 2013. It is a unique institution – the only one of its kind established with the purpose of conducting research and training in matters related to UN Peacekeeping Operations (UNPKOs). Its mandate is, however, not restricted to the relatively narrow field of peacekeeping. The studies at CIPS are organized within the overarching discipline of Peace & Conflict Studies. This relatively new branch of social sciences is devoted to identifying and analysing the nature of conflict with a view to finding solutions through peaceful and non-violent means. The center is offering MS and PhD programme in Peace and Conflict Studies.

## Risalpur Campuses

### Military College of Engineering (MCE)



The School of Military Engineering was established after the end of World War-II in 1946 near Kirkee (Poona) in southern India. After the partition of the sub-continent and emergence of Pakistan, the School of Military Engineering was established at Sialkot in April 1948. The institute was shifted from Sialkot to Risalpur in the year 1952 and developed into an engineering institution.

Military College of Engineering is a premier college of NUST that offers an undergraduate degree in Civil Engineering. It has a rich legacy dating back to the post World War II era. Passing several milestones, MCE was granted degree awarding status through Presidential Ordinance of 1962. With the emergence of NUST,

MCE entered the folds of the University's constituent colleges in 1995. MCE was recertified as an ISO 9001-2000 institute after successfully meeting all quality standards in July 2008. MCE has the honour of producing 3157 BE graduates, including 60 foreign students.

## College of Aeronautical Engineering (CAE)



College of Aeronautical Engineering (CAE) has a legacy which is as impressive as some of its aforementioned counterparts. The college was established in 1965 with the help of USAF, which provided three experienced and qualified officers as its pioneering Principal and Head of Departments. This premier college offers undergraduate and postgraduate degrees in Aerospace and Avionics Engineering. Its programmes are fortified by foreign qualified faculty. The College was initially located at Pakistan Air Force (PAF) Base Korangi and was affiliated with the University of Karachi. Later, on the establishment of NED University of Engineering & Technology in March, 1977, affiliation of the College was transferred to NED University. In May, 1986, CAE was shifted to Risalpur and since then it is an integral part of the PAF Academy. It became a constituent college of National University of Sciences and Technology (NUST), Islamabad in 1994. The MS programme in Aerospace and Avionics Engineering commenced at CAE in 1997. In 1999 CAE achieved ISO 9000 certification for the quality management system of its academic programmes. Outcome Based Education (OBE) programme was started at CAE in 2014 after PEC became a provisional signatory of the Washington Accord (WA) of International Engineering Alliance (IEA).

## National Institute of Transportation (NIT)

The National Institute of Transportation (NIT) is one of the pioneer constituent institute of NUST. The Institute was established in 1991 at Risalpur. The Institute's mandate is to develop manpower equipped with latest engineering knowledge and compatible skills to take on the challenges in the field of transportation. Since its inception, this National institute has been imparting advance higher education in core civil engineering fields (i.e. MS / PhD programs in Transportation Engineering, Structural Engineering and Geotechnical Engineering). NIT is focused to become a center of excellence of international repute by providing quality education, research and training. NIT has always played a leading role as a think



tank by sharing expertise and suggesting long term solutions for complex engineering issues. The faculty of the institute has always been involved in national and international level research and development projects.

## Karachi Campus

### Pakistan Navy Engineering College (PNEC)



The genesis of PN Engineering College lies in the Officers Training Section (OTS) which was set up in 1962. In 1966, the status of OTS was upgraded to that of a college and given the name of Pakistan Navy Engineering College (PNEC). PNEC was affiliated with Karachi University in the same year. In 1977, the affiliation of PNEC was transferred to NED University of Engineering & Technology. The college was shifted to its present location in 1982. In 1995 it became constituent college of National University of Sciences and Technology (NUST). PNEC Offering comprehensive undergraduate degrees in Electrical Engineering and Mechanical Engineering. Pakistan Naval Engineering College (PNEC), Karachi has the distinction of being the first educational institution of the country to have obtained ISO-9001 certification. Another milestone was achieved with the introduction of its first MS and PhD programmes in 1998. The College continues to diversify its programmes, and offers MS and PhD programmes in Electrical (Control) Engineering, Manufacturing Engineering & Management, and Mechanical Engineering. The College has also introduced MS in Naval Architecture programme from Fall 2018.

## NUST Balochistan Campus, Quetta



NUST Balochistan campus (NBC) was inaugurated in an impressive ceremony by Chief of Army Staff and Chairman NUST Board of Governors – Gen. Qamar Javed Bajwa NI (M), HI(M), in the presence of Chief Minister Balochistan – Abdul Quddus Bizenjo, Speaker Balochistan Assembly Rahila Durrani, Balochistan Assembly's Leader of Opposition Abdul Rahim Ziaratwal, Vice Chancellors and students of different universities and other notables in 2019. Through this campus, NUST aims to take quality education to the youth of Balochistan, enabling them to graduate from Pakistan's No. 1 Science & Technology university, and be at par with the best engineers and scientists not only in Pakistan but also internationally.



# Institutions and Programmes



**MCE**

Military College of Engineering,  
Risalpur



Civil engineers design, construct, manage and improve our environment. They develop our infrastructure and have a profound effect on the way we live through consideration of function, aesthetics, economics and sustainability.

The School of Military Engineering was established after the end of World War-II in 1946 near Rurkee (Poona) in southern India. After partition of the sub-continent and emergence of Pakistan, the School of Military Engineering was established at Sialkot in April 1948. The institute was shifted from Sialkot to Risalpur in the year 1952 and developed into an engineering institution.

Military College of Engineering (MCE) attained the status of a degree-awarding institution in 1962. In pursuit of academic excellence and to keep pace with the state-of-the-art technologies, the College took a lead by instituting postgraduate classes in 1988 offering specialisation in the disciplines of structures and transportation engineering. In 1990, the College was affiliated with Michigan State University, USA, for split Masters Degree. National Institute of Transportation (NIT) was established at Risalpur in 1992, thereafter, Post Graduate (PG) programme was shifted from MCE to NIT. With the emergence of NUST, MCE became its constituent college in 1995. In year 2000, MCE got ISO-9001-2000 certification after successfully meeting all quality standards. MCE has the honour of producing 3,569 engineering graduates, including around 60 international students. Later, 285 students completed their masters and over 50 have done their PhD's from renowned universities of the country and abroad. MCE resumed postgraduate programmes in five rare disciplines Disaster Management, Construction Engineering & Management, Structural Engineering, Transportation Engineering and Geotechnical Engineering. The journey that started in 1948 from Sialkot, spans over 63 years of rich history and success. The College is committed to the pursuit of knowledge and professionalism. In 2020, MCE has published 25 publications in research journals.

## Location and Significance

Risalpur is linked with Islamabad and Peshawar through Grand Trunk (GT) Road and Islamabad-Peshawar Motorway M-1. It is located just 5 kms from Rashaki Interchange on M-1 and is just an hour distance from Islamabad. Risalpur has rich educational and diverse history. It harbours three important institutions, i.e., MCE, College of Aeronautical Engineering (CAE), and PAF Academy.

## Faculty Profiles

The Military College of Engineering is committed to high quality education. It provides excellence in teaching underpinned by research and links with business and industry. Dedicated faculty and staff make the learning experience both exciting and rewarding. The College endeavours to provide support and facilities of the highest possible quality.

### Engr Akhtar Subhan, **Commandant**

MPhil (NDU, Islamabad), Pakistan

**Discipline:** Social Sciences

**Specialisation:** Public Policy & Strategic Security Management

### Dr Muhammad Irfan, **Dean**

PhD (Purdue University), USA

**Discipline:** Civil Engineering

**Specialisation:** Transportation Engineering

## Department of Structural Engineering

### Dr Muhammad Rizwan, **HoD**

PhD (UIUC) USA

**Discipline:** Civil Engineering

**Specialisation:** Structural Engineering

### Engr Abdul Basit

MS (NED UET, Karachi), Pakistan

**Discipline:** Civil Engineering

**Specialisation:** Structural Engineering

### Dr Muhammad Rizwan

PhD (UET Lahore) Pakistan

**Discipline:** Civil Engineering

**Specialisation:** Structural Engineering

### Engr Nadeem Iqbal

MS (NUST), Pakistan

**Discipline:** Civil Engineering

**Specialisation:** Structural Engineering

### Dr Muhammad Shahid Siddique

MS (Bauhaus University Weimar) Germany

**Discipline:** Civil Engineering

**Specialisation:** Structural Engineering

### Engr Asad Naeem

MS (TU Dresden), Germany

**Discipline:** Civil Engineering

**Specialisation:** Structural Engineering

### Dr Syed Hassan Farooq

PhD (UET Lahore), Pakistan

**Discipline:** Civil Engineering

**Specialisation:** Structural Engineering

### Engr Sarmad Sonyal

MS (UET Lahore), Pakistan

**Discipline:** Civil Engineering

**Specialisation:** Structural Engineering

### Engr Syed Roshan Zamir Hashmi

MS (NUST), Pakistan

**Discipline:** Civil Engineering

**Specialisation:** Structural Engineering

### Engr Momina Rauf

MS (NUST), Pakistan

**Discipline:** Civil Engineering

**Specialisation:** Structural Engineering

**Engr Yasir Siraj**  
MS (NUST), Pakistan  
**Discipline:** Civil Engineering  
**Specialisation:** Structural Engineering

## Disaster Management Department

**Dr Nadeem Shahzad, HoD**  
PhD (NUST) Pakistan  
**Discipline:** Civil Engineering  
**Specialisation:** Environmental Engineering

**Mrs Zarmina Akbar**  
MS (NUST) Pakistan  
**Discipline:** Disaster Management  
**Specialisation:** Disaster Managements

**Ms Somana Riaz**  
MS (NUST) Pakistan  
**Discipline:** Disaster Management  
**Specialisation:** Disaster Managements

## Department of Basic Sciences & Humanities

**Dr Faisal Yousafzai, HOD**  
PhD (University of Science and Technology of China) China  
**Discipline:** Mathematics  
**Specialisation:** Mathematics

**Dr Imran Ullah**  
PhD (University Teknologi) Malaysia  
**Discipline:** Mathematics  
**Specialisation:** Mathematics

**Mr Asim Khan**  
M.Phil (University of Peshawar) Pakistan  
**Discipline:** Mathematics  
**Specialisation:** Mathematics

**Mr Muhammad Danish Zia**  
M.Phil (NUST) Pakistan  
**Discipline:** Mathematics  
**Specialisation:** Mathematics

**Dr Banat Gul**  
PhD (PIEAS), Pakistan  
**Discipline:** Physics  
**Specialisation:** Physics

## Department of Water Resources Engineering & Management (WRE&M)

**Dr Naeem Shahzad, HoD**  
PhD (NUST), Pakistan  
**Discipline:** Civil Engineering  
**Specialisation:** Environmental Engineering

**Dr Muhammad Amjad**  
PhD (METU, Ankara), Turkey  
**Discipline:** Civil Engineering  
**Specialisation:** Water Resources Engineering

**Engr Muhammad Umair Ghazi**  
MS (NUST), Pakistan  
**Discipline:** Civil Engineering  
**Specialisation:** Water Resources Engineering

**Engr Muhammad Ukasha**  
ME (The University of Tokyo), Japan  
**Discipline:** Civil Engineering  
**Specialisation:** Water Resources Engineering

**Engr Ahmad Hanan**  
MS (University of Hertfordshire), UK  
**Discipline:** Civil Engineering  
**Specialisation:** Mechanical Engineering

## Department of Transportation & Geotechnical Engineering

**Dr Sarfraz Ahmed, HoD**  
PhD (University of Illinois, Urbana), USA  
**Discipline:** Civil Engineering  
**Specialisation:** Transportation Engineering

**Dr Abdul Waheed**  
PhD (UET Taxila), Pakistan  
**Discipline:** Civil Engineering  
**Specialisation:** Geotechnical Engineering

**Mr Zulfiqar Ali Khan**  
MS (The University of Punjab) Pakistan  
**Discipline:** Geology  
**Specialisation:** Engineering Geology

**Dr Rana M. Asad Khan**  
PhD (Hanyang University), South Korea  
**Discipline:** Civil Engineering  
**Specialisation:** Geotechnical Engineering

**Engr Nawab Ali**  
MS (SCEE, NUST), Pakistan  
**Discipline:** Civil Engineering  
**Specialisation:** Geotechnical Engineering

**Engr Yasir Mahmood**  
MS (NUST), Pakistan  
**Discipline:** Civil Engineering  
**Specialisation:** Transportation Engineering

**Engr Muhammad Waqar Zafar**  
MS (NUST), Pakistan  
**Discipline:** Civil Engineering  
**Specialisation:** Geotechnical Engineering

**Dr Rai Waqas Azfar Khan, HoD**

PhD (NUST, Islamabad) Pakistan

**Discipline:** Civil Engineering

**Specialisation:** Engineering Management

**Dr Sajid Mahmood**

PhD (University Technology Malaysia), Malaysia

**Discipline:** Geomatics Engineering

**Specialisation:** Photogrammetry (Terrestrial LiDAR/ Remote Sensing)

**Dr Khwaja Mateen Mazhar**

PhD (The Hong Kong Polytechnic University), Hong Kong

**Discipline:** Civil Engineering

**Specialisation:** Construction Engineering & Management

**Dr Abubakar Sharafat**

PhD (Hanyang University), Seoul

**Discipline:** Civil Engineering

**Specialisation:** Construction Engineering & Management

**Dr Ali Abbas**

PhD (The Hong Kong Polytechnic University), Hong Kong

**Discipline:** Civil Engineering

**Specialisation:** Construction Engineering & Management

**Engr Khurram Iqbal**

MS (NUST), Pakistan

**Discipline:** Civil Engineering

**Specialisation:** Construction Engineering & Management

## Sustainable Advanced Geomechanical Engineering (SAGE) Department

**Dr Hamid Ashraf, HoD**

PhD (WITS), South Africa

**Discipline:** Civil Engineering

**Specialisation:** Mining (Mineral Resource Management)

**Dr Tariq Feroz**

PhD (WITS), South Africa

**Discipline:** Civil Engineering

**Specialisation:** Mining

**Dr Saqib Ahmad Saki**

PhD (Colorado School of Mines), USA

**Discipline:** Civil Engineering

**Specialisation:** Mining and Earth Systems Engineering

**Dr Muhammad Ali**

PhD (China University of Mining and Technology), China

**Discipline:** Civil Engineering

**Specialisation:** Safety of Mines/ Mining

## Students Support Facilities

Different student societies have been formed which cover varied interests such as creativity, sports and intellectual pursuits. The main societies of the College include:

- » Sports Club
- » Media Club
- » Adventure Club
- » Dramatic & Fine Arts Club
- » Community Services Club
- » Cyber & Science Society
- » Debating & Literary Society

In-line with its commitment to support all student initiatives, the College facilitates club activities. Some of the activities that are organized on a regular basis include:

- » Movies on weekend
- » Telecasting cricket matches on large screen
- » Food stalls offering barbecue, Chinese cuisine and sunday brunch etc

### Safety and Security

By virtue of its location inside the cantonment, the College has an elaborate security system. There is an internal security system for each hostel; a guard is deputed for each hostel to ensure the safety of students and their belongings throughout the day. Mobile patrolling is carried out for augmenting security.

### Sports Center

The College has both indoor and outdoor sports facilities including a Sports Complex. Apart from routine games, competitions are held in all the sports on a regular basis in order to inculcate sportsmanship amongst students. These competitions include inter-college and inter-university championship.

### Indoor Sports

Indoor facilities are available for table tennis, badminton, billiard, squash, body weight training and functional fitness etc. Recently, International standard squash courts have been constructed to provide best possible facilities to the students.

### Outdoor Sports

For outdoor sports, i.e. tennis, basket ball, volleyball courts and hockey, football and cricket grounds are available.



### Gymnasium

Our gymnasium provides a combination of top of the line functional fitness, cardio and resistance equipment. Well-stocked free-weight area provides exercise programmes for

beginners and advanced individuals alike. Professionals are available to encourage and advise students.

### Swimming Pool

An international standard swimming pool is being maintained at the College so that students can participate in healthy and competitive swimming galas, besides using the pool as a recreational facility. A swimming gala is organized every summer for students. They can get membership at a nominal fee for an entire season.



### Student Counseling Service

A professional and confidential counseling service is available to all students. During counseling sessions, both personal and social issues like loneliness, family issues and worries pertaining to studies are discussed. Counseling is offered both in groups and on an individual basis. The College has established a special counseling cell, which is headed by an Officer. The cell undertakes the following responsibilities:

- » It helps students make decisions regarding their study plans and provides relevant information on subjects offered in various semesters and their pre-requisites.
- » It seeks to help students address and overcome their weaknesses in various subjects.
- » The services of C<sup>3</sup>A Directorate are also solicited when required.

### Parental Information/Counselling Services

MCE always endeavours to keep the parents fully abreast with the academic and discipline growth of their children. MCE has set procedures to communicate with the parents. On requirement basis, results are also shared with the parents for mentoring and effective learning.

### Academic Evaluation Services

MCE has set procedures to evaluate the academic curriculum and monitor students' performance and provide proper mentoring to the students. Faculty, HoDs, Dean and Commandant are fully involved in this process.

### Academic Learning Support

The academic tutor and course officer, under the supervision of the Chief Instructor or Dean, analyses and finds viable solutions for problems of the students. The service aims at the following:

## Do You Know?

Military College of Engineering, Risalpur, holds the unique honour of being the oldest institution amongst NUST constituent Colleges. It was established in 1948, in Sialkot, and was later shifted to Risalpur in 1952.

- » Helping students maximize their academic potential.
- » Helping students in their individual and collective academic tasks. In this regard, workshops are arranged which focus on a wide range of activities including; developing academic writing skills, revision techniques, understanding learning styles and time management.
- » Helping students in providing extra tutoring individually and / or collectively on requirement basis.

## IT Services

IT services are available to all students and staff. A local area network has been established at the College. A Computer Center has also been set up to keep pace with modern trends and research in the engineering field. Students are provided with internet facilities at the Computer Center, the library and the residence. The Computer Center offers the following facilities to the students.

- » A dedicated internet hall provides internet surfing facilities.
- » 2 networking halls with 25 computers each, provide computer training facilities to students.
- » The software engineering laboratory offers the latest professional civil engineering software in the market.

## Health Service

The College Health Service operates through a doctor hired by NUST for all students. The Nursing Advisor can advise on minor illnesses and injuries. In case of serious illness or detailed investigation, the services of the Combined Military Hospital, Risalpur are also available. This hospital has a medical ward, a surgical ward, an intensive-care unit and an eye-care service. A medical officer is available round-the-clock and in case of emergency, all specialists are on call. Moreover, lectures on health-related issues are regularly delivered to students by qualified physicians.

## Library Services

All students are granted library membership for the duration of their programmes and they get course books free of cost. The library comprises:

- » Over 40,000 books
- » An audio-visual section comprising TV's, VCR's, VCD's and tape recorders
- » Training and technical video cassettes/CD's
- » Scanning and printing services

## Laboratories

The College is equipped with the most sophisticated laboratory equipment for civil engineering. MCE testing facilities are well known for reliability and accuracy. It possesses the most modern equipment, which is calibrated regularly through certified calibrating firms. Quality, precision and accuracy are the hallmarks of MCE laboratories. The main laboratories are:

- » Concrete Materials laboratory
- » Geotechnical Engineering Laboratory
- » Transportation Laboratory
- » Strength of Materials Laboratory
- » Public Health Technology Laboratory
- » Geology Laboratory
- » Hydraulics Laboratory
- » Electrical Technology Laboratory
- » Mechanical Technology Laboratory
- » Electric Project Management Lab
- » Civil Engineering Display Hall
- » BIM Laboratory
- » Structural Dynamics Lab
- » Linguistic Lab



## Accommodation

Accommodation at MCE is secure and comfortable. Through the support of NUST, the College has invested in new and refurbished halls of residence with modern study rooms and communal living spaces where students can relax and feel at home. The social aspect of life at the College is overwhelming as it offers great opportunities to meet new people and provides an intellectual student body which is varied in its interests. Students are provided with transport facilities from their accommodation to halls of study and back.

The College provides excellent messing facilities to its students. Each hostel has a well-furnished mess with the following facilities:

- » Dining hall
- » TV lounge
- » Visitors lounge
- » Indoor games

**Note: Female students are not admitted at MCE due to non-availability of hostel facilities.**

## Seminars/ Webinars and Guest Speakers (Year 2020-21)

- » Dr Muhamad Shahid Siddique organized webinar on “Challenges Faced in the Distance Learning (DL) Teaching Mode and Assessment Mechanism” on 18 June 2020
- » Dr Naeem Shahzad organized webinar on “Challenges Faced in the Distance Learning (DL) Teaching Mode and Assessment Mechanism” on 15 July 2020.
- » Dr Khwaja Mateem Mazhar organized webinar on “Dr Naeem Shahzad organized webinar on “Challenges Faced in the Distance Learning (DL) Teaching Mode and Assessment Mechanism” on 15 July 2020” on 20 August 2020.
- » Dr Naeem Shahzad organized webinar on “Transforming Sustainable Engineering under Climate Change Environments” on 17 November 2020



## Guest Speakers

The College makes an endeavour to keep its students abreast with the latest knowledge and developments in the field of civil engineering and other fields. It invites a number of renowned engineers, scholars, and professionals who deliver lectures on various topics, share their ideas and abreast the students with the latest research and development. Some of the distinguished guest speakers of 2018 include:



Guest Speaker	Title of Talk
Wing Commandar Attiq Ur Rehman	Halaal or Haram
Ms Ayesha Mujeeb	Center for Counseling Career & Advisory (C3A) Orientation Workshop
Asst Prof Dr Hammad Mushtaq	Choosing Career Path-Career Development Center Workshop

## Bachelors in Civil Engineering

The degree programme is designed to meet the huge unsatisfied demand for professional Civil Engineers with special emphasis on basic civil engineering theory dovetailed with practical training. Particular attention is paid to the overgrowing fields of Structural Engineering, Transportation Engineering, Geotechnical Engineering and Water Resources Engineering. BE Civil Engineering syllabus has been revised in line with HEC's Uniform Frame Work of Engineering (UFEE) and accredited by PEC. The curriculum is designed to provide undergraduates with a solid foundation on fundamental principles of basic sciences including Mathematics, Management Sciences, Engineering Mechanics, Strength of Materials, Theory of Structures, Survey, Architecture, Computer Sciences, Fluid Mechanics, Hydraulics, Soil Mechanics, Concrete Technology, Transportation Engineering, Public Health Engineering and then use this knowledge to solve practical Civil Engineering problems.

### Scheme of Studies

Programme Code: X 601

#### Semester 1

Course Code	Course Title	Credits
HU-100	English	2-0
CS-114	Fundamentals of Programming	2-1
HU-107	Pakistan Studies	2-0
MATH-101	Calculus and Analytical Geometry	3-0
PHY-102	Applied Physics	2-1
ME-105	Workshop Practice	0-1
CE-102	Civil Engineering Materials	3-0
<b>Total</b>		<b>14-3</b>

#### Semester-II

Course Code	Course Title	Credits
HU-101	Islamic Studies	2-0
MATH-121	Linear Algebra & ODE	3-0
ME-109	Engineering Drawing	0-2
HU-109	Communication Skills	2-0
CE-121	Engineering Geology	3-0
ME-107	Engineering Mechanics	2-1
<b>Total</b>		<b>12-3</b>

#### Semester-III

Course Code	Course Title	Credits
MATH-355	Numerical Methods	3-1
CE-103	Mechanics of Solids-I	2-1
CE-251	Fluid Mechanics-I	2-1
CE-182	Surveying-I	2-1
CE-222	Soil Mechanics -I	2-1
CE-241	Transportation Engineering-I	3-0
<b>Total</b>		<b>14-5</b>

#### Semester-IV

Course Code	Course Title	Credits
CE-252	Fluid Mechanics - II	2-1
CE-206	Structural Analysis-I	3-0
CE-286	Surveying-II	1-2
CE-324	Soil Mechanics - II	2-1
CE-205	Mechanics of Solids-II	2-1
CE-342	Transportation Engineering - II	2-1
<b>Total</b>		<b>12-6</b>

#### Semester-V

Course Code	Course Title	Credits
HU-212	Technical and Business Writing	2-0
CE-306	Structural Analysis-II	3-0
CE-308	Plain & Reinforced Concrete-I	3-1
CE-358	Engineering Hydrology	2-1
CE-371	Construction Project Management	2-1
CE-388	Computer Aided Civil Engineering Design and Graphics	1-2
<b>Total</b>		<b>13-5</b>

#### Semester-VI

Course Code	Course Title	Credits
CE-310	Plain & Reinforced Concrete-II	3-1
CE-309	Structural Analysis-III	3-0
CE-372	Quantity Surveying and Cost Estimation	3-0
CE-339	Environmental Engineering - I	2-0
MATH-361	Probability & Statistics	3-0
CE-00	Elective - I	3-0
<b>Total</b>		<b>17-1</b>

## Semester-VII

Course Code	Course Title	Credits
ARCH-305	Architecture & Town Planning	2-0
CE-341	Environmental Engineering-II	2-1
CE-411	Steel Structures	3-0
CE-375	Construction Engineering	3-0
HU-222	Professional Ethics	2-0
CE-499	Project-I	0-3
CE-00	Elective-II	3-0
	<b>Total</b>	<b>15-4</b>

## Semester-VIII

Course Code	Course Title	Credits
MGT-271	Entrepreneurship	2-0
ECO-130	Engineering Economics	2-0
CE-463	Irrigation Engineering	2-1
CE-288	Geoinformatics	1-1
CE-499	Project-II	0-3
CE-00	Elective-III	3-0
	<b>Total CHs</b>	<b>10-5</b>
	<b>Overall Total CHs</b>	<b>139</b>

\* Students will have the option to register for an elective course from the list of approved courses covering variety of disciplines i.e. structural, geotechnical, transportation, construction and environmental engineering and water resources. Elective course will be offered depending upon the availability of instructor.

## Elective Courses

Structures		
CE-412	Design of Concrete Structures	3-0
CE-413	Design of Steel Structures	3-0
CE-414	Bridge Engineering	3-0
CE-415	Special Application Structures	3-0
CE-416	Earthquake Engineering	3-0
Geotech		
CE-425	Introduction to Rock Mechanics	3-0
CE-426	Slope Stability	3-0
CE-427	Soil and Site Improvement	3-0
CE-428	Design & Construction of Earthen Dams	3-0
CE-429	Introduction to Geotechnical Earthquake Engineering	3-0
CE-430	Applied Soil Mechanics	3-0
CE-431	Investigation and Instrumentation in Earthquake Engineering	3-0
Water Resources		
CE-459	Hydraulic Engineering	2+1
CE-460	Computational Hydraulics	3-0
CE-461	Open Channel Flow	3-0
CE-462	River Engineering	3-0
CE-355	Public Health Engineering (Water Supply and Sanitary Engineering)	2-1
Construction Management		
ENE-433	Environment Management & Impact Assessment	3-0
CE-474	Construction Project Scheduling	3-0
HRM-443	Human Resource Management in Construction	3-0
CE-476	Construction Contract Management	3-0



## Transportation

CE-443	Pavement Design & Rehabilitation	3-0
CE-444	Traffic Engineering & Safety	3-0
CE-445	Road Construction, Materials & Practices	3-0
CE-466	Geometric Design of Highways	3-0



# Postgraduate Programmes

Presently MCE is offering MS in five Disciplines; namely Disaster Management, Construction Engineering Management, Structural Engineering, Transportation Engineering and Geotechnical engineering. All five Postgraduate programmes cover a wide array of courses as listed below. Students have to take 4-6 core and 2-4 elective courses depending on the programme requirement followed by 6 credits research thesis.

## MS Disaster Management

The course is designed to prepare potential industry leaders, capable of implementing the best engineering and management practices and technologies in construction industry.

### Why join this programme?

In Construction Engineering and Management, civil engineers manage and direct physical construction of a project from start to finish. This field is also known as construction management. Construction engineers apply the knowledge of construction methods and equipment along with principles of financing, scheduling, planning, organization, and coordination to convert paper designs into completed usable facilities. They maintain a continuous record of personnel, time, materials, and costs and prepare periodic reports depicting the project's progress to completion.

### Scheme of Studies

Programme Code: X 746

Core Courses		
Course Code	Course Title	Credits
DME-801	Fundamentals of Disaster Management	3
DM-801	Policies, Planning and Strategies for Disaster Management	3
DM-802	Disaster Risk and Vulnerabilities Assessment	3
DM-803	Disaster Risk Reduction and Preparedness	3
DM-804	Disaster Response and Recovery	3
<b>DM-899</b>	<b>MS Thesis</b>	<b>6</b>
	<b>Total</b>	<b>15</b>
Elective Courses (Any Three)		
DME-802	GIS and RS in Disaster Mapping & Management	3
DME-832	Climate Forecasting and Early Warning System	3
DM-811	Community Based Disaster Risk Management	3
DM-812	Environmental Framework on Disasters	3
DM-821	Earthquake Disaster Assessment and Mitigation	3
DM-831	Flood Hazard Assessment and Remediation	3
DM-832	Complex Humanitarian Emergency Management	3
DM-833	Public and Mental Health Aspects of Disaster Management, Psychotrauma Consequent to Disasters	3
URP-806	Sustainable Urban Land-Use Planning	3

URP-808	Social Engineering for Sustainable Development	3
CE-898	Contract Management	3
CE-897	Special Topics in Civil Engineering	3
CE-888	Watershed Management	3
CE-883	Hydrologic System Modeling	3
ENV-805	Climate Change	3
ENE-805	Water Resources Management	3
ENV-829	Environmental Risk Assessment and Management	3
ENV-803	Occupational Safety and Environment	3
STAT-835	Probability and Statistics	3
GIS-834	Hydrology and Water Resources	3
GIS-842	Natural Hazards and Disaster Management	3
GIS-865	Land Information System	3
GIS-901	Special Topics in GIS	3
HRM-616	Negotiation and Conflict Management	3
HRM-542	Human Resource Management	3
FIN-709	Financial Risk Management	3
EM-826	Supply Chain Management	3
EM-832	Risk and Crisis Management	3

Additional Courses		
Course Code	Course Title	Credits
RM-898	Research Methodology	2
SEM/WKSP 897	Seminar / Workshop	1

# MS Construction Engineering & Management

The course is designed to prepare potential industry leaders, capable of implementing the best engineering and management practices and technologies in construction industry.

## Why join this programme?

In Construction Engineering and Management, civil engineers manage and direct physical construction of a project from start to finish. This field is also known as construction management. Construction engineers apply the knowledge of construction methods and equipment along with principles of financing, scheduling, planning, organisation, and coordination to convert paper designs into completed usable facilities. They maintain a continuous record of personnel, time, materials, and costs and prepare periodic reports depicting the project's progress to completion.

## MS Coursework

Programme Code-X 733

### Core Courses

Course Code	Course Title	Credits
CEM 801	Construction Project Administration	3
CEM 802	Construction Planning, Scheduling and Control	3
CEM 805	Safety Management in Construction	3
CE 898	Contract Management	3
CEM 899	MS Thesis	6

### Elective Courses (Any three)

Course Code	Course Title	Credits
CE 803	Concrete Materials and Technology	3
CE 829	Geotechnical Site Investigation	3
CE 835	Water Supply and Wastewater Engineering	3
CE 836	Construction Management	3
CE 843	Urban Flood Management and Disaster Risk Mitigation	3
CE 846	Modeling Theory and Information Management	3
CE 861	Pavement Rehabilitation & Management	3
CE 862	Pavement Materials Engineering	3
CE 863	Transportation Planning	3
CE 866	Airport Engineering	3
CE 886	Water Resources, Economics, Planning and Management	3
CE 897	Special Topics in Civil Engineering	3
CEM 803	Economic Decision Analysis in Construction	3
CEM 804	Construction Cost Estimating and Control	3
CEM 806	Construction Equipment Management	3
CEM 807	Risk Management in Construction	3
CEM 811	Construction Quality & Productivity Management	3
CEM 812	Sustainable Construction	3
CEM 813	Supply Chain Management in Construction	3
CEM 814	Human Resources Management in Construction	3
CEM 816	Building Information Modeling	2+1
CSE 800	Introduction to Modeling and Analysis	3
DM 801	Policies, Planning and Strategies for Disaster Management	3
DM 802	Disaster Risk and Vulnerabilities Assessment	3
DM 803	Disaster Risk Reduction and Preparedness	3
DM 804	Disaster Response and Recovery	3
DM 811	Community Based Disaster Risk Management	3
DM 812	Environmental Framework on Disasters	3
DM 821	Earthquake Disaster Assessment and Mitigation	3
DME 801	Fundamentals of Disaster Management	3
ENE 802	Environmental Impact Assessment	3
ENE 804	Energy and Environment	3
ENE 843	Environmental Health and Safety	3
ENV 844	Sustainable Development	3
ESE 812	Energy Management in Buildings	3
GIS 802	GIS & Remote Sensing Application for Civil Engineering	3

GIS	836	Management of Energy Resources	3
GIS	854	Infrastructure and Transport Planning	3
GIS	856	Planning and Management of Housing	3
STAT	835	Probability and Statistics	3
SYSE	806	Complex Systems and Dynamics	2+1
URP	804	Regional Development Planning	3

URP	808	Social Engineering for Sustainable Development	3
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#### Additional Courses

RM	898	Research Methodology	2
SEM/ WKSP	897	Seminar / Workshop	1

## MS/PhD Mining Engineering

### Scheme of Studies

Programme Code-X771/X8741

#### Core Courses

Course Code	Course Title	Credits
MinE 801	Advanced Mining Engineering	3
MinE 802	Mine Ventilation, Health and Safety	3
MinE 803	Advanced Numerical Modelling Techniques in Mining	3
MinE 804	Mineral Resource Management for Sustainable Mining	3
MinE 899	MS Thesis	6

#### Elective Courses

MinE 811	Advanced Rock Mechanics	3
MinE 812	Rock Mechanics in Major Slopes	3
MinE 813	Design and Construction of Excavation Support Systems	3
MinE 814	Planning and Optimisation of Surface Mines	3
MinE 815	Planning and Optimisation of Underground Mines	3
MinE 816	Rock Engineering for Underground Coal Mines	3
MinE 817	Mineral Exploration and Mining Geology	3
MinE 818	Drilling and Blasting in Mining	3
MinE 819	Rock Cutting Technologies	3
MinE 820	Mine Planning Principles	3
MinE 821	Geostatistical Ore Reserve Estimation	3
MinE 822	Advanced Coal Technology	3
MinE 823	Tunnel Design And Construction	3
MinE 824	Sequential Excavation Method of Tunneling	3
MinE 825	Ground Behaviour Monitoring (Open Pit Mines)	3
MinE 826	Mineral Policy Development	3
MinE 827	Sustainable Mineral Development	3
MinE 828	Business Risks in Mining	3

MinE 829	Risk Management in Mining	3
MinE 830	Decision Making for Mining Investment	3
MinE 831	Mineral Resource Management & Financial Valuation	3
MinE 832	Mineral Resource Management & Sustainable Mining	3
MinE 833	Mineral Development For Growth	3
MinE 834	Environmental, Social And Economic Impacts of Mining	3
MinE 835	RS&GIS and Machine learning in Mining Engg	3
MinE 836	Mine Ventilation and Climate Control	3
MinE 837	Principles of Ventilation	3
MinE 838	Occupational Health and Hygiene for Non Specialists	3
MinE 839	Atmospheric Environmental Control and Mining	3
MinE 840	Bin Design Wall Loads and Flow Patterns	3
MinE 841	Operations Management of Mining Systems	3
MinE 842	Earth Moving Equipment, Technology and Management	3
MinE 843	Belt Conveyer Motions and Belt Conveyor Design	3
MinE 844	Mine Transportation	3
MinE 845	Trackless Mechanized Mining	3
MinE 846	Mechanized Mining Systems	3
MinE 847	Bulk Solid Testing and Equipment Design	3
MinE 848	Bulk Solid Handling Theory	3
MinE 849	Pneumatic and Hydraulic Conveying Designs	3
MinE 850	Mineral Processing	3
MinE 851	Analysis of Mining and Metallurgical Data	3
MinE 852	Extractive Metallurgy and Alloy Production	3
ME 835	Advanced Mechanics of Materials	3
EE 818	Micro Electro Mechanical Systems	3

ME	801	Optimization of Engg Systems	3
ME	894	Advanced Refrigeration and Air-conditioning	3
ME	817	Advanced Theory of Vibrations	3
ME	816	Modelling and Simulation of Dynamic Systems	3
ME	833	Computational Fluid Dynamics II	3
CE	821	Soil & Site Improvement	3
CE	823	Slope Stability	3
CE	808	Finite Element Method	3
SE	807	Machine Learning	3
MEM	814	Technology Management	3
EM	890	Modelling and Simulation	3
MTS	840	Data Acquisition and Control	3

**Additional Courses**

RM	898	Research Methodology	2
SEM/ WKSP	897	Seminar / Workshop	1

## PhD Mining Engineering

MinE	801	Advanced Mining Engineering	3
MinE	802	Mine Ventilation, Health and Safety	3
MinE	803	Advanced Numerical Modelling Techniques in Mining	3
MinE	804	Mineral Resource Management for Sustainable Mining	3
MinE	811	Advanced Rock Mechanics	3
MinE	812	Rock Mechanics in Major Slopes	3
MinE	813	Design and Construction of Excavation Support Systems	3
MinE	814	Planning and Optimisation of Surface Mines	3
MinE	815	Planning and Optimisation of Underground Mines	3
MinE	816	Rock Engineering for Underground Coal Mines	3
MinE	817	Mineral Exploration and Mining Geology	3
MinE	818	Drilling and Blasting in Mining	3
MinE	819	Rock Cutting Technologies	3
MinE	820	Mine Planning Principles	3
MinE	821	Geostatistical Ore Reserve Estimation	3
MinE	822	Advanced Coal Technology	3
MinE	823	Tunnel Design And Construction	3
MinE	824	Sequential Excavation Method of Tunneling	3
MinE	825	Ground Behaviour Monitoring (Open Pit Mines)	3
MinE	826	Mineral Policy Development	3
MinE	827	Sustainable Mineral Development	3
MinE	828	Business Risks in Mining	3
MinE	829	Risk Management in Mining	3
MinE	830	Decision Making for Mining Investment	3

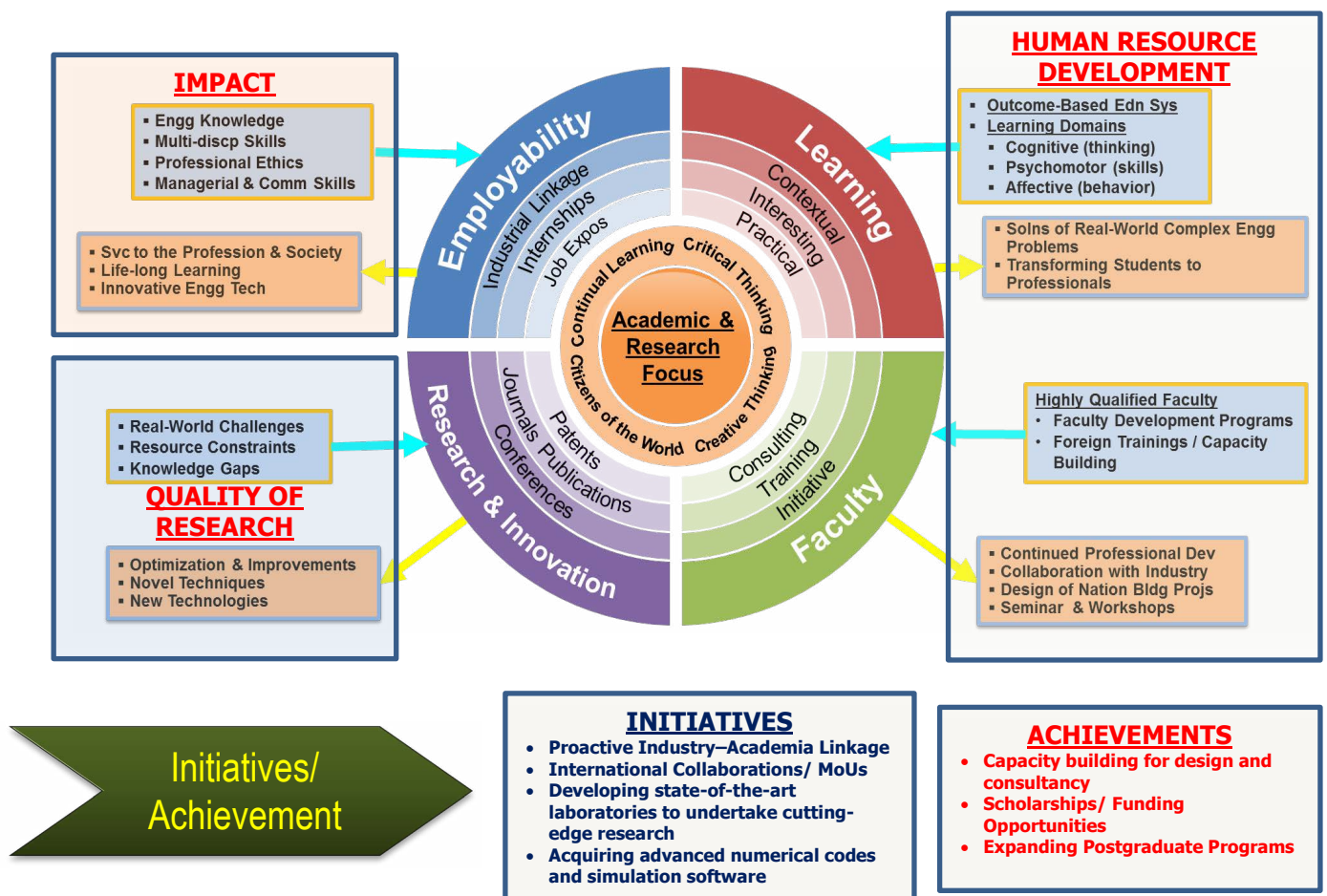
MinE	831	Mineral Resource Management & Financial Valuation	3
MinE	832	Mineral Resource Management & Sustainable Mining	3
MinE	833	Mineral Development For Growth	3
MinE	834	Environmental, Social And Economic Impacts of Mining	3
MinE	835	RS&GIS and Machine learning in Mining Engg	3
MinE	836	Mine Ventilation and Climate Control	3
MinE	837	Principles of Ventilation	3
MinE	838	Occupational Health and Hygiene for Non Specialists	3
MinE	839	Atmospheric Environmental Control and Mining	3
MinE	840	Bin Design Wall Loads and Flow Patterns	3
MinE	841	Operations Management of Mining Systems	3
MinE	842	Earth Moving Equipment, Technology and Management	3
MinE	843	Belt Conveyer Motions and Belt Conveyor Design	3
MinE	844	Mine Transportation	3
MinE	845	Trackless Mechanized Mining	3
MinE	846	Mechanized Mining Systems	3
MinE	847	Bulk Solid Testing and Equipment Design	3
MinE	848	Bulk Solid Handling Theory	3
MinE	849	Pneumatic and Hydraulic Conveying Designs	3
MinE	850	Mineral Processing	3
MinE	851	Analysis of Mining and Metallurgical Data	3
MinE	852	Extractive Metallurgy and Alloy Production	3
ME	835	Advanced Mechanics of Materials	3
EE	818	Micro Electro Mechanical Systems	3
ME	801	Optimization of Engg Systems	3
ME	894	Modelling and Simulation of Dynamic Systems	3
ME	817	Advanced Theory of Vibrations	3
ME	816	Computational Fluid Dynamics II	3
ME	833	Advanced Refrigeration and Air-conditioning	3
CE	821	Finite Element Method	3
CE	823	Soil & Site Improvement	3
CE	808	Slope Stability	3
EM	807	Modelling and Simulation	3
SE	814	Machine Learning	3
MTS	890	Data Acquisition and Control	3
MEM	840	Technology Management	3
MinE	999	PhD Thesis	30

**Additional Courses**

SEM/ WKSP	997	Seminar / Workshop	1
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# MCE Research Strategy

Research is the focal point of university education all over the world. Universities significantly contribute towards creation of new knowledge and discovery of new frontiers of creativity and innovation. In order to develop MCE into a true Centre of excellence, it is imperative that apart from maintaining high standards in teaching, research is rigorously pursued and suitably rewarded. The research output of an institute must be in line with national needs and contribute towards socio-economic growth of the country. At MCE, a strategy is developed for the short- and long-term research goals/ objectives that asserts an adaptable framework through which it can sustain and add value to the academic excellence, thereby discharging the responsibilities to the Army in particular and nation in general. A research strategy defines a series of mechanisms through which researchers can, individually and collectively, fulfil their potential. There exist an effective and flexible mechanism at departmental, faculty and institutional level to anticipate and respond to the rapidly and continually changing external environment. For the individual researcher – and to those contemplating becoming a researcher at MCE – this strategy seeks to define a nurturing environment in which: your research leadership is encouraged, cherished and sustained; your expertise can be creatively linked with and enhanced by that of other disciplines; impediments to you reaching across traditional boundaries are minimized; and the consequences of your work are amplified. We encourage all researchers – and professional staff to make the most of its potential as a force for public good.





MCS

Military College of Signals

# Military College of Signals

Military College of Signals (MCS) is a premier institution of the Pakistan Army and has established itself as a centre of professional excellence. MCS was established in 1947 as School of Signals. In order to fulfill Pakistan Army's requirement for telecom engineers, the College was affiliated with Royal School of Signals in 1960. In 1977, it got affiliated with University of Engineering and Technology, Lahore, for award of telecommunication degree and thus upgraded as Military College of Signals. After becoming the pioneer constituent college of NUST in 1991, the College started undergraduate, MS and PhD programmes in Software Engineering and Master programme in Telecommunication and Information Security under NUST. Postgraduate programme in system engineering was started in 2014. College started its PhD programme in year 2001 and to date 24 PhDs have graduated and 48 are pursuing their PhD degree. The College has a unique honor of being the pioneer in the country for offering these disciplines. At present, the College is producing over 300 graduates every year.

## Faculty Profile

### Engr Muhammad Ali Khan, Commandant

MSc (NDU) Pakistan

**Discipline:** War Studies

### Engineering Wing

#### Dr Asif Masood, Dean

PhD (UET Lahore) Pakistan

**Discipline:** Computer Science

**Specialisation:** Computer Graphics, Image Processing

#### Dr Imran Rashid, Chief Instructor

PhD (University of Manchester) UK

**Discipline:** Telecomm Engineering

**Specialisation:** Wireless MIMO Systems

#### Dr Fahim Arif

PhD (NUST), Pakistan

**Discipline:** Software Engineering

**Specialisation:** Software Engineering

#### Engr Awais Ali, Staff Officer (Acad)

MS (University of COMSATS) Pakistan

**Discipline:** Telecomm Engineering

**Specialisation:** Project Management

#### Engr Omar Hayat Bajwa, Staff Officer (Coord)

MS (NUST) Pakistan

**Discipline:** Electrical Engineering

**Specialisation:** Telecomm Engineering

## Department of Electrical Engineering

#### Dr Adil Masood Siddiqui, HOD

PhD (UET Lahore) Pakistan

**Discipline:** Electrical (Telecom) Engineering

**Specialisation:** Digital Signal, Image and Video Processing

#### Dr Hasnat Khurshid

PhD (NUST) Pakistan

**Discipline:** Electrical Engineering

**Specialisation:** Telecommunication

#### Dr Muhammad Zeeshan Zahid

PhD (Hanyang University) South Korea

**Discipline:** Electronics Engineering

**Specialisation:** Antenna Design for Mobile Devices

#### Dr Mir Yasir Umair

PhD (Beijing University, Beijing) China

**Discipline:** Electrical Engineering

**Specialisation:** Wireless Communication

#### Dr Abdul Wakeel

PhD (Jacobs University Bremen) Germany

**Discipline:** Electrical Engineering

**Specialisation:** Wireless Communication

#### Dr Farooq Ahmad Bhatti

PhD (Shanghai University) China

**Discipline:** RF Electronics

**Specialisation:** Microwave Circuit Design

#### Dr Attiq Ahmad

PhD (NUST) Pakistan

**Discipline:** Electrical Engineering

**Specialisation:** Image / Signal processing

#### Dr Imran Touqeer

PhD (UET Lahore) Pakistan

**Discipline:** Electrical Engineering

**Specialisation:** Digital Image Processing

#### Engr Ajlaan Bin Mamoon

MS (NUST) Pakistan

**Discipline:** Electrical Engineering

**Specialisation:** Telecommunication Engineering

#### Engr Syed Javed Hussain

MS (Michigan State University) USA

**Discipline:** Electrical Engineering

**Specialisation:** Electronic / VLSI Design, Telecom Systems



**Dr Alina Mirza**

PhD (NUST) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** DSP and Communication Systems**Engr Raja Iqbal (Manager I&P)**

MS (Wayne State University) USA

**Discipline:** Computer Engineering, Telecomm Engineering**Specialisation:** Computer & Telecomm Engineering**Engr Aimen Aakif**

MS (NUST) Pakistan

**Discipline:** Software Engineering**Specialisation:** Software Engineering**Engr Maryam Rasool**

MS (COMSATS) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Telecomm Engineering**Mrs Atiya Obaid**

MSc (QAU) Pakistan

**Discipline:** Computer Science**Specialisation:** Computer Science (Database)**Engr Amara Umar**

MS (COMSATS) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Telecomm & Networking**Engr Amir Ali**

MS (Bahria University) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Telecommunication**Engr Zohaib Naqvi**

BE (UET Peshawar) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Electrical Engineering**Engr Muhammad Imran Javaid**

MS (NUST) Pakistan

**Discipline:** Information Security**Specialisation:** Information Security**Engr Ubaid ur Rehman**

MS (NUST) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Telecommunication Engineering**Dr Shibli Nisar**

PhD (FAST) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Signal and Speech Processing**Dr Ayesha Habib**

PhD (UET), Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Telecomm**Dr Kifayat Ullah**

PhD (CEME, NUST) Pakistan

**Discipline:** Engineering Management**Specialisation:** Engineering Management**Engr Muhammad Junaid Khan (Coord Officer)**

MS (NUST) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Telecomm Engineering**Dr Muhammad Imran**

PhD (NUST) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Control Systems Communication & Signal Processing

Dr Hussain Ali

PhD (King Fahd University) KSA

**Discipline:** Electrical Engineering**Specialisation:** Signal Processing**Engr Shabana Basharat**

MS (NUST) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Telecommunication**Dr Farooq Ahmad Bhatti**

PhD (Shanghai University) China

**Discipline:** RF Electronics**Specialisation:** Microwave and Millimeter Waves Circuit Design**Dr Mehmood Alam**

PhD (Aarhus University) Denmark

**Discipline:** Electrical Engineering**Specialisation:** Massive Machine Type Comm in 5G**Muhammad Hammad**

MS (C of EME, NUST) Pakistan

**Discipline:** Software Engineering**Specialisation:** Computer Engineering**Engr Zeeshan Ahmad**

MS (NUST, Karachi) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Communication System

## Department of Computer Software Engineering

### Dr Asim Dilawar Bakhshi, HoD

PhD ( UET, Lahore), Pakistan  
Discipline: Computer Engineering  
Specialisation: Digital Signals Processing

### Dr Hammad Afzal

PhD (University of Manchester) UK  
Discipline: Software Engineering  
Specialisation: Computational Linguistics

### Dr Tauseef Ahmed Rana

PhD (University of Manchester) UK  
Discipline: Software Engineering  
Specialisation: ComponentBased Development

### Mr Bilal Rauf

MS (Umea University) Sweden  
Discipline: Computer Science  
Specialisation: Wireless Networking

### Dr Ahmed Muqem Sheri (on Post doc)

PhD (Gwangju Institute of Science and Technology) South Korea  
Discipline: Computer Science  
Specialisation: Neural Networks

### Engr Mobeena Shahzad

MS (NUST) Pakistan  
Discipline: Information Technology  
Specialisation: ObjectOriented Technologies

### Dr Naima Iltaf

PhD (NUST) Pakistan  
Discipline: Software Engineering  
Specialisation: Distributed/ Pervasive Computing

### Dr Yawar Abbas

PhD (University of Science & Technology) China  
Discipline: Computer Science  
Specialisation: Software Defined Networks

### Engr Ather Mohsin Zaidi

MS (NUST) Pakistan  
Discipline: Computer Science  
Specialisation: Software Engineering

### Dr Zaki Murtaza

PhD (USC) USA  
Discipline: Computer Science  
Specialisation: Parallel Computing

### Engr Ayesha Naseer

MS (UET Lahore) Pakistan  
Discipline: Computer Science  
Specialisation: Database

### Engr Marium Hida

MS (NUST), Pakistan  
Discipline: Software Engineering

### Engr Kabeer Ahmed

MS (Iqra Uni Islamabad) Pakistan  
Discipline: Computer Science  
Specialisation: Telecommunication & Networks

### Dr Zaki Murtaza

Post Doc NTNU Trondheim, Norway  
Discipline: Computer Science  
Specialisation: Parallel Computing, Artificial Intelligence

### Dr Saddaf Rubab

PhD Universiti Teknologi PETRONAS Malaysia  
Discipline: Computer Science  
Specialisation: Distributed Computing, Data Science

### Engr Muhammad Asif

MS (Computer Science), Preston University, Islamabad  
Discipline: Computer Science  
Specialisation: Programming, Networks

### Engr Khawir Mahmood

MS (NUST), Pakistan  
Discipline: Computer Software  
Specialisation: Computer Software

### Engr Saba Siddique

MS (NUST), Pakistan  
Discipline: Software Engineering  
Specialisation: Data Mining & Machine Learning

### Engr Sehrish Firdous

MS (International Islamic University, Islamabad), Pakistan  
Discipline: Software Engineering  
Specialisation: Computer Engineering

### Engr Wajahat Sultan (Coord Officer)

PhD ( UET, Lahore), Pakistan  
Discipline: Computer Engineering  
Specialisation: Digital Signals Processing

### Dr Humayun Zuabair Khan

PhD (NUST), Pakistan  
Discipline: Electrical Engineering  
Specialisation: Electrical Engineering

### Dr Ihtesham Ul Islam

PhD (Politenico Di Torino) Italy  
Discipline: Computer Engineering  
Specialisation: Machine Learning and Computer Vision

### Dr Ikram Syed

PhD (Ajou University) South Korea  
Discipline: Computer Engineering  
Specialisation: Wireless Networks

### Engr Muhammad Asif

MS (Computer Science), Preston University, Islamabad  
Discipline: Computer Science  
Specialisation: Programming, Networks

## Department of Information Security

### **Dr Haider Abbas, HoD Research**

PhD (KTH) Sweden

**Discipline:** IT Security, Cloud Security

**Specialisation:** Information Security

### **Engr Muhammad Sohaib Khan**

MS (NUST) Pakistan

**Discipline:** Information Security

**Specialisation:** Information Security

### **Shahzaib Tahir**

MS (NUST) Pakistan

**Discipline:** Information Security

**Specialisation:** Cryptography/Information Security

### **Waleed Bin Shahid**

MS (NUST) Pakistan

**Discipline:** Information Security

**Specialisation:** Malware Analysis, Smartphone Security

### **Mian Muhammad Waseem Iqbal**

MS (NUST) Pakistan

**Discipline:** Information Security

**Specialisation:** Computer/Network Security, Digital Forensic

### **Dr Shahzaib Tahir**

PhD (University of London) UK

**Discipline:** Information Engineering

**Specialisation:** Cyber Security

### **Dr Fawad Khan**

PhD ( Xi'an, Shaanxi) China

**Discipline:** Information Security

**Specialisation:** Cryptography and Information

### **Dr Muhammad Faisal Amjad**

PhD (University of Central Florida) USA

**Discipline:** Computer Science

**Specialisation:** Cognitive Radio Networks,  
Information Security

## Department of Humanities and Basic Sciences

### **Dr Abdul Razzaque, HoD**

PhD (Uni of West Scotland) UK, Post Doc

**Discipline:** Mathematics/Cyber Security

**Specialisation:** Mathematics/Cyber Security

### **Dr Farkhanda Afzal**

PhD (Beihang University) China

**Discipline:** Mathematics

**Discipline:** Applied Mathematics

### **Ms Alia Razia Malik**

MSc (Quaid-i-Azam University) Pakistan

M Phil (Fatima Jinnah Women University) Pakistan

**Discipline:** English

**Specialisation:** Linguistics

### **Dr Saeed Murtaza**

PhD (Birmingham University) UK

**Discipline:** Physics

**Specialisation:** Mathematical Modeling and Simulation

### **Dr Safia Akram**

Ph D (Quaid-i-Azam University) Pakistan

**Discipline:** Mathematics

**Specialisation:** Fluid Mechanics

### **Uzma Ehsan**

MA (NUML) Pakistan

**Discipline:** English

**Specialisation:** English Linguistics and Literature

### **Engr Bilal Ishaq**

M Phil (GC, Lahore), Pak

**Discipline:** Physics

## Research and Development

Military College of Signals is engaged in providing meaningful education in engineering while conducting original research of the highest standard. R&D cell provides a focal point in the College to coordinate R&D activities between various departments, faculty members and various research institutions. It is now making concerted efforts to align academia in accordance with R&D to focus with the national goal of achieving technological selfreliance. The research groups are involved in hitech R & D projects in solving Information & Communication Technology related problems and solutions. "In 2020, MCS has published 91 publications in research journals and 8 conference papers in proceedings of international conferences.

- » Research Paper Writing Using Latex Software on 28-Mar-18
- » Netlogo Multi Agent Programming on 4-5 Apr 18
- » How to Write Technical Research Paper on 18-Apr-18
- » Current Research in Nanotechnology on 24-Oct-18
- » Ethical Hacking 29-Oct-18
- » Role of Engineers in Green Living on 7-Nov-18
- » 5G and Beyond on 28-Nov-18
- » Cyber Security: Staying safe on the Internet, Social Media and Mobile Phones on 5-Dec-18
- » SDR Waveform Development on 12-Dec-18

## Students Support Facilities

The College has excellent lab facilities to facilitate students in their academic pursuits. Some the labs include:

### Labs

- Lego Kit Laboratory
- Image Processing Centre Laboratory
- Satellite Communication Research Laboratory
- Communication System Laboratory
- Communication Research Laboratory
- RF & Microwave Laboratory
- Electronic Laboratories (2)
- Electrical Machine Laboratory
- Fiber Optics Research Laboratory
- Final Year Project Laboratories
- Modeling and Simulation Laboratory
- DSP & FPGA Laboratory
- Wireless and SDR Research Laboratory
- Computer Networks Laboratory
- Operating System Laboratory
- Database Systems Laboratory
- Digital Design Laboratory
- Information Security Laboratory
- Computer Laboratories (2)
- Applied Physics Laboratory
- Communication Equipment Design and Evaluation Laboratory
- Computer Security Incident Response Laboratory
- Control System Laboratory
- Microwave Communication Laboratory
- Communication Skills Laboratory
- Crypto Design Engineering Laboratory
- Network Security Laboratory
- Software Define Radio Laboratory
- National Cyber Security Eval and Auditing Laboratory
- Information Security Research Laboratory
- Research and Development Laboratory

### Library

MCS library is fully computerized, provides excellent services and facilities to fulfill the information needs of faculty members as well as students. It has a collection of over 35,000 volumes. It also provides a wide range of services that include issuance of books on loan, online information searching, reference services, interlibrary loan, document delivery, photocopying, access to virtual collections and digital resources like CDROMs and up-to-date collection of online IEEE research papers. The library is efficiently maintained by qualified and experienced staff

## Short Courses/Seminars/Workshops organized by MCS

- Research Tool 27 Feb 2019
- Research Paper Writing Using Latex Software 6 Mar 2019
- How to Write Technical Research Paper 17 Apr 2019
- Blockchain on 24 Apr 2019
- An Editor's Perspective of Publishing Quality Research 14 May 2019
- Millimeter Wave Technology for Military Application 18 & May 2019
- Cyber Security: Staying safe on the Internet, Social Media and Mobile Phone 26 Jun 2019
- Antenna Design for Mobile Devices 30 Jul 2019
- Climate Change: Challenges, Vulnerabilities and Mitigation Strategies in Pakistan 23 Oct 2019

## Internet

MCS fully realizes the importance of providing roundtheclock internet access to students and faculty members in order to facilitate them in their academic and research pursuits. An optical fiber network has been laid to provide fast and reliable internet bandwidth. WiFi Internet connectivity of 44 Mbps is available to all students and faculty at the offices, hostels and residences.

## Transportation

MCS has an excellent bus service. Students receive a lowcost bus pass that grants them full access to College routes. Students can get a parking pass that allows them to park their cars in the Campus parking lots.

## Cafeteria

The cafeteria provides a modern dining and café facility to all students. It is equipped with A Cs, LCD TVs and Wi Fi connectivity for internet users. The cafeteria offers a variety of hygienic food items on nominal prices. A mosque and printing kiosk are also located in the vicinity for convenience of the students.

## Counseling

Student counseling services are geared to provide students with an avenue to discuss their personal and academic concerns with

competent counselors, without vacillation. Counseling is provided by qualified faculty members of the College. A competent faculty member is appointed as Course Advisor to every new batch. Every Course Advisor is given weekly student teacher interaction classes to interact with the students. Every student is free to schedule meetings with the Course Advisor as and when required.

## Hostels

Hostel accommodation is available for both male and female students. Accommodation is allotted on a first-come, first-served basis. Dining facility is available and the boarders enjoy the tranquillity and fine meals of the mess. Three blocks (1 for girls and 2 boys) are operational. Furnished rooms are available for students. Each hostel block offers a friendly and secure environment to its residents, and is equipped with a wide range of facilities including laundry, Kitchen, TV lounges, and easy access to dining facilities. Dedicated hostel staff is accessible to student for help at all time, and emergency services including transport facilities are available. Maximum outstation students are facilitated with hostel accommodation. However, the University cannot assure accommodation to all applicants. Fresh student are given priority whereas juniors and seniors are offered on-campus accommodation depending on availability.

Guest Speakers	Symposia Titles
GOC 34 LID (SSD)	CPEC Infrastructure, Security, Current Development and Future Prospect
Dr Shoaib Ahmed	Roll of Emotional Intelligence in Managing Stress among Youth
Dr Abdul Karim Usman, IIU, Islamabad	Personality Grooming and Social Responsibilities (in the light of Soorah Mominoon, Furqan and Hujrat)
Prof Dr Talib Hussain Sial, International Islamic University, Islamabad	Iqbal's Concept of Khudi (Ego)
Maj Gen Rashid Qayyum, Comdt AFIMH Prof Dr Riaz, QAU, Islamabad	Lec on "Stress Management" Quaid-i-Azam and Pakistan Narrative

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## Fact file

MCS, a premier college of telecommunication engineering, has been functioning since Pakistan's independence in 1947. The College is built around a rich heritage of nineteenth century buildings. Lt Col CWM Young, a British Army Officer of the Royal Corps of Signals, was the first Commandant of MCS, then known as the School of Signals. MCS has the honor of imparting education in Telecommunication since 1947. The College instituted a postgraduate programme (MS leading to PhD in Information Security) and PhD programme in 1997 and 2001, respectively. The later programme is one-of-its-kind in Pakistan.



## Contact Us

<b>Website <a href="http://www.mcs.nust.edu.pk">www.mcs.nust.edu.pk</a></b>		
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Postal Address	Military College of Signals, Humayun Road, Rawalpindi Cantt, 46000	



# Bachelors in Electrical Engineering

## Programme Description

This programme seeks to impart a strong foundation in telecommunication engineering in line with the growing importance of digital and wireless networks. It covers vast areas such as satellite communications, signal and image processing, optical fiber, mobile communications, data networks, software systems, micro-electronic devices and systems, data coding, compression, encryption and transmission, and real-time embedded systems.

## Associated Careers

Telecommunications is a rapidly developing and dynamic field of engineering. The demand for graduates in telecommunications is growing as technology is advancing and broadening its scope of applications. Our close links with employers and professional bodies ensure that our students are equipped with skills that are in demand. Therefore, MCS continues to be the College of choice for employers seeking high-caliber graduates. All of our graduates get employed, start their own ventures or opt for higher studies/professional trainings on completing their degrees. Our graduates normally find employment with major service providers and large private industrial groups. In addition, there are a number of highly specialized and technologically advanced opportunities available with smaller service and technology providers.

## Scheme of Studies

Programme Code: Y 603

### Semester-I

Course Code	Course Title	Credits	Course Code	Course Title	Credits
HU-100	English	2-0	HU-107	Pakistan Studies	2-0
CS-114	Fundamentals of Programming	2-1	MATH-121	Linear Algebra and ODEs	3-0
HU-101	Islamic Studies	2-0	ME-109	Engineering Drawing	0-2
MATH-101	Calculus and Analytical Geometry	3-0	HU-109	Communication Skills	2-0
ME-105	Workshop Practice	0-1	*ME-100	Engineering Mechanics	3-0
PHY-102	Applied Physics	2-1	*EE-211	Electrical Network Analysis	3-1
*EE-111	Linear Circuit Analysis	3-1		<b>Total</b>	<b>13-3</b>
	<b>Total</b>	<b>14-4</b>			

### Semester-II

### Semester-III

Course Code	Course Title	Credits	Course Code	Course Title	Credits
*CS-212	Object Oriented Programming (OOP)	3-1	EE-215	Electronic Devices and Circuits	3-1
ME-102	Thermodynamics	2-0	EE-241	Electromagnetic Field Theory	3-0
EE-221	Digital Logic Design	3-1	EE-222	Microprocessor Systems	3-1
HU-212	Technical & Business Writing	2-0	MATH-232	Complex Variable and Transforms	3-0
MATH-243	Vector Calculus	3-0	ECO-130	Engineering Economics	2-0
	<b>Total</b>	<b>13-2</b>		<b>Total CHs</b>	<b>14-2</b>

### Semester-IV

### Semester-V

Course Code	Course Title	Credits	Course Code	Course Title	Credits
EE-383	Instrumentation and Measurements	3-1	EE-351	Communication Systems	3-1
EE-260	Electrical Machines	3-1	EE-371	Linear Control Systems	3-1
EE-313	Electronic Circuit Design	3-1	EE-330	Digital Signal Processing	3-1
EE-232	Signals and Systems	3-1	MATH-351	Numerical Methods	3-0
MATH-361	Probability & Statistics	3-0	EC/EE-XXX	Elective-I	3-X
	<b>Total</b>	<b>15-4</b>		<b>Total</b>	<b>15-(3+X)</b>

### Semester-VI

## Semester-VII

Course Code	Course Title	Credits
OTM-455	Engineering Project Management	2-0
EE-498	Senior Design Project-I	0-2
EC/EE-XXX	Elective-II (Tfr from sem VI)	3-X
EC/EE-XXX	Elective-III	3-X
EC/EE-XXX	Elective-IV	3-X
	<b>Total</b>	<b>11-(2+X)</b>

## Semester-VIII

Course Code	Course Title	Credits
HU-222	Professional Ethics	2-0
MGT-271	Entrepreneurship	2-0
XX-XXX	University Elective	3-X
EC/EE-XXX	Elective-V	3-X
EE-499	Senior Design Project-II	0-4
	<b>Total</b>	<b>10-(4+X)</b>
	<b>Overall Total</b>	<b>105+24+X (129+X)</b>

## Elective Courses for BE in Electrical Engineering (BEE)

Course Code	Course Title	Credits	Course Code	Course Title	Credits
CE-185	Basic Civil Engineering	3-1	EE-384	Digital Instrumentation	3-1
CS-220	Database Systems	3-1	EE-385	Industrial Electronics	3-1
CS-251	Design & Analysis of Algorithms	3-0	EE-411	CMOS Analog Circuits Design	3-0
CS-435	Parallel & Distributed Processing	3-1	EE-412	VLSI Circuit Design	3-0
CS-470	Machine Learning	3-0	EE-414	Digital Electronics	3-1
CS-474	Computer Vision	2-1	EE-415	Opto-Electronics	3-1
CS-475	Computer Vision	3-0	EE-421	Digital System Design	3-1
EE-316	Operational Amplifier Applications	3-1	EE-423	Embedded System Design	3-1
EE-317	Integrated Circuits	3-0	EE-428	Industrial Process Control	3-1
EE-318	Solid State Electronics	3-0	EE-441	Microwave ICs Design	3-0
EE-332	Linear Systems and Signal Processing	3-0	EE-442	Microwave Devices	3-1
EE-333	Digital Image Processing	3-0	EE-443	Electromagnetic Compatibility	3-0
EE-341	Transmission Lines, Antennas and Wave Propagation	3-1	EE-463	Fundamentals of High Voltage Engineering	3-0
EE-342	Microwave Engineering	3-1	EE-464	Power Systems Protection	3-0
EE-343	Transmission Lines, Waveguides	3-1	EE-465	Power Economics and Management	3-0
EE-344	Wave Propagation and Antennas	3-1	EE-466	Advanced Electrical Machines	3-1
EE-356	Wireless Communication	3-0	EE-472	Industrial Control and Automation	3-0
EE-357	Computer and Communication Networks	3-1	EE-474	Advanced Control Systems	3-0
EE-361	Analysis and Design of Electric Machines	3-0	EE-475	Power System Operation and Control	3-0
EE-363	Power Transmission	3-0	EE-476	System Identification	3-0
EE-364	Power Distribution and Utilization	3-0	EE-481	Robotics-II	3-0
EE-365	Renewable Energy Systems	3-0	EE-482	Electric Drives	3-0
EE-366	Power Engineering	3-0	EE-491	Radar Systems	3-1
EE-367	Electrical Power Transmission & Distribution	3-1	EE-493	Applied Control & Navigation Systems	3-0
EE-368	Power Electronics	3-1	EE-497	Power Engineering Lab	0-1
EE-369	Power Electronics	3-0	SE-200	Software Engineering	3-0
EE-372	Digital Control Systems	3-1	CS-330	Operating Systems	3-1
EE-374	Optimal Control	3-0	EE-321	Computer Architecture & Organisation	3-1
EE-375	Introduction to Adaptive Control	3-1	EE-444	Antenna Design	3-0
EE-376	Stochastic Control	3-1	EE-451	Mobile Communication Systems	3-0
EE-377	Multivariable Control	3-1	EE-452	Satellite Communication Systems	3-0
EE-378	Introduction to Non-linear Control	3-0	EE-455	Optical Fibre Communication	3-0
EE-381	Robotics-I	3-1	EE-458	Broadband Technologies	3-0
			EE-461	Power System Analysis and Design	3-0



## Programme Description

The postgraduate programme is offered at different levels, i.e. MS and PhD. All these programmes allow the students to explore their subjects of interest in detail under the guidance of qualified faculty. This postgraduate programme is suited for professionals who are looking to advance their level of expertise for further career development. The programme specially designed and scheduled to make it convenient for working engineers to enhance their qualification and expertise.

## Research

The programme has been designed to cater for the following key areas of research:

- » Satellite Communications
- » Signal and Image Processing
- » Optical Fibres and Mobile Communications
- » Data Networks
- » Data Coding, Compression, Encryption and Transmission
- » Software Define Radio

## Associated Careers

Our close links with employers and professional bodies ensure that our students are equipped with skills that are in demand, therefore the college continues to be the choice for employers seeking high calibre graduates. A hundred percent of our College graduates go into employment or higher studies/professional trainings, immediately after the completion of their degrees. Our graduates normally find employment with major service providers and large private industrial groups or a host of smaller service and technology providers.

## Scheme of Studies

Programme Code: U 703/Y803

### Core Courses

Course Code	Course Title	Credits
<b>Signal Processing</b>		
MATH-816	Applied Linear Algebra	3
EE-832	Pattern Recognition	3
EE-833	DSP Hardware System Design	3
EE-834	Applied Signal Processing	3
EE-835	Multirate Systems & Filter Banks	3
EE-836	Advanced Digital Image Processing	3
EE-837	Advanced Topics in Computer Vision & Image Processing	3
EE-838	Filtering & Tracking	3
EE-839	Adaptive Filters	3
EE-930	Spatial Array Processing	3
EE-931	DSP Software System Design	3
EE-932	Speech Processing	3
EE-933	Time Frequency Analysis	3
EE-939	Selected Topics in Signal Processing	3
CS-867 CE-803	Computer Vision	3

### RF & Microwave

MATH-816	Applied Linear Algebra	3
EE-840	RF MEMS: Theory and Applications	3
EE-841	Electromagnetic Theory	3
EE-842	Microwave Communication System Design	3
EE-843	Microwave Transmission Lines & Waveguides	3
EE-844	Antennas & Wave Propagation	3
EE-845	EMC/EMI	3

EE-846	Microwave Photonics	3
EE-848	Radiating Systems & Antennas	3
EE-940	Advanced RF Measurements	3
EE-941	RF Transceiver Design	3
EE-942	Microwave Integrated Circuit Design	3
EE-943	Microwave Devices I	3
EE-944	Microwave Devices II	3
EE-945	Computational Electromagnetics	3
EE-946	Advanced Antenna Theory and Design	3
EE-947	Microwave Devices & Systems	3
EE-948	Advance Electromagnetic Fields	3
EE-949	Selected Topics in Microwave Engineering	3
EE-896	Electrodynamics of Plasmas	3
EE-895	Analysis of Measurement Environment	3

### Telecommunication / Communication Systems

MATH-816	Applied Linear Algebra	3
EE-853	Advanced Wireless Communication	3
EE-854	Optical Communication Systems	3
EE-855	Error Control Coding	3
EE-856	Software Defined Radio	3
EE-857	Advanced Satellite Communication Systems	3
EE-858	Communication Project Management	3

EE-859	Performance Analysis of Communication Networks	3	EE-884	Photonic Networks	3
EE-950	Advanced Data Communication Systems	3	EE-885	Broadband Networks	3
EE-951	Radar Systems	3	EE-886	Advanced Wireless Networks	3
EE-959	Selected Topics in Communication Systems	3	EE-887	Network Switching & Routing	3
EE-897	Detection & Estimation	3	EE-888	Advanced Computer Network Design & System Security	3
CSE-812	RF Communication System Design	3	EE-889	Network and Service Management and Control	3
EE-881	Advanced Communication Networks	3	EE-989	Selected Topics in Networks	3
EE-882	Cognitive Radio Networks	3	CSE-820	Advanced Computer Networks	3
EE-883	Wireless Sensor & Mesh Networks	3	CSE-879	Network Performance Analysis	3

## Bachelors in Software Engineering

### Programme Description

Software is central to our lives. We interact daily with software systems; at home through computer games, at the office through online services and in the car through embedded control systems. Software Engineering applies both, computer science and engineering principles and best practices to the design, implementation, testing, maintenance, and evolution of software. Our Software Engineering programme covers not only the technical aspects of building software systems, but also management issues. This programme is an amalgamation of strong applied science knowledge, applications of engineering practice and an ability to understand the impact of technology. We endeavour to help students carry out both theoretical and experimental research in software engineering and to disseminate the results in the form of publications, patents and technology transfer to industry. MCS also has a set of specialized courses for Network & Information Security domain. Students can specialize in these areas by registering these courses from 5th semester onwards.

### Associated Careers

The software industry has grown exponentially over the years; mechanical and electronic devices in automobiles, aeroplanes, entertainment and communication equipment and manufacturing are being replaced by software components because software is more adaptable, and can provide greater functionality. The ubiquity of software applications has created a multitude of career prospects for our graduates. Our graduates normally find employment with major service providers and large private industrial groups. There are a number of opportunities available within smaller service and technology providers, some of which are highly specialized and technologically advanced.

### Scheme of Studies

Programme Code-Y 605

#### Semester – I

#### Semester – II

Course Code	Course Title	Credits	Course Code	Course Title	Credits
HU-100	English	2-0	CS-212	Object Oriented Programming (OOP)	3-1
CS-114	Fundamentals of Programming	2-1	HU-101	Islamic Studies	2-0
HU-107	Pakistan Studies	2-0	MATH-121	Linear Algebra and ODEs	3-0
MATH-101	Calculus and Analytical Geometry	3-0	ME-109	Engineering Drawing	0-2
ME-105	Workshop Practice	0-1	HU-109	Communication Skills	2-0
PHY-102	Applied Physics	2-1	EE-122	Computer Architecture and Logic Design	3-1
*MATH-161	Discrete Mathematics	3-0	<b>Total</b>		<b>17</b>
OHS-101	Occupational Health and Safety	1-0			
<b>Total</b>		<b>18</b>			

#### Semester – III

#### Semester – IV

Course Code	Course Title	Credits	Course Code	Course Title	Credits
CS-220	Database Systems	3-1	CS-330	Operating Systems	3-1
SE-200	Software Engineering	3-0	CS-251	Design & Analysis of Algorithm	3-0
CS-250	Data Structures & Algorithms	3-1	MATH-232	Complex Variables and Transforms	3-0
MATH-361	Probability and Statistics	3-0	SE-211	Software Design and Architecture	2-1
EE-353	Computer Networks	3-1	MATH-352	Numerical Methods	2-1
			XXX-XXX	"Sociology Elective-I (Professional Ethics/ Engg Economics/ Professional Practices) "	2-0
<b>Total</b>		<b>18</b>	<b>Total</b>		<b>18</b>

## Semester – VI

Course Code	Course Title	Credits
XX-XXX	"Management Science Elective-I (Engg Management / Project Management)"	3-0
XX-XXX	Engineering Elective-I (Web Engg)	3-1
SE-315	Cloud Computing	2-1
CS-336	MDEE-I (Embedded Systems)	2-1
HU-212	Technical & Business Writing	2-0
CS-314	Software Construction	2-1
<b>Total</b>		<b>18</b>

## Semester – V

Course Code	Course Title	Credits
SE-320	Formal Methods	3-0
SE-321	Software Quality Engineering	3-0
MGT-271	"Entrepreneurship (Management Science Elective-II)"	2-0
	"Engineering Elective-II (Distributed Computing / Information Retrieval)"	3-X
SE-430	Software Project Management	3-0
CS-261	Human Computer Interaction	2-1
<b>Total</b>		<b>17-X</b>

## Semester – VII

Course Code	Course Title	Credits
CS-484	Information Security	3-0
SE-499	Senior Project	0-3
	Engineering Elective-III	3-X
	Engineering Elective-IV	3-1
ECO-130	Sociology Elective-II (Engineering Economics)	2-0
<b>Total</b>		<b>15-X</b>

## Semester – VIII

Course Code	Course Title	Credits
SE-499	Senior Project	0-3
	Engineering Elective-V	3-1
CS-335	MDEE-II (Internet of Things)	3-0
CSL-401	Community Service	0-2
<b>Total</b>		<b>10-X</b>
<b>Grand Total</b>		<b>131-X</b>

## Notes:

1. The labs and elective courses will be offered in such a way that the total number of credit hours should remain in between 133 - 137.
2. The Elective course in particular category may not be offered, if the minimum credit hours requirement is already met.
3. The order of offering of General Education/Supporting Science core courses can be changed depending on availability of resources.
4. \* Community Service is a non-credit course.

## SE Elective Courses

**Note:** No limit on number of courses, minimum 21Credit Hours

Code	Course Title	Credits	Code	Course Title	Credits
BIO-215	Bioinformatics	3-0	CS-453	Programming Languages	3-0
BIO-317	Computational Biology	3-0	CS-471	Machine Learning	3-1
CS-213	Advanced Programming	3-1	CS-472	Natural Language Processing	3-0
CS-321	Advanced Database Systems	3-0	CS-473	Theory of Intelligent Systems	3-1
CS-322	RDBMS Using Oracle	2-1	CS-474	Computer Vision	2-1
CS-331	System Programming	2-1	CS-476	Speech and Image Processing	3-1
CS-332	Distributed Computing	3-1	CS-481	Computer Forensics	3-1
CS-334	Open Source Systems	3-1	CS-482	System Incident Handling	3-0
CS-340	Web Technologies-I	2-1	CS-490	Advanced Topics in Computing	3-0
CS-342	Mobile Computing	3-0	EE-232	Signals and Systems	3-1
CS-344	Web Engineering	3-1	EE-322	Wireless Networks	3-0
CS-352	Theory of Automata and Formal Languages	3-0	EE-330	Digital Signal Processing	3-1
CS-361	Computer Graphics	3-1	EE-350	Data Communication	3-0
CS-362	Multimedia Systems and Design	2-1	EE-430	Telecommunication Systems	3-0
CS-363	Visualization	2-1	EE-433	Digital Image Processing	3-1
CS-364	Game Programming	2-1	MATH-352	Numerical Methods	2-1
CS-380	Introduction to Computer Security	3-0	SE-301	Object Oriented Software Engineering	3-0
CS-381	Network Security	3-1	SE-313	Design Patterns	2-1
CS-414	Advanced Java with emphasis on Internet Applications	3-1	SE-422	Software Testing	3-0
CS-423	Data Warehousing and Data Mining	3-1	SE-423	Software Metrics	3-0
CS-424	Information Retrieval	3-0	SE-431	Software Engineering Economics	3-0
CS-425	Management Information Systems	3-0	SE-440	Business Process Automation	3-0
CS-433	Applied Parallel Computing	2-1	SE-490	Advanced Topics in Software Engineering	3-0
CS-441	Web Technologies-II	3-1	CS-260	Human Computer Interaction	3-0
CS-443	E-Commerce and Solutions	3-0	CS-370	Artificial Intelligence	3-1
			CS-483	Information Security Management	3-0

**General Education Electives**

CS-309	Computing and Society	3-0
EC-303	Mobile Application Development for SME's	2-1
ECO-130	Engineering Economics	2-0
FIN-100	Principles of Accounting	3-0
FIN-204	Financial Management for IT Professional	2-0
HRM-240	Organizational Behaviour	2-0
HRM-241	Organization Behavior	3-0
HRM-441	Human Resource Management	2-0
HRM-442	Human Resource Management	3-0
HU-102	Psychology	3-0
HU-103	Principles of Sociology	3-0
HU-104	English Literature	3-0
HU-223	Professional Ethics	3-0
MGT-164	Introduction to Management	2-0
MGT-175	Intellectual Property Rights	3-0
MGT-452	New Business Ventures	2-0
MKT-102	Principles of Business and Marketing	2-0

**Supporting Science Electives**

PHY-101	Applied Physics	3-1
CH-101	Applied Chemistry	2-1
CS-271	Computational Logic	3-0
CS-382	Fundamentals of Cryptography	3-0
EE-102	Basic Electrical Engineering	3-1
EE-201	Engineering Mechanics	3-0
EE-212	Basic Electronics	2-1
EE-215	Electronic Devices and Circuits	3-1
EE-414	Digital Electronics	3-1
EE-477	Analogue and Digital Communications	3-1
MATH-112	Calculus II	3-0
MATH-133	Engineering Mathematics	3-0
MATH-221	Number Theory	3-0
MATH-232	Complex Variables and Transforms	3-0
MATH-234	Multivariable Calculus	3-0
MATH-351	Numerical Methods	3-0
OTM-455	Engineering Project Management	2-0
PHY-401	Advanced Physics	2-1
SE-410	System Modeling and Simulation	3-1
CEM-300	Procurement Management	3-0

**Software Engg - Core Depth Elective Courses**

SE-403	Agent Based Software Engineering	2-1
CS-404	Big Data Analytics	2-1
CS-405	Deep Learning	3-1
CS-406	Visual Programming	2-1
SE-407	Real Time Systems	2-1
CS-408	Data Encryption and Security	2-1

**Multi-Disciplinary Engineering Electives**

CS-335	Internet of Things	3-0
CS-336	Embedded Systems	2-1

## Programme Description

The postgraduate programme in Software Engineering is offered at different divisions, i.e. MS and PhD. All these programmes allow the students to explore their subjects of interest in detail under the guidance of qualified faculty. This postgraduate programme is suited for professionals, who are looking to advance their level of expertise for further career development, as it is offered in the evening.

## Research

Research is conducted in the following areas:

- » Web Engineering
- » Computer Vision and Image Processing
- » Software System Design and Architecture
- » Software Requirement Engineering
- » Software Project Management
- » Data Text Mining

## Associated Careers

The software industry has grown manifold over the years; areas like mechanical and electronic devices in automobiles, aero planes, entertainment and communication equipment and manufacturing are being replaced by software components as software is more adaptable, reliable and accurate. Software is used in medical, transportation and financial systems to automate critical tasks. Scientists and business researchers use software to sift through data warehouses and identify pertinent facts and trends. Banking, insurance, and other businesses use software to automate and personalize the services they offer to their customers. This proliferation of software applications has increased the demand for software professionals in Pakistan and all over the world. A hundred percent of our graduates get employed or opt for higher studies/professional trainings after the completion of their degrees. Our graduates normally find employment with major service providers and large private industrial groups.

## Scheme of Studies

Programme Code: Y 705/Y 805

Course Code	Course Title	Credits
<b>Core Courses</b>		
SE-860	Advanced Software Engineering	3
SE-861	Software System Design & Architecture	3
SE-862	Software Requirement Engineering	3
SE-863	Software Quality Engineering	3
<b>SE-899</b>	<b>MS Thesis</b>	<b>6</b>

### Electives Courses

SE-864	Team-Based Software Development	3	SE-827	Wireless Communication	3
SE-865	Human Computer Interface	3	SE-828	Network Security	3
SE-867	Formal Methods	3	SE-801	Artificial Neural Network	3
SE-868	Software Project Management	3	SE-802	Pattern Recognition	3
SE-869	Model Driven Software Engineering	3	SE-803	Computer Vision	3
SE-871	Business Process Re-engineering	3	SE-805	Adv Artificial Intelligence	3
SE-897	Empirical Software Engineering	3	SE-807	Machine Learning	3
SE-870	Agile Software Engineering Methods	3	SE-808	Bio Informatics System	3
CS-822	Data Mining	3	SE-830	Adv Algorithm Analysis	3
CS-825	Information Retrieval	3	SE-835	Adv Algorithmic Graph Theory	3
CS-833	Cloud Computing	3	SE-810	Data Engineering	3
SE-876	Web-Engineering	3	SE-880	Adv Database Systems	3
SE-877	Software Development for Web	3	SE-812	Adv Operating Systems	3
SE-825	Adv Computer Network	3	SE-813	Design of Parallel & Distributed Systems	3
SE-826	Adv Computer Network Design & System Security	3	SE-820	Adv Computer Architecture	3
			SE-850	Digital Image Processing	3

**Note:** Students will choose four elective courses in addition to four core courses to complete 24 credit hours. PhD students will complete the requirements of 800/900 level coursework (18 credits) to be decided by the Doctoral Guidance and Examination Committee (GEC).

SE-851	Wavelet Compression	3
SE 900-919	Selected topics in relevant Area	3
RM-896	Research Methodologies	3
SE-899	MS Thesis	6
SE-999	PhD Thesis	30
EE-800	Stochastic Systems	3
IS-810	Secure Coding	3
IS-820	Computer Security	3
IS-821	Network Security	3
EE-821	Advanced Embedded System Design	3
IS-822	Wireless Network Security	3
IS-824	Biometrics	3
IS-825	Vulnerability Exploitation & Defence	3
IS-827	Electronic Warfare – Principles and Techniques	3
IS-830	Information Security Management	3
IS-831	Information Security Project Management	3
IS-833	IT Security Evaluation & Auditing	3
IS-843	Advanced Cryptography	3
IS-851	Secure Communications	3
IS-852	Data Communication Networks & Security	3

EE-852	Information and Coding Theory	3
IS-853	Cloud Computing Security	3
EE-853	Advanced Wireless Communication	3
IS-854	Advanced Web Security	3
IS-855	Information Hiding	3
IS-856	Access Control and Database Security	3
IS-863	Cellular and Mobile Network Security	3
EE-876	Robotics	3
EE-883	Wireless Sensor and Mesh Networks	3
EE-888	Broadband Networks	3
EE-926	System Validation	3
EE-937	Advanced Topics in Computer Vision and Image Processing	3
EE-887	Network Switching and Routing	3

### Additional Course

RM-898	Research Methodology	2
SEM/WKSP 897	Seminar / Workshop	1
SEM/WKSP 997	Seminar / Workshop	1

## Bachelors in Information Security

### Programme Description

Recent years have seen tremendous development in the field of information security. The modern world is connected by billions of mobile devices, computer networks and industrial systems. Reliance on Information Technology, IP based communication and use of cyberspace has exposed infrastructure and information to eminent cyber attacks. As MCS is already running MS and PhD programmes in information security and now has started BE Information Security programme w.e.f 2019.

### Associated Careers

To equip undergraduate students with an understanding of the basic area of Information Security while providing them with an extended curriculum base to choose from, widely covering all aspects. Enhance research and development along with the applied knowledge of Information Security in order to generate considerable number of information security manpower. To provide effective personal development and team-work skills for continuing professional progress/growth and life-long learning.

### Scheme of Studies

Programme Code: Y 614

#### Semester – I

Course Code	Course Title	Credits
MATH-161	Discrete Mathematics	3(3+0)
CS-114	Fundamentals of Programming	3(2+1)
HU-107	Pakistan Studies	2(2+0)
HU-100	English	2(2+0)
PHY-102	Applied Physics	3(2+1)
MATH-101	Calculus and Analytical Geometry	3(3+0)
ME-105	Workshop Practice	1(0+1)
	<b>Total</b>	<b>17 (14+3)</b>

#### Semester – II

Course Code	Course Title	Credits
CS-212	Object Oriented Programming	4(3+1)
HU-109	Communication Skills	2(2+0)
HU-101	Islamic Studies	2(2+0)
MATH-121	Linear Algebra and ODEs	3(3+0)
ME-109	Engineering Drawing	2(0+2)
EE-221	Digital Logic Design	4(3+1)
	<b>Total</b>	<b>17(13+4)</b>

## Semester – III

Course Code	Course Title	Credits	Course Code	Course Title	Credits
MATH-361	Probability and Statistics	3(3+0)	IS-353	Cryptographic Design Engineering	4(3+1)
CS-250	Data Structures & Algorithms	4(3+1)	EE-321	Computer Architecture & Organization	4(3+1)
MATH-106	Multivariable and Vector Calculus	3(3+0)	EE-357	Computer and Communication Networks	4(3+1)
IS-201	Introduction to Information Security Engineering	3(3+0)	HU-212	Technical and Business Writing	2(2+0)
EE-111	Linear Circuit Analysis	4(3+1)	MATH-232	Complex Variables and Transforms	3(3+0)
	<b>Total</b>	<b>17 (15+2)</b>		<b>Total</b>	<b>17 (14+3)</b>

## Semester – V

Course Code	Course Title	Credits	Course Code	Course Title	Credits
IS-241	Network Security Engineering	4(3+1)	IS-331	Embedded and Realtime Systems Security	3(2+1)
EE-211	Electrical Network Analysis	4(3+1)	-	University Elective-I (IDEE)	4(3+1)
EE-231	Signals and Systems	3(3+0)	IS-433	Security Assessment and Evaluation	3(2+1)
-	Info Security Engg Elective-I	4(3+1)	-	Info Security Engg Elective-II	3(2+1)
MATH-352	Numerical Methods	3(2+1)	HU-222	Professional Ethics	2(2+0)
	<b>Total</b>	<b>18 (15+3)</b>	OTM-455	Engg Project Management	<b>2(2+0)</b>
				<b>Total Credit Hours</b>	<b>17 (13+4)</b>

## Semester – VII

Course Code	Course Title	Credits	Course Code	Course Title	Credits
IS-345	Secure Wireless Communications	4(3+1)	-	Info Security Engg Elective-V	3(2+1)
-	Info Security Engg Elective-III	4(3+1)	-	Info Security Engg Elective-VI	3(3+0)
IS-382	Security Engineering Management	3(3+0)	IS-499	Senior Project FYP	4(0+4)
-	University Elective-II (Humanities/Management)	2(2+0)	-	Info Security Engg Elective-VII	3(2+1)
IS-499	Senior Project FYP	2(0+2)	MGT-271	Entrepreneurship	2(2+0)
-	Info Security Engg Elective-IV	3(2+1)		<b>Total</b>	<b>15 (9+6)</b>
	<b>Total</b>	<b>18 (13+5)</b>		<b>Grand Total</b>	<b>136 (105+31)</b>

## B.E Information Security Depth Electives

Course Code	Course Title	Credits
IS348	Cloud Architecture Engineering & Security	(3-1-4)
IS363	Critical Infrastructure Protection	(3-1-4)
IS379	Digital Information Forensics	(2-1-3)
IS471	Network Forensics	(2-1-3)
IS442	Secure RF Communications	(3-0-3)
IS378	Legal Aspects of Information Security	(3-0-3)
IS376	Human Factors and Information Security Engineering	(3-0-3)
IS333	Firmware and Execution Environment Security	(2-1-3)
IS220	Database Security	(3-1-4)
IS349	Modern Networking Concepts	(2-1-3)
IS372	Malicious Software & Hardware	(2-1-3)
IS383	Secure Intelligent Systems	(2-1-3)
IS453	Cryptanalysis	(3-0-3)
IS374	Parallel and Distributed Computing	(3-0-3)
IS455	Emission Security	(3-0-3)
IS361	Power Systems and Smart Grid	(3-0-3)

## Semester – IV

Course Code	Course Title	Credits
IS-353	Cryptographic Design Engineering	4(3+1)
EE-321	Computer Architecture & Organization	4(3+1)
EE-357	Computer and Communication Networks	4(3+1)
HU-212	Technical and Business Writing	2(2+0)
MATH-232	Complex Variables and Transforms	3(3+0)
	<b>Total</b>	<b>17 (14+3)</b>

## Semester – IV

Course Code	Course Title	Credits
IS-331	Embedded and Realtime Systems Security	3(2+1)
-	University Elective-I (IDEE)	4(3+1)
IS-433	Security Assessment and Evaluation	3(2+1)
-	Info Security Engg Elective-II	3(2+1)
HU-222	Professional Ethics	2(2+0)
OTM-455	Engg Project Management	<b>2(2+0)</b>
	<b>Total Credit Hours</b>	<b>17 (13+4)</b>

## Semester – VIII

Course Code	Course Title	Credits
-	Info Security Engg Elective-V	3(2+1)
-	Info Security Engg Elective-VI	3(3+0)
IS-499	Senior Project FYP	4(0+4)
-	Info Security Engg Elective-VII	3(2+1)
MGT-271	Entrepreneurship	2(2+0)
	<b>Total</b>	<b>15 (9+6)</b>
	<b>Grand Total</b>	<b>136 (105+31)</b>

IS362	Power Grid Security	(3-0-3)
IS461	VLSI Security	(3-0-3)
IS347	GPS Security	(3-0-3)
IS377	System Security and Resilience	(3-0-3)
IS346	Mobile Devices Security	(2-1-3)
IS441	Internet of Things (IoT) Security	(2-1-3)
IS431	System Engineering Principles	(3-0-3)

## Inter Disciplinary Engineering Electives (IDEE)

EE-371	Linear Control Systems	(3-1-4)
EE-222	Microprocessor Systems	(3-1-4)
EE-354	Analog Communication Systems	(3-1-4)
EE-382	Electronic Devices and Circuits	(3-1-4)
EE-330	Digital Signal Processing	(3-1-4)
EE-355	Digital Communication Systems	(3-1-4)

## Humanities (Social Sciences/Language) &amp; Management Electives

Course Code	Course Title	Credits
HUxxx	Professional Psychology	(2-0-2)
HUxxx	Sociology for Engineers	(2-0-2)

HUxxx	Critical Thinking	(2-0-2)
<b>Culture (Language) Electives</b>		
HUxxx	Arabic	(2-0-2)
HUxxx	German	(2-0-2)
HUxxx	Chinese	(2-0-2)

**Management (Professional Practice) Electives**

ECO-130	Engineering Economics	(2-0-2)
HRM-441	Human Resource Management	(2-0-2)
GMT-164	Introduction to Management	(2-0-2)
HRM-240	Organizational Behavior	(2-0-2)

## MS/PhD in Information Security

### Programme Description

Cyber threats to federal information systems and cyber-based critical infrastructures are evolving and growing. These threats can be unintentional and intentional, targeted or non-targeted, and can come from a variety of sources, such as foreign nations engaged in espionage and information warfare, criminals, hackers, virus writers, disgruntled employees and contractors working within an organization. As government, private sector, and personal activities continue to move to networked operations; digital systems add more capabilities; wireless systems become more ubiquitous and as the design, manufacture, and service of information technology have moved overseas, the threat will continue to grow. In the absence of robust security programmes, agencies have experienced a wide range of incidents involving data loss or theft, computer intrusions and privacy breaches; underscoring the need for improved security practices.

### Information Security Center of Excellence

This setup is aimed at reducing the vulnerabilities faced by the national information infrastructure and cyber-space, by producing more qualified graduates and researchers in the various disciplines of Information Security, as well as indigenously designing and delivering technological solutions. The research and technical solutions designed at the proposed Information Security Center of Excellence will provide important substitute and enhanced level of trust.

### Associated Careers

The programme is focused to produce professionals competent enough to offer solution for Information Security problems in the market. Graduates of this programme will be able to address information security related issues in present and future era of Information Technology. The need of Information Security has grown dramatically over the last few years. Like the Industrial Revolution, the Information Technology Boom, which started in the 1990's and is still present today, has dramatically changed commerce around the world. This is mostly due to advancement of technology in computers, telecommunications equipment, and networking standards, leading to the development and widespread use of the Internet. This propagation of information security has led to an urgent and growing demand for information security professionals in Pakistan and all over the world. A hundred percent of our graduates go into employment or higher studies/professional trainings immediately after completion of their degrees. Our graduates normally pursue careers in major service providers such as PTCL, Warid, Mobilink, Zong, Ufone, Telenor and Special Communication Organization (SCO); large private industrial groups such as Microsoft, NetSol, Ericsson, and Cisco; and a host of smaller service and technology providers.





## Core Courses

Course Code	Course Title	Credits
IS-820	Computer Security	3
IS-821	Network Security	3
IS-830	Information Security Management	3
IS-842	Advanced Cryptography-1	3
IS-899	MS Thesis	6

## Electives (Cryptography)

IS-843	Advanced Cryptography – II	3
IS-844	Cryptanalysis	3
IS845	Quantum Cryptography	3
IS-846	Formal Method for Information Security	3
IS-891	Advanced Topics in Cryptology	3

## Electives (Systems/Network Security)

IS-822	Wireless Network Security	3
IS-825	Vulnerability Exploitation and Defense	3
IS-827	Electronic Warfare – Principles and Techniques	3
IS-851	Secure Communications	3
IS-852	Data Communication Networks & Security	3
IS-853	Cloud Computing Security	3
IS-854	Advanced Web Security	3
IS-861	Secure Electronic Commerce	3
IS-863	Cellular and Mobile Network Security	3
IS-859	Information Security Engineering	3
IS-893	Advanced Topics in Systems Security	3

## Electives (Information Security Management)

IS-831	Information Security Project Management	3
IS-833	IT Security Evaluation & Auditing	3
IS-832	Legal Aspects of Information Security	3
IS-834	Security Planning and Incident Management	3
IS-835	Security Risk Analysis and Management	3
IS-836	Auditing Networks, Perimeters and Systems	3
IS-837	Security and Privacy of Information and Information Systems	3
IS-894	Advanced Topics in Information Security Management	3

## Electives (Digital Forensics and Incident Response)

IS-823	Computer Forensics	3
IS-855	Information Hiding	3
IS-870	Network Forensics	3
IS-871	OS & File System Forensics	3
IS-872	Forensics Incident Response	3
IS-873	Malware Analysis and Reverse Engineering	3
IS-874	Intrusion Detection	3
IS-895	Advanced Topics in Digital Forensics and Incident Response	3
IS-839	Critical Infrastructure Protection and Incident Management	3

## Electives : General

IS-810	Secure Coding	3
IS-824	Biometrics	3
IS-826	Cyber Warfare	3
IS-856	Access Control and Database Security	3
IS-890	Advanced Topics in Information Security	3
IS-838	Advanced Simulation and Modeling	3
CE-838	Analysis of Stochastic Systems	3
SE-802	Pattern Recognition	3
SE-805	Advance Artificial Intelligence	3
IS-999	PhD Thesis	30

**Note:** Out of the eight academic subjects, **FOUR** will be core courses, and remaining **FOUR** will be elective courses. The elective courses have been further grouped into **FOUR** streams and each student must select at least **TWO** elective courses from any specific stream in which student is pursuing Specialisation.

## Programme Description

Masters in Computer Science offers a comprehensive and professional-oriented computer science education that combines the foundations of computer science with the applied and in-demand skills necessary for careers in technology. MS-CS is especially well suited for students interested in software engineering, mobile computing, data analytics, and high-performance computing and intelligent systems.

## Research

Research is conducted in the following areas:

- » Parallel and Distributing Computing
- » Graphics and Visual Computing
- » Intelligent Information Systems
- » Software Design and Management
- » Computer and Wireless Network

## Associated Careers

The IT industry is playing a major role in boosting Pakistan's economy as demonstrated by other Asian countries. Graduates with a degree in computer science have a wide range of career options in Pakistan's growing IT landscape. The skills computer science students gain in logical analysis, software engineering, Programming database development, computer graphics and multimedia technologies, networking, communication, information management, and project management open a whole new range of jobs in universities, research institutions, and in the CS and IT markets in Pakistan and abroad.

## Scheme of Studies

Programme Code: Y742

### Core Courses

Course Code	Course Title	Credits
CS-813	Mathematical Method for Computing	3
CS-850	Advanced Theory of Computation	3
CS-854	Advanced Algorithms Analysis	3
CS-837	Advanced Operating Systems	3
<b>Mandatory courses/ Thesis</b>		
CS-899	Thesis	6
RM-898	Research Methodologies	Non credit

### Electives

#### Parallel and Distributed Computing (PDC)

Course Code	Course Title	Credits
CS-821	Distributed Databases	3
CS-830	Advanced Computer Architecture	3
CS-832	Parallel Computing	3
CS-833	Cloud Computing	3
CS-834	Scientific Computing	3
CS-836	Advanced Distributed Computing	3
CS-839	Parallel and Distributed Simulation	3
CS-865	Ubiquitous and Autonomic Computing	3
IS-838	Advanced Simulation & Modeling	3
CS-897	Advanced Topics in Computing	3

#### Graphics and Visual Computing (GVC)

CS-861	Advanced Computer Graphics	3
CS-862	Advanced Image Processing	3
CS-864	Scientific Visualization	3

CS-866	Information Visualization	3
CS-867	Computer Vision	3
CS-869	Game Design	3
CS-876	Augmented and Virtual Reality	3
CS-893	Advanced Computer Vision	3
CS-897	Advanced Topics in Computing	3

#### Intelligent Information Systems (IIS)

CS-863	Applied Artificial Intelligence	3
CS-871	Machine Learning	3
CS-875	Natural Language Processing	3
CS-878	Deep Learning	3
CS-879	Advanced Machine Learning	3
CS-890	Advanced Data Science	3
CS-891	Multi Agent Systems	3
CS-895	Big Data Analytics	3
CS-897	Advanced Topics in Computing	3

#### Software Design and Management (SDM)

CS-810	Advanced Requirements Engineering	3
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CS-811	Component-based Software Engineering	3	IS-845	Quantum Cryptography	3
CS-812	Object Oriented Analysis & Design	3	IS-852	Data Communication Networks & Security	3
CS-840	Software Verification	3	IS-853	Cloud Computing Security	3
CS-841	Software Quality Engineering	3	IS-891	Advanced Topics in Cryptology	3
CS-842	Rich Internet Applications	3	IT-807	Cryptography and Security Mechanisms	3
CS-853	Formal Methods	3	IT-815	Graph Theory & Algorithm	3
SE-860	Advanced Software Engineering	3	IT-817	Enterprise Object Oriented Technologies	3
SE-869	Model Driven Software Engineering	3	IT-872	Wireless Networks	3
CS-897	Advanced Topic in Computing	3	IT-874	Wireless Sensor Networks	3
<b>Computer &amp; Wireless Networks (C&amp;WN)</b>			IT-875	QoS for Networks	3
IT-877	Advance Computer Networks	3	IT-877	Advance Computer Networks	3
IT-872	Wireless Networks	3			
IT-874	Wireless Sensor Networks	3			
IT-875	QOS for Networks	3			
IS-852	Data Communication Networks & Security	3			
CSE-879	Network Performance Analysis	3			
EE-981	Network Switching and Routing	3			
CS-897	Advanced Topics in Computing	3			
IS-821	Advanced Network / Web Security	3			
<b>Additional Electives</b>					
CS-800	Strategic Information Management	3			
CS-820	Advanced Database Concepts	3			
CS-822	Data Mining	3			
CS-823	Advance Topics in Databases	3			
CS-824	Web based Databases	3			
CS-825	Information Retrieval	3			
CS-835	Numerical Simulation	3			
CS-870	Social Web Mining	3			
CS-872	Ontology Engineering	3			
CS-873	Semantic Web	3			
CS-880	Information Assurance	3			
CS-881	Computer Security Architecture	3			
CS-882	Advanced Information Security	3			
CS-885	Data Security and Privacy	3			
CS-892	Convex Optimization	3			
CSE-879	Network Performance Analysis	3			
EE-891	Stochastic Systems	3			
EE-981	Network Switching and Routing	3			
IS-821	Advanced Network / Web Security	3			
IS-823	Computer Forensics	3			
IS-824	Biometrics	3			
IS-825	Vulnerability Exploitation and Defense	3			
IS-826	Cyber Warfare	3			
IS-842	Advanced Cryptography – I	3			



**CEME**

NUST College of Electrical and  
Mechanical Engineering

# NUST College of Electrical and Mechanical Engineering

The College of Electrical and Mechanical Engineering was established in 1957 as a polytechnic institute at Quetta. The College was moved to its present campus in 1984. With the establishment of NUST in 1991, the College became one of its constituent colleges. The College is situated on the Grand Trunk Road at the Rawalpindi-Islamabad junction. Its open landscape makes it an ideal place for an academic campus. A fascinating locale and congenial environment are indeed the hallmarks of the College. It is the largest College of NUST in terms of PhD faculty, student enrolment, diversity of academic programmes, research activities, space, infrastructure and facilities. The College attained ISO-9001 certification in 1999, ISO 9001-2000 certification in 2003 and ISO 9001-2008 in May 2009. It has earned accolades in quality assurance from Pakistan Engineering Council (PEC) in accreditation evaluation. The College offers degree programmes in diverse undergraduate and postgraduate programmes, mainly in the disciplines of Electrical, Mechanical, Computer and Mechatronics Engineering, and postgraduate programme in Engineering Management. The College lays great emphasis on indigenous research. As a result, quantum research material is produced annually. The faculty mostly comprises eminent research scholars who regularly participate in conferences and seminars, both at home and abroad. A state-of-the-art spacious library, stocked with around 95,197 books, an e-library section and a good number of computers with wireless internet connectivity facilitate students and faculty in their research. "In 2020, CEME has published 124 publications in research journals and 21 conference papers in proceedings of international conferences.

## Faculty Profile

The College of E&ME is staffed with highly qualified faculty that offers the most dynamic, up-to-date and highly challenging academic programmes. Currently, there are 74 PhD faculty members; most of them are foreign qualified.

### Dr Aamer Baqai Dean

PhD (Paris Tech University) France

**Discipline:** Mechanical Engineering

**Specialisation:** Manufacturing Systems Design & Optimization

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## Electrical Engineering

### Dr Fahad Mumtaz Malik, HoD

PhD (NUST) Pakistan

**Discipline:** Electrical Engineering

**Specialisation:** Control Systems

### Dr Shahzad Amin Sheikh,

hD (Southwest Jiaotong University) China

**Discipline:** Information Systems & CommEngg

**Specialisation:** Signal Processing & Communication

### Dr Mojeeb Bin Ihsan

PhD (Drexel University) USA

**Discipline:** Electrical Engineering

**Specialisation:** Microwave Engineering, Solid State Electronics

### Dr Syed M Tahir Zaidi

PhD (Georgia Institute of Tech) USA

**Discipline:** Electrical Engineering

**Specialisation:** Semiconductor Devices, Digital Signal Processing

### Dr Mashhood Ahmad

PhD (Quaid-i-Azam University) Pakistan

**Discipline:** Electronics

**Specialisation:** Quantum Optics

### Dr Muwahida Liaquat

PhD (NUST) Pakistan

**Discipline:** Electrical Engineering

**Specialisation:** Digital Signal Processing, Control Systems

### Dr Usman Ali

PhD (NUST) Pakistan

**Discipline:** Electrical Engineering

**Specialisation:** Embedded System Design, Computer Vision

### Dr Muhammad Zeeshan

PhD (NUST) Pakistan

**Discipline:** Electrical Engineering

**Specialisation:** Communication Systems

### Dr Qasim Umar Khan

PhD (NUST) Pakistan

**Discipline:** Electrical Engineering

**Specialisation:** Microwave Engineering, Antenna Design, Communication

### Dr SaifUllah Awan

PhD (Quaid-i-Azam University Islamabad) Pakistan

**Discipline:** Physics

**Specialisation:** Solid State Physics Semiconductors

### Dr Azhar UlHaq

PhD (University of L'aquila) Italy

**Discipline:** Electrical Engineering

**Specialisation:** Power Systems

### Dr Shahzor Ahmad

PhD (National University of Singapore) Singapore

**Discipline:** Electrical & Computer Engg

**Specialisation:** Computer Vision

### Kamran Aziz Bhatti

MPhil (Quaid-i-Azam University) Pakistan

**Discipline:** Electronics

**Specialisation:** Electronics

### Engr Sobia Hayee

MS (IOWA State University) USA

**Discipline:** Electrical Engineering

**Specialisation:** Antenna Design, Microwave Engineering

**Engr Muhammad Anis Chaudhry**

MS (NUST) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Microwave Circuits and Systems**Engr Salman Qadir**

MS (NUST) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Control Systems**Engr Aamir Javed**

MS (NUST) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Microwave Engineering**Engr Furqan Haider Qureshi**

MS (NUST) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Communication Systems**Engr Sarmad Majeed Malik**

MS (North China Electric Power University) China

**Discipline:** Electrical Engineering**Specialisation:** Power Systems**Engr Muhammad Kamran Bodla**

MS (North China Electric Power University) China

**Discipline:** Electrical Engineering**Specialisation:** Electric Power Systems and Automation**Engr Taosif Iqbal**

MS (Ivanovo State University) Russia

**Discipline:** Electrical Engineering**Specialisation:** Automation & Control**Dr Atif Qayyum**

PhD NUST (Pakistan)

**Discipline:** Electrical Engineering**Specialisation:** Control Systems**Dr Zubair Ahmed**

PhD (CUST) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Antenna and, Microwave Engineering**Dr Ahmad Rauf Subhani**

PhD (University Teknologi PETRONAS)

**Discipline:** Electrical & Electronic Engg**Specialisation:** Biomedical Signal Processing & Applied Machine Learning

## Mechanical Engineering

**Dr Aamer Baqai, Dean**

PhD (Paris Tech University) France

**Discipline:** Mechanical Engineering**Specialisation:** Manufacturing Systems Design & Optimization**Dr Imran Akhtar, HoD**

PhD (Virginia Tech) USA

**Discipline:** Mechanical Engineering**Specialisation:** Nonlinear Systems, CFD, Flow Control**Dr Hasan Aftab Saeed**

PhD (Univ of Tokyo) Japan

**Discipline:** Mechanical Engineering**Specialisation:** Solid Mechanics, Dislocation Nucleation, Modeling & Simulation**Dr Tariq Talha**

PhD (Univ. of Warwick) UK

**Discipline:** Mechanical Engineering**Specialisation:** Computational Fluid Dynamics, Active Flow Control**Dr Sajid Ullah Butt**

PhD (ParisTech Univ) France

**Discipline:** Mechanical Engineering**Specialisation:** Fixture design, Workpiece repositioning, System Kinematics**Dr Raja Amer Azim**

PhD (NUST) Pakistan

**Discipline:** Mechanical Engineering**Specialisation:** Vehicle Dynamics & Controls**Dr Naveed A. Din**

PhD (University of Manchester) UK

**Discipline:** Mechanical Engineering**Specialisation:** Structural Dynamics**Engr Saheeb Kiyani**

MS (NUST) Pakistan

**Discipline:** Mechanical Engineering**Specialisation:** Modeling & Simulation**Engr Rehan Ahmed Khan**

MS (UMIST) UK

**Discipline:** Mechanical Engineering**Specialisation:** Non-traditional Manufacturing Processes, CAD/CAM**Engr Yasser Riaz Awan**

MS (HUST) China

**Discipline:** Mechanical Engineering**Specialisation:** Reverse Logistics**Engr Usman Zia**

MS (Rochester Institute of Technology) USA

**Discipline:** Mechanical Engineering**Specialisation:** Materials**Dr Faisal Ahmed**

PhD (Sungkyunkwan University), South Korea

**Discipline:** Mechanical Engineering.  
**Specialisation:** Nanomaterial, Power Dissipation.

**Dr Bilal Anjum Ahmed**  
 PhD (King Fahd University of Petroleum and Mineral), KSA  
**Discipline:** Mechanical Engineering  
**Specialisation:** Ceramic Materials, Powder Metallurgy

**Engr Saida Riaz**  
 MS (Mechanical) Pakistan  
**Discipline:** Mechanical Engineering.  
**Specialisation:** Navigation of Control

**Engr Najum Us Saher**  
 MS (UET Taxila) Pakistan  
**Discipline:** Mechanical Engineering  
**Specialisation:** Engg Mgmt

**Engr Shahbaz Ghani**  
 MS (BIT), China  
**Discipline:** Mechanical Engineering  
**Specialisation:** Vehicle Engineering

**Dr Rashid Naseer**  
 PhD (NMSU) USA  
**Discipline:** Mechanical Engineering  
**Specialisation:** Mathematical modelling, Aeroelastic Energy Harvesting, Non-linear dynamics, Design optimization

## Computer & Software Engineering

**Dr Usman Qamar, HOD**  
 PhD (University of Manchester) UK  
**Discipline:** Computer Sciences  
**Specialisation:** Data Engineering

**Dr Shoab Ahmad Khan**  
 PhD (Georgia Tech University) USA  
**Discipline:** Electrical & Computer Engineering  
**Specialisation:** Digital Signal Processing

**Dr Muhammad Usman Akram**  
 PhD (National University of Sciences & Technology) Pakistan  
**Discipline:** Computer Engineering  
**Specialisation:** Digital Image Processing

**Dr Arslan Shaukat**  
 PhD (The University of Manchester) UK  
**Discipline:** Computer Science/Informatics  
**Specialisation:** Machine Learning

**Dr Farooque Azam**  
 PhD (Beijing University of Aeronautics and Astronautics) China  
**Discipline:** computer science  
**Specialisation:** Digital Signal Design, Image Processing

**Dr Muhammad Ai Khan**  
 PhD (NUST) Pakistan  
**Discipline:** Mechanical Engineering  
**Specialisation:** Manufacturing

**Dr Zafar Abbas Bangash**  
 PhD (URV) Spain  
**Discipline:** Mechanical Engineering  
**Specialisation:** Fluid structure interaction

**Dr Abdur Rehman Mazhar**  
 PhD (Coventry University) UK  
**Discipline:** Mechanical Engineering  
**Specialisation:** Thermofluids

**Dr Muhammad Rehan Khan**  
 PhD (UTP) Malaysia  
**Discipline:** Mechanical Engineering  
**Specialisation:** Erosion-Corrosion

**Dr Muhammad Nasir**  
 PhD (Universiti Malaya) Malaysia  
**Discipline:** Mechanical Engineering  
**Specialisation:** Materials and Manufacturing

**Dr Ahsan Shahzad**  
 PhD (Gwangju Institute of Science and Technology-GIST) South Korea  
**Discipline:** Electrical Engineering  
**Specialisation:** Embedded System Design, Field Programmable Gate Array, Information Security

**Dr Rizwan Masood**  
 PhD (Intitut Mines Télécom), France  
**Discipline:** Computer Science  
**Specialisation:** Information and Communication Science and Technology (ICT)

**Dr Ali Hassan**  
 PhD (University of Southampton) UK  
**Discipline:** Electrical engineering  
**Specialisation:** Machine Learning and Biomedical Signal Processing

**Dr Farhan Riaz**  
 PhD, (University of Porto) Portugal  
**Discipline:** Computer Engineering  
**Specialisation:** Digital Image Processing

**Dr Wasi Haider Butt**  
 PhD (National University of Sciences and Technology) Pakistan  
**Discipline:** Computer Software Engineering  
**Specialisation:** Database Engineering

**Dr Aimal Khan**

PhD (University of Rostock) Germany

**Discipline:** Communications Engineering**Specialisation:** Wireless Communications, Wireless Cooperative Relay Networks, Algorithms Design**Dr Muhammad Umar Farooq**

PhD (University Politehnica of Bucharest) Romania

**Discipline:** Computer Science**Specialisation:** Mobile Ad hoc Networks**Dr Farhan Hussain**

PhD (Hanyang University) South Korea

**Discipline:** Electronics & Computer Engineering**Specialisation:** Artificial Neural Networks, Machine Learning, Video Compression, NAND Flash Memory**Dr Sajid Gul Khawaja**

PhD (National University of Sciences and Technology) Pakistan

**Discipline:** Computer Engineering**Specialisation:** Digital Image Processing**Dr Urooj Fatima**

PhD (Norwegian University of Science and Technology - NTNU) Norway

**Discipline:** Telematics**Specialisation:** Systems Modelling and Analysis**Mr Jahan Zeb**

MS (National University of Sciences and Technology) Pakistan

**Discipline:** Computer Software Engineering**Specialisation:** Digital Image Processing**Ms Anum Abdul Salam**

MS (University of Engineering &amp; Technology) Pakistan

**Discipline:** Computer Engineering**Specialisation:** Signal and Image Processing

## Mechatronics Engineering

**Dr Amir Hamza , HoD**

PhD (King Fahad University of Petroleum and Minerals )

**Discipline:** Mechatronics Engineering**Specialisation:** Engineering Materials**Dr Umar Shahbaz Khan**

PhD (University of Liverpool) UK

**Discipline:** Mechatronics Engineering**Specialisation:** Embedded Systems/ Image Processing**Dr Mohisn Islam Tiwana**

Phd (University of New South Wales) Australia

**Discipline:** Mechatronics Engineering**Specialisation:** Bio Medical Engineering.**Dr Muhammad Mubasher Saleem**

PhD (Politecnico di Torino) Italy

**Discipline:** Mechanical Engineering**Specialisation:** Microelectromechanical Systems (MEMs)**Dr Waqar Shahid Qureshi**

PhD (Asia Institute of Technology) Thailand

**Discipline:** Mechatronics Engineering**Specialisation:** Machine Vision**Dr Nasir Rashid**

MS (NUST) Pakistan

**Discipline:** Mechatronics Engineering**Specialisation:** Robotics**Engr Kanwal Naveed**

MS (NUST), Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Control Systems**Engr Usman Asad**

MS (Rochester Institute of Technology), USA

**Discipline:** Mechanical Engineering**Specialisation:** Vibrational Analysis**Muhammad Qasim**

MSc (Quaid-i-Azam University) Pakistan

**Discipline:** Electronics**Specialisation:** Microcontroller based systems**Dr Hamid Jabbar**

Ph.D. Hanyang University, Seoul, South Korea

**Discipline:** Electrical Engineering**Specialisation:** Low-power energy harvesting, piezoelectric material applications**Dr Danish Hussain**

PhD (Harbin Institute of Technology) P.R China

**Discipline:** Mechatronics Engineering**Specialisation:** Mechatronics**Engr Ayesha Zeb**

MS (NUST) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Digital Signal Processing and Communication Systems**Engr. Muneeb Masood Raja**

MS (Wright State University), USA

On study Leave

**Discipline:** Electrical Engineering**Specialisation:** Control Systems**Dr Uzair Khaleeq Uz Zaman**

PhD (Ecole Nationale Supérieure d'Arts et Métiers de Paris) France

**Discipline:** Industrial Engineering**Specialisation:** Integrated Product Process Design**Dr Anas Bin Aqeel**

PhD (PhD (Peking University) China

**Discipline:** Solid Mechanics**Specialisation:** Advanced Materials and Structural Mechanics**Dr Kunwar Faraz**

PhD (University of Toronto) Canada

**Discipline:** Mechanical Engineering**Specialisation:** Mobile Robotics**Dr Tayyab Zafar**

PhD (University of Electronic Science and Technology) China



**Discipline:** Mechanical Engineering  
**Specialisation:** Reliability Based Design Optimization

**Engr. Adnan Shujah**

MS (NUST), Pakistan

**Discipline:** Mechatronics Engineering  
**Specialisation:** Robotics and Industrial Automation

**Engr. Sehrish Shahnawaz**

MS (NUST), Pakistan

**Discipline:** Mechanical Engineering  
**Specialisation:** Robotics, Kinematics

**Engr. Umar Aslam**

BE (Islamic International), Pakistan

**Discipline:** Electrical Engineering  
**Specialisation:** Power Electronics

**Engr. Arshia Arif**

MS (NUST), Pakistan

**Discipline:** Robotics and Intelligent Machine Learning  
**Specialisation:** Robotics and Intelligent Machine Learning

## Department of Engineering Management

**Dr Masood Raza**

PhD (Cranfield University) UK

**Discipline:** Engineering Management  
**Specialisation:** Operation Research Modeling & Simulation

**Dr Syed Tasweer Hussain Shah**

PhD (NUML) Pakistan

**Discipline:** Management  
**Specialisation:** Service Quality, Entrepreneurship, HR, Project Mgmt, Strategic Mgmt

**Dr Yasir Ahmad**

PhD (UET Taxila) Pakistan

**Discipline:** Engineering Management  
**Specialisation:** Engineering Management, Strategic Management and Technology Management

**Dr Syed Muhammad Ali**

PhD (Management Science & Business Administration), USTC China.

**Discipline:** Engineering Management  
**Specialisation:** Employees Behavior, Knowledge Management & HRM

**Engr Ali Salman**

MS (University of Surrey) UK

**Discipline:** Engineering Management  
**Specialisation:** Manufacturing Management

**Dr Afshan Naseem**

PhD (UET, Taxila) Pakistan

**Discipline:** Engineering Management  
**Specialisation:** Engg & Technology Management

**Dr Muhammad Zeeshan Mirza**

PhD University Technology PETRONAS, Malaysia

**Discipline:** Management Sciences  
**Specialisation:** Leadership, Human Resource Management, OHS, Org Context

**Dr Mehran Ullah**

PhD Hanyang University, South Korea

**Discipline:** Industrial Management Engineering  
**Specialisation:** Sustainability, Supply chain management, Optimization, Circular Economies

## Basic Sciences & Humanities

**Dr Noreen Sher Akbar HoD**

PhD (Quaid-i-Azam University), Pakistan

**Discipline:** Mathematics  
**Specialisation:** Fluid Dynamics

**Dr Asim Aziz**

PhD (Glasgow Caledonian University), UK

**Discipline:** Mathematics  
**Specialisation:** Mathematical Biology

**Dr Yasir Ali**

PhD (NUST), Pakistan

**Discipline:** Mathematics  
**Specialisation:** Optimization Theory

**Dr Hina Sadaf**

PhD (Quaid-i-Azam University), Pakistan

**Discipline:** Mathematics  
**Specialisation:** Applied Mathematics

**Dr Tayyab Hussain Shah**

PhD (Quaid-i-Azam University), Pakistan

**Discipline:** Mathematics  
**Specialisation:** Fluid Mechanics

**Dr Muhammad Umar Farooq**

PhD (NUST), Pakistan

**Discipline:** Mathematics  
**Specialisation:** Symmetry Methods , General Relativity

**Mr Syed Hussain Shah**

MPhil (NUST University), Pakistan

**Discipline:** Physics  
**Specialisation:** Solar Thermal Applications

**Dr Safia Taj**

PhD (NUST), Pakistan

**Discipline:** Mathematics  
**Specialisation:** Black Hole Thermodynamics

**Ms Samreen Sheriff**

MPhil (NUST University), Pakistan

**Discipline:** Mathematics**Specialisation:** Fluid Dynamics**Dr Faizullah**

PhD (Ocean University), China

**Discipline:** Mathematics**Specialisation:** Stochastic Differential Equations, Stochastic Analysis, Non-linear Ordinary Differential Equations**Ms Rukaiza Khan**

MPhil (Air University), Pakistan

**Discipline:** English**Specialisation:** Linguistics**Ms Pakeeza Tabassum**

MPhil (International Islamic University), Pakistan

**Discipline:** Islamic Studies**Specialisation:** Comparative Religions, Sharia Law**Ms Sabeen Malik**

MPhil (Quaid-i-Azam University), Pakistan

**Discipline:** Electronics**Specialisation:** Electronics**Ms Aaminah Hassan**

MPhil (Bahauddin Zakariya University) Pakistan

**Discipline:** English Linguistics and Literature**Specialisation:** English Linguistics and Literature**Lec. Zara Rizwan**

MPhil (Air University), Pakistan

**Discipline:** English**Specialisation:** Linguistics & Literature

# Student Support Facilities

## Laboratories

### Department of Electrical Engineering

#### Teaching Labs

- » Electronics Lab
- » Embedded Systems Lab
- » Control & Communication Systems Lab
- » Electrical Machines Lab
- » Antenna and Microwave Lab
- » Power Systems Lab
- » Instrumentation Lab

#### Research Labs

- » Microwave Engineering Research Lab
- » Agriculture Robotics Lab, MEMS Design Lab
- » Postgraduate Research Lab

### Department of Mechanical Engineering

#### Teaching Labs

- » Fluid Mechanics Laboratory (I & II)
- » Strength of Materials Laboratory
- » Dynamics & Controls Laboratory
- » Heat Transfer Laboratory
- » Steam Laboratory
- » Automotive Laboratory (ETL)
- » Vibrations & Instrumentation Laboratory
- » Computer Aided Engineering (CAE) Laboratory (I & II)
- » Drawing Hall (I & II)
- » Engineering Workshops
  - » Wood Working Shop
  - » Foundry Shop
  - » Tin copper smith shop
  - » Machine Shop
  - » Fitter Shop
  - » Welding Shop
  - » Project Lab

#### Research Labs

- » Advance Manufacturing Laboratory
- » High Performance Computing Center

### Department of Computer & Software Engineering

#### Teaching Labs

- » Embedded System Laboratory
- » Computer Networks Laboratory
- » Computing Laboratory
- » DSP/DSD Laboratory
- » Image Processing Laboratory
- » Electronics Laboratory

#### Research Labs

- » BIOMedical Image and Signal Analysis (BIOMISA) Lab
- » Project Laboratory

### Department of Mechatronics Engineering

#### Teaching Labs

- » Industrial Automation Laboratory
- » Robotics and Control Laboratory
- » Circuit Design Laboratory
- » Machine Vision and Embedded Systems Laboratory
- » CAD Laboratory
- » Electronics Lab
- » Instrumentation and Sensing Lab

- » Computer Lab

#### Research Labs

- » Robot Maker lab (RML)
- » Robot Design and Development Lab (RDDL)
- » Micro and Nano Research Lab

#### Industrial Collaboration Labs

- » FAIZ Programmable Logic Controller (PLC) Laboratory

### Department of Engineering Management

- » Decision Support System Laboratory

## Library

The computerized College library has a collection of 80,000 printed and digital books. It provides a range of services that include loans, online information searching, reference services, inter-library loan, document delivery, photocopying, access to virtual collection & digital resources and CD-ROM's. The College library is fully wired to the internet through high-speed DSL and Wi-Fi networks.

## Cafeterias

Inexpensive hygienic food is available in cafes. The food quality is closely monitored by the campus doctor. Besides, utility shops have been set up on the campus to fulfill students' day-to-day needs.

## Accommodation

Hostel / accommodation facilities are available for both male and female NUST Cadets as well as Paying Cadets. Well-furnished rooms are available on "First Come, First Serve" basis. Detailed procedure for applying for hostel accommodation at College of E&ME and other rules and regulations can be seen at <http://www.nust.edu.pk/INSTITUTIONS/Colleges/CEME/Campus-Life/Pages/CEME-Hostel-information.aspx>

## Alumni Directory

An updated database of alumni is maintained by the general body. Calls are made regularly to the alumni members to send their updated data to the association. The information gathered during reunion registration is also used to append/update the database.

## Wireless Network

Wireless LAN Facility is being provided to the students in various hostels using 802.11b technology operating at 11 Mbps. College is obtaining a total bandwidth of 7 Mbps (4 MB CIR from M/S Skynet (Pvt) Ltd) and additional 3 Mbps (Shared) through PERN project. This bandwidth is also available to the students through Wi-Fi network. Wireless LAN facility is available at the entire premises of the College.

## Sports Facility

The campus also facilitates different games and sports. Regular tournaments are held within the campus to encourage extra-curricular activities for the students. College has been actively participating in various Inter NUST Sports Competitions and representing NUST in Inter-University and Zonal Championships. The College provides following sports facilities:-

### Outdoor

- » Cricket.
- » Football
- » Hockey.
- » Basketball
- » Lawn Tennis
- » Volleyball
- » Handball
- » Baseball
- » Firing
- » Riding Club
- » Roller Skating
- » Archery
- » Athletics

### Indoor

**Sports Complex.** A state-of-the-art Sports Complex is established inside the campus which provides almost all indoor sports facilities including

- » Badminton.
- » Basketball
- » Volleyball
- » Table Tennis
- » Swimming Pool
- » Billiard
- » Snooker
- » Hand Ball
- » Judo
- » Squash
- » Gymnasium (Ladies and Gents)

### Tennis Courts

College has three tennis courts of international standard. One hard and two clay courts are provided for youth events as well as inter-company competitions.

### Basketball Courts

A cemented basketball court is established inside college sports complex

### Gymnasium

Three state of the art and well equipped fitness centers / gymnasiums have been established in the sports complex, two for male and one for female students.

### Stadium

The College has a beautiful stadium of international standards.

### Athletics Ground

The College has a beautiful athletics ground of international standards.

## Events

The College of E&ME regularly holds educational events on its campus to stimulate the minds of its students. Some events have been briefly mentioned below:

### National Engineering Robotics Contest

The idea of National Engineering Robotics Contest (NERC) was initiated in the department of Mechatronics. The aim of this contest is to provide a platform to the engineering students and their teachers/ supervisors from all over Pakistan to participate in a contest of a multi-disciplinary field of Robotics with a view to expand the knowledge of this field and its applications in Pakistan. The theme of the competition is to build an Autonomous Mobile Robot, which should be able to move in

a specified arena and complete some specified and predefined task. The task is uploaded on the NERC website one year prior to the next year's competition. This competition was started back in the year 2003. The Contest has now become one of the mega events in the annual calendar of the NUST College of EME. It is well on its way to expand beyond the geographical boundaries to become an international contest.

### International Conference on Robotics and Automation in Industry (ICRAI)

The National Centre of Robotics and Automation (NCRA), Department of Mechatronics Engineering hosts an International Conference on Robotics and Automation in Industry. The third conference of this series was held under IEEE platform on 22<sup>nd</sup> October 2019 with the fourth expected on 26<sup>th</sup> October 2021. Within this conference, international keynote speakers gave enlightened talks on latest trends of robotics and automation in industry. The conference attracted various high quality local and international articles with an acceptance ratio of 30%. The international keynote speakers appreciated the quality of work presented in the conference and, praised the research and development of Mechatronics Engineering Department.



### Open House

Annual Event of Open House & Job Fair is organized by department of Electrical Engineering at College E & ME. The objective of this event is to provide an opportunity to both, potential employers and the graduating students of the College, to come closer and share their mutual interests and strengthen the already existing links with the Industry. Students exhibit Final Year Projects in the areas of Electrical, Mechanical, Computer and Mechatronics Engineering, focusing on practical solutions of engineering problems during. Various delegates from prestigious companies participate in this event to conduct interviews and Entry tests.

### Computer Project Exhibition & Competition (COMPPEC)

COMPPEC is a National level, annual Computer Project Exhibition and Competition which the Department of Computer and Software Engineering at NUST College of E&ME has been hosting for eighteen years, since 2002. It is one of the most prestigious computers and technological event held in Pakistan that provides a platform for head to head competition of

the brilliant brains from all over the Country. COMPPEC is a great source of inspiration for the students, providing them with an opportunity to demonstrate their talents through their projects, giving them a chance to exhibit their talent in the field of programming, software applications and hardware design. COMPPEC provides a platform that facilitates the exchange of the state-of-the-art technologies, innovative ideas, new trends, technical skills and modern programming tools in the field of engineering sciences and information technology.

### Seminars/Workshops

To introduce new advances in research and innovation to the Industry and Academia, the college conducts various seminars/workshops on the wide ranging topics.

## Alumni Reunion

EME Alumni reunion is an annual event arranged for the graduate of this College. This is an event that brings the graduates of this college starting from the youngest most graduates to the oldest ones together on a same forum to share their memories and relive the golden times spent in the corridors and lawns. It is an event that brings a lot of joy and memories to the graduates and family members.

## Olympiad

NUST EME Olympiad is organized by three foremost professional societies, the IEEE Student Chapter, Sports and Adventure Society (SAS) and Society for Promotion of Arts and Literature (SPAL) to promote the cause of charity. Students from different National-wide Universities, Colleges and Schools participate and contribute to the appeal of charity for flood affected people of Pakistan.

## Contacts

### Website

[www.ceme.nust.edu.pk](http://www.ceme.nust.edu.pk)

### Inauguration of NCRA National Centre of Robotics and Automation

#### About NCRA

NCRA is a consortium of 11 labs hosted at 13 universities spread across Pakistan with its secretariat at College of E&ME NUST. The Centre was established in 2018 with the vision of fast pacing the technological advancements in the fields of Robotics and Automation in Pakistan. The Centre is a PSDP funded project working under the guidance of Higher Education Commission of Pakistan. The Technical guidance is being provided by the Scientific and Industrial Advisory Board which consists of leading International experts in Robotics and Automation. The secretariat of the centre is established



at NUST College of E&ME, Dr. Umar Shahbaz Khan is the project director of the centre. Details and brief description of NCRA affiliated labs are as follows:

- **Robot maker lab:** This is a shared facility with state of the art prototyping facility. This facility is established at NUST college of E&ME. This maker space provides prototype development facility to all the other labs of the centre. The Robot Maker lab has state of the art fabrication setup in both electrical and mechanical domains.
- **Human Cantered Robotics Lab:** This is a joint lab established at UET Lahore and UCP Lahore. This lab will be working in the domain of collaborative robotics, Exoskeleton systems, Prosthesis and active orthoses for the disabled.
- **Industrial Monitoring and Automation Lab:** This lab is established at ITU Lahore. This lab is working in the domains of industrial energy monitoring and control systems, industrial health monitoring and performance prediction and motor characterization and improvement facility. The lab is working in collaboration with WASA and has delivered notable projects such as control of Tube wells in Lahore and smart cones to detect water level.
- **MEMs Sensor Design and Testing Lab:** This is established at Air University Islamabad. The lab is working towards Micro Electro Mechanical Systems (MEMs). The key domains include development of MEMs physical sensors, development of micro-robotic manipulators and open source cell libraries and development of RF-MEMs devices and energy harvesters. The lab has a state of the art MEMs testing machine which can be availed by various researchers and organizations to test their MEMs devices.
- **Agricultural Robotics Lab:** This lab is established at LUMS Lahore. The lab is doing research and development towards achieving high water efficiency, reliable crop monitoring and low environmental footprints.
- **UAV Dependability Lab:** This lab is established at FAST NUCES. The lab is working towards UAV Software-in-the-loop testing, UAV Hardware-in-the-loop testing, civil adaption of developed technologies.
- **Swarm Robotics Lab:** This lab is established at UET Taxila. The lab is doing research and development on swarm intelligence, Artificial Intelligence based computer vision, decentralised communications.
- **Robot Design and Development Lab:** This lab is established at NUST College of E&ME. This lab will be working in the domain of prosthesis, unmanned ground vehicles and agricultural robotics. The lab has delivered notable projects such as OBD compliant defender test bench to Pakistan Army, football panel counting machine to Leatherware Pvt Ltd Sialkot.
- **Haptics, Human-robotics and Condition monitoring Lab:** This lab is a joint lab established at NEDUET Karachi and MUET Jamshoro. The lab is working in the domain of haptics teleoperation systems for disaster management, design and development

of haptic education/assistive robots, condition monitoring of Railway/Road Infrastructure.

- **Control Automotive and Robotics Lab:** This is a joint lab established at BUITEM and MUST. The lab objectives include Search and Rescue, Social mobile autonomous robot and autonomous vehicles.
- **Advanced Robotics and Automation Lab:** This lab is established at UET Peshawar. This lab is working in the domain of prosthesis (lower limb), Agriculture machinery and robotics.



**Major Events organized by the Centre are:**

### IEEE International Conference on Robotics and Automation in Industry (ICRAI)

NCRA organizes an international conference every year under the title of IEEE International Conference on Robotics and Automation in Industry (ICRAI). This conference is one of the leading international forums in Pakistan for researchers in Robotics and Automation to present their work. Previously ICRAI conference was held in the year 2012, 2016 and 2019. The fourth ICRAI 2021 will be held on 26th and 27th October 2021 at NUST College of Electrical and Mechanical Engineering (CEME), Rawalpindi.

### Research Fund

NCRA has conducted a funding opportunity for various research activities in the field of Robotics and automation. The aim of this opportunity is to foster the transition from Research and Technology into business. 40 applicants applied for the funding opportunity out of which, 9 proposals have been selected after rigorous 3 Staged review. The maximum funding amount for each proposal is PKR 15 million with a duration of 1.5 years.

### NCRA Participation in National Drone Policy (Event)

NCRA's researchers possess vast experience in drone technology through the development of the indigenous solutions catering Pakistani needs. Due to this expertise, they have identified the problems and areas of improvement around the drone technology in Pakistan. To cater these problems Ministry of Science and Technology formulated a committee of experts to propose solutions and to draft a National Drone Policy that can become a guideline for use of drones in Pakistan. Experts from NCRA played a vital role in this committee and developed the National Drone Policy which was presented to the Prime Minister on December 21st 2020. This policy has also led to formation of Civil Drone Regulatory Authority (CDRA), which will operate under the Ministry of Aviation.



### Robotics and Automation Startup Challenge (Event)

NCRA has launched its annual Robotics and Automation Startup Challenge to support the students and young researchers working hard to convert their ideas in business feasible products. The challenge encourages product development for solving problems of industry and society using Robotics and Automation as a tool. NCRA floated a call for concept notes and a total of 58 young startups applied for the challenge. A team of experts shortlisted 29 ideas based on their relevance to Robotics and Automation and idea maturity. One Winner in each theme was awarded PKR 300,000 in January 2021 on basis of problem identification, proposing solution and business feasibility.

Considering the objectives of the centre, i.e., solving issues of local communities and promoting 4IR standard in the industry, the challenge had two main theme areas:

- Indigenous Product Development for Solving Societal/Industrial Problems using Robotics & Automation
- Indigenous Product Development to Provide Automation Solution to any Local Industry in line with Industry 3.0 – 4.0
- In the theme of "Indigenous Product Development for Solving Societal/Industrial Problems using Robotics & Automation" Greenovation - An automated system for Recycling Plastic



into LPG won the prize. The startup proposed a complete cycle from collection of waste to its conversion into LPG and later on sale of produce for domestic and industrial use. With NCRA funding, the startup will be able to setup a model facility for recycling in KPK.

- In the second theme i.e., “Indigenous Product Development to Provide Automation Solution to any Local Industry in line with Industry 3.0 – 4.0” startup named Smart Industrial Hopper for Pigment Filling Applications won the award. The founders have developed a pigment dispenser which has wide range of applications in industries where pigments are used. The founders have already established links with sports, leather and surgical industry in Sialkot. The founders will utilize NCRA funding towards development of improved variant of the hopper for specific industrial needs. NCRA will conduct the Robotics and Automation startup challenge every year with themes that are most relevant to Pakistani needs.

### NCRA Relief Related Activities (Event)

When the COVID-19 hit the country, the researchers at NCRA retrofitted their existing equipment to develop the decontamination devices and other supporting gears for medical staff and public. The highlights of NCRA devices include 2 Ventilators, Decontamination Unmanned Ground Vehicle (UGV) and Spraying Drone. In 2020, Pakistan faced a strong attack from locust swarms. NCRA team was the first one to respond from technological front. NCRA dedicated its drones for spraying locusts eradicating insecticide. NCRA Robot Design and Development Lab also facilitated a donation of five agriculture drones to NDMA, the drones will be used by the National Locust Control Cell and Department of Plant Protection for locust control and agricultural spraying applications.



Position	Contact Info
Commandant	051-9247540
Dean	051-9247547
Head Department of Electrical Engineering	051-9247539
Head Department of Mechanical Engineering	051-9247546
Head Department of Computer & Software Engineering	051-2229564
Head Department of Mechatronics Engineering	051-9247544
Head Department of Engineering Management	051-9247542
Head Department of Basic Sciences and Humanities	051-9247541

#### Helpline

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# Academic Programmes

## Bachelors in Electrical Engineering

Department of Electrical Engineering is committed to provide high quality engineering education in Pakistan, second to none. The Department offers postgraduate and undergraduate programmes in electrical engineering. The undergraduate programme of the department is well reputed, organized and is built on the standard that enables our graduates to fulfill the national needs. On the other hand, the postgraduate programme of our department strengthens the research requirements of the country by offering blend of control, communication, microwave and electronics streams at master and PhD level. Various commercial valued national projects are being completed by this department in collaboration with commercial and defense organizations.

### Associated Careers

Electrical engineering graduates are in demand in a number of industries such as communication (including broadcast communications, mobile communications), integrated circuit design, instrumentation, bio-medical engineering, avionics, consumer electronics and computer networking, to name a few. Graduates can also pursue research, as MS & PhD students, or join industrial laboratories.

### Scheme of Studies

Programme Code: W 603

#### Semester-I

#### Semester-II

Course Code	Course Title	Credits	Course Code	Course Title	Credits
HU-100	English	2-0	HU-107	Pakistan Studies	2-0
CS-114	Fundamentals of Programming	2-1	MATH-121	Linear Algebra and ODEs	3-0
HU-101	Islamic Studies	2-0	ME-109	Engineering Drawing	0-2
MATH-101	Calculus and Analytical Geometry	3-0	HU-109	Communication Skills	2-0
ME-105	Workshop Practice	0-1	*ME-100	Engineering Mechanics	3-0
PHY-102	Applied Physics	2-1	*EE-211	Electrical Network Analysis	3-1
*EE-111	Linear Circuit Analysis	3-1			
	<b>Total</b>	<b>14-4</b>		<b>Total</b>	<b>13-3</b>

#### Semester-III

#### Semester-IV

Course Code	Course Title	Credits	Course Code	Course Title	Credits
*CS-212	Object Oriented Programming (OOP)	3-1	EE-215	Electronic Devices and Circuits	3-1
ME-102	Thermodynamics	2-0	EE-241	Electromagnetic Field Theory	3-0
EE-221	Digital Logic Design		EE-222	Microprocessor Systems	3-1
HU-212	Technical & Business Writing	2-0	MATH-232	Complex Variable and Transforms	3-0
MATH-243	Vector Calculus	3-0	ECO-130	Engineering Economics	2-0
	<b>Total</b>	<b>13-2</b>		<b>Total</b>	<b>14-2</b>

Note: Transfer students will take one additional course EE-111 Linear Circuit Analysis (3-1) in 3<sup>rd</sup> Semester

Note: Transfer students will take one additional course (EE-211 Electrical Network Analysis (3-1) or ME-100 Engineering Mechanics (3-0)) in 4th Semester. 1x left over will be taken in next Summer.

#### Semester – V

#### Semester – VI

Course Code	Course Title	Credits	Course Code	Course Title	Credits
EE-383	Instrumentation and Measurements	3-1	EE-351	Communication Systems	3-1
EE-260	Electrical Machines	3-1	EE-371	Linear Control Systems	3-1
EE-313	Electronic Circuit Design	3-1	EE-330	Digital Signal Processing	3-1
EE-232	Signals and Systems	3-1	MATH-351	Numerical Methods	3-0
MATH-361	Probability & Statistics	3-0	EC/EE- XXX	Elective-I	3-X
	<b>Total</b>	<b>15-4</b>		<b>Total CHs</b>	<b>15-(3+X)</b>



## Semester – V II

## Semester – VIII

Course Code	Course Title	Credits	Course Code	Course Title	Credits
OTM-455	Engineering Project Management	2-0	HU-222	Professional Ethics	2-0
EE-498	Senior Design Project-I	0-2	MGT-271	Entrepreneurship	2-0
EC/EE-XXX	Elective-II (Tfr from sem VI)	3-X	XX-XXX	University Elective	3-X
EC/EE-XXX	Elective-III	3-X	EC/EE-XXX	Elective-V	3-X
EC/EE-XXX	Elective-IV	3-X	EE-499	Senior Design Project-II	0-4
	<b>Total</b>	<b>11-(2+X)</b>		<b>Total CHs</b>	<b>105+24+X (129+X)</b>

## Electives

Course Code	Course Title	Credits	Course Code	Course Title	Credits
EE317	Integrated Circuits	3-0	EE362	Power Generation	3-0
EE318	Solid State Electronics	3-0	EE368	Power Electronics	3-1
EE421	Digital System Design	3-1	EE461	Power System Analysis and Design	3-0
EE352	Communication Systems II	3-1	EE333	Digital Image Processing	3-0
EE491	Radar Systems	3-1	EE-365	Renewable Energy Systems	3-0
EE342	Microwave Engineering	3-1	EE-365	Machine Learning	3-0
EE344	Wave Propagation and Antennas	3-1	EC413	Computer Vision	3-0
EE441	Microwave ICs Design	3-0	EE472	Industrial Control and Automation	3-0
EE418	Electro Optics & Infra-Red Systems	3-0			



## MS/PhD in Electrical Engineering (Evening)

The Department of Electrical Engineering offers programmes leading to the Master of Science and Doctor of Philosophy degrees. Graduate study in the department is organized into following streams:

- » Control Systems
- » AI & Autonomous System
- » Signal Processing
- » Communication Systems
- » Power Systems
- » Solid State Electronics & Circuits
- » RF & Microwave

### MS Electrical Engineering Degree Requirements:

The student must complete a total of 30 credits and meet the requirements specified below:

- » MS students are required to take at least 3 core courses (9 Cr Hrs) out of the pool of core courses. Selection of core courses will be based on their relevance to the stream the student has been admitted to, and will be subject to prior approval of concerned Head of Department.
- » In addition to the core courses an MS Student must complete a minimum of 3 courses (9 Cr Hrs) from the list of approved EE courses, of the approved streams.
- » Furthermore, a Student will be allowed to take a maximum of 2 courses (6 Cr Hrs) from all the approved courses of other engineering and basic sciences disciplines of NUST Schools / Institutes / Colleges with prior approval of HOD.
- » However a student may, in addition to completing 6 courses(18 Cr Hrs), to fulfill the requirements specified in para (a) and (b) above, and in lieu of courses defined in para (c) above, may choose to complete the remaining 2 courses (6 Cr Hrs), by studying approved EE courses from any of the streams.

### Scheme of Studies

Programme Code: W 703/W803

Course Code	Course Title	Credits
EE 849	Electromagnetic Field Analysis	3
EE 847	Microwave Networks and Passive Components	3
EE CE 831 866	Advanced Digital Signal Processing	3
EE 891	Stochastic Systems	3
EE 851	Advanced Digital Communication Systems	3
EE 852	Information and Coding Theory	3
EE 871	Linear Control Systems	3
EE 801	Semiconductor Device Physics	3
EE 802	Quantum Mechanics	3
EE 803	Physical Electronics	3
EE CE 823 825	Advanced Digital System Design	3
EE 826	Advanced VLSI Design	3
EE 863	Power Systems Analysis	3
EE 862	Power System Operation and Control OR Power System Operations, Control and Optimization	3
EEE 801	Clean Energy Generation, Integration and Storage	3
EEE 802	Advanced Power System Stability and Transient Studies	3
EE 877	Mobile Robotics	3
SE 807	Machine Learning	3

### Electives

### Solid State Electronics and Circuits

Course Code	Course Title	Credits
EE 804	Photonic Devices	3
EE 805	Semiconductor Processing	3
EE 806	Thin Film Processing	3
EE 807	Thin Film Characterization	3
EE 808	Digital Integrated Circuit Design	3
EE 809	Analog Integrated Circuit Design	3
EE 900	Optoelectronic Devices & Materials	3
EE 901	Power Electronics & Electric Drives	3
EE 902	Nano-Electronics	3
EE 903	Advanced Semiconductor Device Theory	3
EE 904	Microchip Fabrication Technology	3
EE 905	Advanced Power Electronics	3
EE 906	Solid State Electronics	3
EE 907	Micro & Nano Fabrication	3
EE 908	Ultra High Speed Nanoelectronic Devices	3
EE 909	Selected Topics in Electronics	3
EE 898	Nanotechnology	3
EE 818	Micro-Electro-Mechanical Systems	3
EE 893	Data Acquisition & Mixed Signal Design	3

### Signal Processing

EE 832	Pattern Recognition	3
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EE	833	DSP Hardware System Design	3
EE	834	Applied Signal Processing	3
EE	835	Multirate Systems & Filter Banks	3
EE	836	Advanced Digital Image Processing	3
EE	837	Advanced Topics in Computer Vision & Image Processing	3
EE	838	Filtering & Tracking	3
EE	839	Adaptive Filters	3
EE	930	Spatial Array Processing	3
EE	931	DSP Software System Design	3
EE	932	Speech Processing	3
EE	933	Time Frequency Analysis	3
EE	939	Selected Topics in Signal Processing	3
CS	867	Computer Vision	3
CE	803		

## RF & Microwave

EE	840	RF MEMS: Theory and Applications	3
EE	841	Electromagnetic Theory	3
EE	842	Microwave Communication System Design	3
EE	843	Microwave Transmission Lines & Waveguides	3
EE	844	Antennas & Wave Propagation	3
EE	845	EMC/EMI	3
EE	846	Microwave Photonics	3
EE	848	Radiating Systems & Antennas	3
EE	940	Advanced RF Measurements	3
EE	941	RF Transceiver Design	3
EE	942	Microwave Integrated Circuit Design	3
EE	943	Microwave Devices I	3
EE	944	Microwave Devices II	3
EE	945	Computational Electromagnetics	3
EE	946	Advanced Antenna Theory and Design	3
EE	947	Microwave Devices & Systems	3
EE	948	Advance Electromagnetic Fields	3
EE	949	Selected Topics in Microwave Engineering	3
EE	896	Electrodynamics of Plasmas	3
EE	895	Analysis of Measurement Environment	3

## Communication Systems

EE	853	Advanced Wireless Communication	3
EE	854	Optical Communication Systems	3
EE	855	Error Control Coding	3
EE	856	Software Defined Radio	3

EE	857	Advanced Satellite Communication Systems	3
EE	858	Communication Project Management	3
EE	859	Performance Analysis of Communication Networks	3
EE	950	Advanced Data Communication Systems	3
EE	951	Radar Systems	3
EE	959	Selected Topics in Communication Systems	3
EE	897	Detection & Estimation	3
CSE	812	RF Communication System Design	3
EE	881	Advanced Communication Networks	3
EE	882	Cognitive Radio Networks	3
EE	883	Wireless Sensor & Mesh Networks	3
EE	884	Photonic Networks	3
EE	885	Broadband Networks	3
EE	886	Advanced Wireless Networks	3
EE	887	Network Switching & Routing	3
EE	888	Advanced Computer Network Design & System Security	3
EE	889	Network and Service Management and Control	3
EE	989	Selected Topics in Networks	3
CSE	820	Advanced Computer Networks	3
CSE	879	Network Performance Analysis	3

## Control Systems

EE	872	Optimal Control	3
EE	873	Fuzzy Control	3
EE	874	Adaptive Control	3
EE	875	Discrete Time Control Systems	3
EE	876	Probabilistic Robotics	3
EE	877	Mobile Robotics	3
EE	878	System Identification	3
EE	879	Robust Control	3
EE	970	Advanced Robotics	3
EE	971	Modeling & Simulation of Dynamic Systems	3
EE	972	Advanced Digital Control Systems	3
EE	973	Control System Optimization	3
EE	974	Networked & Embedded Control Systems	3
EE	975	Robust & Multivariable Control	3
EE	976	Optimal & Multivariable Control	3
EE	977	Nonlinear Control Systems	3
EE	979	Selected Topics in Control Systems	3

EE	894	Cognitive Robotics	3
EE	892	Instrumentation & Systems	3
EM	800	Robotics - 1	3
EM	805	Robotics - 2	3
MTS	800	Advanced Robotics I	3
MTS	801	Advanced Robotics II	3
MTS	840	Data Acquisition and Control	3
ME	837	Nonlinear Dynamics	3

### AI & Autonomous Systems

EE	836	Advanced Digital Image Processing	3
EE	876	Probabilistic Robotics	3
EE	837	Advanced Topics in Computer Vision & Image Processing	3
EE	897	Detection & Estimation	3
EE	970	Advanced Robotics	3
EE	839	Adaptive Filters	3
EE	832	Pattern Recognition	3
EE	871	Linear Control Systems	3
EE	821	Advanced Embedded System Design	3
EE	878	System Identification	3
SE	801	Artificial Neural Networks	3
CS	867	Computer Vision	3
SYSE-	804	Modeling, Simulation & Optimization	3
MATH	816	Applied Linear Algebra	3

### Power Stream

EEE	811	Electric Power Quality	3
EEE	812	Advanced Power System Protection	3
EEE	813	Computer Modeling of Electrical Power Systems	3
EEE	814	Advanced Power Electronics	3
EEE	815	Electric Power Generation Transmission and Distribution	3
EEE	816	Electric Power Markets	3
EEE	817	High Voltage Engineering	3
EE	861	Alternating Current Electrical Machines and Drives	3
ESE	803	Photovoltaic Devices	3
ESE	813	Energy Economics and Policy	3
ESE	814	Fuel Cells	3
ESE	817	Wind Energy	3
ESE	820	Energy and Environment	3
ESE	824	Nuclear Energy Engineering	3

#### Note:

1. Offering of Elective Courses in all the specialisation streams is subject to the availability of faculty and class strength.
2. PhD students will complete additional requirement of 800/900 level coursework (18 credit hours) other than the courses studied during their Masters Programme as recommended by the doctoral Guidance and Examination Committee. They would also carryout original and independent research work to produce PhD thesis (EE-999 PhD Thesis) which is a mandatory requirement for award of PhD degree.

# Department of Mechanical Engineering

The Department faculty possesses an impressive competence in their respective areas of specialty through their academic and industrial experiences. All faculty members in the Department are committed to the development and teaching of the programme in additions to maintaining continuity and academic standards.

The Department is actively engaged in research in the areas of Thermofluids and Manufacturing Engineering Systems. Manufacturing Research Group is committed to advanced industrial capability in a globally competitive marketplace by control of manufacturing processes, precision manufacturing, nano/micromolding, rapid prototyping and manufacturing. The research activities of the Thermofluids Research Group cover application areas such as Thermodynamics, Fluid Mechanics, CFD, Turbo-machinery, Micro-fluidics, Refrigeration and Air Conditioning, and Environmental Fluid Mechanics with a strong emphasis on computational modeling.

## Bachelors in Mechanical Engineering

The Programme is designed to inculcate a comprehensive understanding of theory and practice related to structural mechanics, thermofluids, and manufacturing. It is a unique blend of engineering sciences with well-balanced laboratory work, design project and manufacturing processes with extensive usage of computers and latest software packages.

### Scheme of Studies

Programme Code: W 604

#### Semester-I

Course Code	Course Title	Credits	Course Code	Course Title	Credits
MATH-101	Calculus & Analytical Geometry	3-0	MATH-121	Linear Algebra & ODEs	3-0
HU-100	English	2-0	ME-221	Engineering Materials	3-0
HU-107	Pakistan Studies	2-0	ME-113	Engineering Mechanics-I: Statics	3-0
CH-109	Applied Chemistry	2-0	HU-101	Islamic Studies	2-0
PHY-102	Applied Physics	2-1	HU-109	Communication Skills	2-0
CS-114	Fundamentals of Programming	2-1	ME-109	Engineering Drawing	0-2
ME-105	Workshop Practice	0-1			
<b>Total</b>		<b>13-3=16</b>	<b>Total</b>		<b>13-2=15</b>

#### Semester-II

#### Semester-III

Course Code	Course Title	Credits	Course Code	Course Title	Credits
MATH-232	Complex Variables and Transforms	3-0	MATH-351	Numerical Methods	3-0
ME-230	Fluid Mechanics-I	3-0	ME-210	Mechanics of Materials-I	3-0
ME-130	Thermodynamics-I	3-0	ME-330	Fluid Mechanics-II	3-0
ME-114	Engineering Mechanics-II: Dynamics	3-0	ME-231	Thermodynamics-II	3-0
EE-103	Electrical Engineering	2-1	EE-227	Electronics Engineering	2-1
ME-223	Advanced Workshop Practice	1-1	HU-212	Technical and Business Writing	2-0
ME-211	Computer Aided Drawing	0-1	ME-337	Fluid Mechanics Lab	0-1
ME-115	Engineering Mechanics Lab	0-1	ME-232	Thermodynamics Lab	0-1
<b>Total</b>		<b>15-4=19</b>	<b>Total</b>		<b>16-3=19</b>

#### Semester-IV

#### Semester-V

Course Code	Course Title	Credits	Course Code	Course Title	Credits
ME-218	Machine Design-I	3-0	ME-310	Mechanics of Machines	3-0
ME-212	Mechanics of Materials-II	3-0	ME-327	Instrumentation and Measurement	2-1
ME-331	Heat & Mass Transfer	3-0	ME-320	Machine Design-II	2-0
ME-322	Manufacturing Processes	3-1	MATH-361	Probability & Statistics	3-0
ME-325	Engineering Economics	2-0	XXX-	Technical Elective-1	2-0
ME-216	Mechanics of Materials Lab	0-1	ME-326	Heating, Ventilating and Air Conditioning	3-0
ME-339	Control Engineering	2-1	ME-332	Heat Transfer and HVAC Lab	0-1

#### Semester-VI

			CSL-401			Community Service Learning			0-2*		
<b>Total</b>			<b>16-3=19</b>			<b>Total</b>			<b>15-2=17+2*</b>		
<b>Semester-VII</b>						<b>Semester-VIII</b>					
Course Code	Course Title	Credits	Course Code	Course Title	Credits	Course Code	Course Title	Credits	Course Code	Course Title	Credits
MGT-271	Entrepreneurship	2-0	HU-222	Professional Ethics	2-0						
ME-411	Introduction to Finite Element Analysis	2-1	ME-420	Project Management (Management Elective)	2-0						
ME-421	Mechanical Vibrations	3-0	ME-424	Health, Safety and Environment	1-0						
ME-433	Mechanisms and Mechanical Vibrations Lab	0-1	XXX	Technical Elective-3	2-0						
XXX	Technical Elective-2	2-0	ME-439	Internal Combustion Engines	3-0						
ME-430	Power Plants	3-0	ME-431	IC Engines & Power Plants Lab	0-1						
ME-499	Final Year Project-1	0-3	ME-498	Internship (Pass/Fail basis)	-						
<b>Total</b>		<b>12-5=17</b>	ME-499	Final Year Project-II	0-3						
						<b>Total</b>			<b>10-4=14</b>		
						<b>Grand Total</b>			<b>136-2*</b>		

## Electives

Course Code	Course Title	Credits	Course Code	Course Title	Credits
ME-401	Fundamentals of Aerodynamics	2-0	ME-466	Ship Propulsion Engineering	2-0
ME-408	Applied Heat Transfer	2-0	ME-488	Renewable Energy Technologies	2-0
ME-409	Applied Thermodynamics	2-0	ME-489	Robotics and Automation	2-0
ME-412	Automotive Technology	2-0	ME-490	Ship Propulsion Engineering	2-0
ME-413	Basic Naval Architecture	2-0	ME-491	Solar Energy Systems	2-0
ME-414	Computational Fluid Dynamics	2-0	ME-492	Vehicle Design Performance	2-0
ME-415	Computer Aided Engineering	1-1	ME-493	Production Tooling & Automation	2-0
ME-416	Computer Aided Thermal System Design	1-1	ME-496	Vehicle Dynamics	2-0
ME-424	Introduction to Oil and Natural Gas Engineering	2-0	ME-497	Advanced Engineering Design	2-0
ME-429	Laser & its applications	2-0	ME-498	Power Train Systems	2-0
ME-438	Mechanical Engineering Design	2-0	DME-480	Automotive Manufacturing Systems	2-0
ME-470	Marine Environment Issues	2-0	DME-481	Computer Applications in Automobile Manufacturing	2-0
ME-471	Optimization Techniques	2-0	DME-482	Computer Applications in Manufacturing Systems	2-0
ME-473	Power Generation and Distribution	2-0	DME-483	Industrial Maintenance Management	2-0
ME-474	Electrical Machines	2-0	DME-484	Logic Design & Micro-processors	2-0
ME-475	Energy Conversion and Power Electronics	2-0	DME-485	Logistics and Inventory Management	2-0
ME-476	Engine Tribology	2-0	DME-486	Ergonomics, Work Study and Methods Engineering	2-0
ME-477	FEM applications in Automobile	2-0	DME-487	FEM applications in Manufacturing	2-0
ME-478	Finite Element Methods	2-0	M&S-402	Introduction to Modeling and Simulation	1-1
ME-479	Gas Dynamics	2-0	RIME-222	Introduction to Mechatronics Design Fundamentals	2-0
ME-484	Gas Turbines	2-0	ME-425	Total Quality Management	2-0
ME-485	Fuel Cell Technology	2-0	ME-483	Power Train Systems	2-0
ME-384	Operations Management	2-0	ME-428	Engineering Law	2-0
ME-427	Operations Research	2-0			
ME-487	Power System Analysis	3-0			

**Focus Areas:** Dynamics & Control/Computational Mechanics/Product & Manufacturing Systems Design/Thermofluids

The curriculum of the programme has been developed to build upon the foundation of their mechanical engineering and technical skills learnt in their bachelor’s course. A blend of coursework and research tailored to the needs of industry and students will equip the student to carry out R&D in industry or pursue a career in academia.

**Why join this programme?**

Mechanical engineering is the backbone for technical development of any country. The demand for competent mechanical engineers is never satiated. This programme will enable the student to improve his knowledge as well as inculcate in him research capabilities, as well as communication skills. The faculty members are professional engineers and scientists, each actively engaged in research work in his chosen field.

**Scheme of Studies**

Programme Code: W 704/W 804

Course Code	Course Title	Credits
MATH-812	Advanced Engineering Mathematics	3
ME-801	Optimization of Engineering Systems	3
ME-802	Finite Element Methods	3
ME-803	Continuum Mechanics	3
ME-899	MS Thesis	6

ME-853	Manufacturing System Design & Management	3
ME-854	Computer Integrated Manufacturing	3
ME-898	Special Topics	3
MTS-852	Advanced Measurement Techniques	3
RM-896	Research Methodologies	3

**Computational Mechanics**

EM-843	Advanced Research Methods	3
MATH-850	Advanced Numerical Analysis	3
ME-815	Advanced Modeling & Simulation	3
ME-817	Advanced Theory of Vibrations	3
ME-820	Advanced Instrumentation and experimental methods	3
ME-831	Computational Fluid Dynamics-I	3
ME-832	Parallel & Distributed Simulation for Research	3
ME-833	Computational Fluid Dynamics-II	3
ME-834	Fracture Mechanics	3
ME-835	Advanced Mechanics of Materials	3
ME-836	Theory of Elasticity	3
ME-837	Nonlinear Dynamics	3
ME-838	Advanced Stress Analysis	3
ME-839	Advanced Finite Element Analysis	3
ME-840	Computational Fluid Dynamics and Heat Transfer	3
ME-841	Finite Element Analysis of Composite	3
ME-851	Advanced Manufacturing Processes	3
ME-857	Product Design Fundamentals	3
ME-859	Mechanics of Fibre Reinforced Composites (FRC Materials)	3
ME-861	Theory of Plasticity	3
ME-874	Reliability Based Design	3
ME-881	Advanced Fluid Mechanics	3
ME-882	Heat & Mass Transfer	3
ME-883	Gas Dynamics	3

Minimum 2 courses from one stream & any Two NUST approved courses (duly recommended by the concerned department & GEC)

**Dynamic and Control**

Course Code	Course Title	Credits
EE-873	Fuzzy Control	3
EE-977	Nonlinear Control Systems	3
EM-800	Introduction to Advanced Robotics	3
EM-806	Operations Research	3
MATH-850	Advanced Numerical Analysis	3
ME-811	Modeling & Artificial Intelligence	3
ME-812	Advanced Control Systems-I	3
ME-813	Advanced Control Systems-II	3
ME-814	Digital Control Systems	3
ME-815	Advanced Modeling & Simulation	3
ME-816	Modeling & Simulation of Dynamic Systems	3
ME-817	Advanced Theory of Vibrations	3
ME-818	Kinematics & Rigid Body Dynamics	3
ME-819	Instrumentation & Data Acquisition Systems	3
ME-820	Advanced Instrumentation and experimental methods	3
ME-831	Computational Fluid Dynamics-I	3
ME-837	Nonlinear Dynamics	3
ME-852	Rapid Prototyping, Tooling & Manufacturing	3

ME-898	Special Topics	3
MTS-858	Smart Materials & Structures	3
RM-896	Research Methodologies	3
<b>Product &amp; Manufacturing Systems Design</b>		
EM-806	Operations Research	3
EM-843	Advanced Research Methods	3
MATH-850	Advanced Numerical Analysis	3
ME-812	Advanced Control Systems-I	3
ME-816	Modeling & Simulation of Dynamic Systems	3
ME-818	Kinematics & Rigid Body Dynamics	3
ME-819	Instrumentation & Data Acquisition Systems	3
ME-834	Fracture Mechanics	3
ME-835	Advanced Mechanics of Materials	3
ME-836	Theory of Elasticity	3
ME-841	Finite Element Analysis of Composite	3
ME-842	Additive Manufacturing	3
ME-851	Advanced Manufacturing Processes	3
ME-852	Rapid Prototyping, Tooling & Manufacturing	3
ME-853	Manufacturing System Design & Management	3
ME-854	Computer Integrated Manufacturing	3
ME-855	Material Selection & Design	3
ME-856	Joining of Materials & Structures	3
ME-857	Product Design Fundamentals	3
ME-858	Laser Material Processing	3
ME-859	Mechanics of Fibre Reinforced Composites (FRC Materials)	3
ME-860	Form Synthesis & Stress Analysis of Machinery	3
ME-861	Theory of Plasticity	3
ME-862	Advanced Engineering Materials	3
ME-863	Product Lifecycle Management	3
ME-864	Advanced Manufacturing Technologies	3
ME-865	Lean and Agile Manufacturing	3
ME-866	Industrial Design and Human Factor	3
ME-867	Quality and Reliability Management	3
ME-868	Operations Management	3
ME-869	Project Management	3
ME-870	Supply Chain Management	3
ME-871	Product Design & Development	3
ME-874	Reliability Based Design	3
ME-875	Computer Aided Engineering Design	3
ME-876	Product Design and Development	3
ME-898	Special Topics	3
MTS-820	Advanced Manufacturing Design Techniques	3
MTS-851	Precision Manufacturing Systems	3

MTS-852	Advanced Measurement Techniques	3
MTS-858	Smart Materials & Structures	3
RM-896	Research Methodologies	3
<b>Design</b>		
EM-843	Advanced Research Methods	3
MATH-850	Advanced Numerical Analysis	3
ME-817	Advanced Theory of Vibrations	3
ME-818	Kinematics & Rigid Body Dynamics	3
ME-824	Engine Tribology	3
ME-834	Fracture Mechanics	3
ME-836	Theory of Elasticity	3
ME-837	Nonlinear Dynamics	3
ME-838	Advanced Stress Analysis	3
ME-851	Advanced Manufacturing Processes	3
ME-855	Material Selection & Design	3
ME-857	Product Design Fundamentals	3
ME-858	Laser Material Processing	3
ME-862	Advanced Engineering Materials	3
ME-865	Lean and Agile Manufacturing	3
ME-866	Industrial Design and Human Factor	3
ME-867	Quality and Reliability Management	3
ME-868	Operations Management	3
ME-869	Project Management	3
ME-870	Supply Chain Management	3
ME-871	Product Design & Development	3
ME-873	Advanced Engineering Design	3
ME-874	Reliability Based Design	3
ME-875	Computer Aided Engineering Design	3
ME-876	Product Design and Development	3
ME-898	Special Topics	3
RM-896	Research Methodologies	3
<b>Thermofluids</b>		
EM-806	Operations Research	3
MATH-850	Advanced Numerical Analysis	3
ME-816	Modeling & Simulation of Dynamic Systems	3
ME-819	Instrumentation & Data Acquisition Systems	3
ME-820	Advanced Instrumentation and experimental methods	3
ME-831	Computational Fluid Dynamics-I	3
ME-832	Parallel & Distributed Simulation for Research	3
ME-840	Computational Fluid Dynamics and Heat transfer	3
ME-855	Material Selection & Design	3
ME-858	Laser Material Processing	3
ME-881	Advanced Fluid Mechanics	3
ME-882	Heat & Mass Transfer	3
ME-883	Gas Dynamics	3
ME-884	Convection Heat Transfer	3



ME-885	Thermal System Design	3
ME-886	Power Plant Engineering	3
ME-887	Sustainable Energy Systems	3
ME-888	Radiation Heat Transfer	3
ME-889	Conduction Heat Transfer	3
ME-890	Advanced Turbo Machinery	3
ME-891	Internal Combustion Engines	3
ME-892	Advanced Propulsion	3
ME-893	Advanced Combustion	3
ME-894	Advanced Refrigeration and Airconditioning	3
ME-898	Special Topics	3
RM-896	Research Methodologies	3

### Thermal & Energy Stream

#### Core Courses

MATH-812	Advanced Engineering Mathematics	3
ME-884	Convection Heat Transfer	3
ME-881	Advanced Fluid Mechanics	3
ME-831	Computational Fluid Dynamics-I	3
ME-899	MS Thesis	6

#### Thermal Power & Fluids Engg

MATH-850	Advanced Numerical Analysis	3
ME-802	Finite Element Methods	3
ME-816	Modeling & Simulation of Dynamic Systems	3
ME-819	Instrumentation & Data Acquisition Systems	3
ME-832	Parallel & Distributed Simulation for Research	3
ME-855	Material Selection & Design	3
ME-867	Quality and Reliability Management	3
ME-869	Project Management	3
ME-883	Gas Dynamics	3
ME-885	Thermal Systems Design	3
ME-886	Power Plant Engineering	3
ME-887	Sustainable Energy Systems	3
ME-888	Radiation Heat Transfer	3
ME-889	Conduction Heat Transfer	3
ME-890	Advanced Turbo Machinery	3
ME-891	Internal Combustion Engines	3
ME-898	Special Topics	3
MEA-801	Fundamentals of Maintenance	3
MEA-802	Maintenance Planning & Control	3
MEA-803	Failure Analysis & Condition Based Maintenance	3
RM-896	Research Methodologies	3

#### Energy Systems Engg

ENV-804	Energy & Environment	3
ESE-800	Clean Coal Technologies	3
ESE-801	Biofuel Engineering	3
ESE-802	Photobioreactor Engineering & Bio-Processing	3

ESE-803	Photovoltaic Devices	3
ESE-810	Computer Applications in Energy Systems	3
ESE-811	Solar Energy	3
ESE-812	Energy Management in Buildings	3
ESE-813	Energy Economics & Policy	3
ESE-814	Fuel Cells	3
ESE-816	Development & Evaluation of Energy Projects	3
ESE-817	Wind Energy	3
ESE-818	Power Distribution Systems	3
ESE-819	Environment Impact Assessment	3
ESE-821	Energy Resources & Technologies	3
ME-898	Special Topics	3
RM-896	Research Methodologies	3

#### PhD Courses (Any Six)

ME-931	Internal Combustion Engine Technology	3
ME-932	Combustion and Pollution Chemistry	3
ME-933	Industrial Energy Management	3
ME-934	Economical Aspects of Energy Conversion	3
ME-935	Renewable Energy	3
ME-936	Solar Technologies	3
ME-937	Vehicle Design and Analysis	3
ME-938	Mechanical Vibration and Noise	3
ME-939	Mechatronics and Robotics Applications	3
ME-940	Vehicle Dynamics and Control	3
ME-941	Analytical Dynamics	3
ME-942	Advanced Stress Analysis	3
ME-943	Laser Manufacturing	3
ME-944	Special topics for PhD programme	3
ME-999	PhD Thesis	30

#### Additional Course PhD

SEM/WKSP-997	Seminar / Workshop	1
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#### Additional Courses MS

RM-898	Research Methodology	2
SEM/WKSP-897	Seminar / Workshop	1

#### Note:

- Offering of Elective Courses in all the specialisation streams is subject to the availability of faculty and class strength.
- Students to take a minimum of two courses from the corresponding stream, and maximum two courses from any other NUST approved school/college.
- For all the specialisation streams, course(s) from other departments/constituent colleges, schools or institutions of NUST, may be recommended, if considered necessary by Department of Mechanical Engineering, NUST College of E&ME.
- PhD students will complete additional requirement of 800/900 level coursework (18 credit hours) other than the courses studied during their Masters Programme as recommended by the doctoral Guidance and Examination Committee. They would also carryout original and independent research work to produce PhD thesis (ME-999 PhD Thesis) which is a mandatory requirement for award of PhD degree.



Computer Engineering (CE) is a blend of computer hardware and software design of devices and systems for a very broad spectrum of applications in communication systems, multimedia systems, medical equipment, defense systems, industrial automation etc. Department of Computer and Software Engineering (DC&SE) started its undergraduate programme. The department has been amongst the pioneers of outcome based learning in Pakistan via getting its programme accredited by Washington Accord. DC&SE is equipped with qualified faculty member, from various disciplines of Computer Engineering including computer architecture, programming, hardware based designs, wireless networks and mobile communication, computer networks, digital signal processing and embedded system design. The versatility of the Faculty members has enabled substantial research outcome, which is highlighted by 425+ MS and 20 PhDs that have been produced by DC&SE. Furthermore, this department has produced most number of international journals publications and has graduated highest number of PhD students among the constituent colleges of NUST. The Faculty of DC&SE have been actively involved in research collaborations with various academic and industrial partners as well, to achieve this MOUs have been signed with IBM, Trillium Pakistan (Private) Limited etc. The Faculty and students from the department have won numerous national and international awards while competing in different competitions these include Microsoft Imagine Cup, APICTA, COMPPEC, SOFTEC, NASCON, P@sha, Mobilink Science Fair etc.

## Bachelors in Computer Engineering

The programme provides high quality engineering education with a sound theoretical foundation and hands-on practice of developing and designing computer hardware as well as software systems and products to prepare them for leadership in industry, business, academia and government departments.

Programme Code: W608

### Scheme of Studies

#### Semester-I

Course Code	Course Title	Credits
EC 120	Computer Organization	2-1
HU-100	English	2-0
HU-107	Pakistan Studies	2-0
PHY-102	Applied Physics	2-1
MATH-101	Calculus and Analytical Geometry	3-0
ME-105	Workshop Practice	0-1
*EE-111	Linear Circuit Analysis	3-1
	<b>Total</b>	<b>18</b>

#### Semester-II

Course Code	Course Title	Credits
CS-114	Fundamentals of Programming	2-1
HU-101	Islamic Studies	2-0
MATH 121	Linear Algebra & ODE	3-0
ME -109	Engineering Drawing	0-2
HU-109	Communication Skills	2-0
EE 211	Electrical Network Analysis	3-1
	<b>Total</b>	<b>16</b>

#### Semester-III

MATH 161	Discrete Mathematics	3-0
CS-212	Object Oriented Programming	3-1
EC-210	Logic and Sequential Circuit Design	3-1
EE-215	Electronic Devices and Circuits	3-1
EC 301	Computer Graphics	2-1
	<b>Total</b>	<b>18</b>

#### Semester-IV

EC 220	Computer System Architecture	3-1
EC 200	Data Structures	3-1
MATH- 232	Complex Variables and Transforms	3-0
EC 221	Operating Systems	3-0
HU 212	Technical and Business Writing	2-0
	<b>Total</b>	<b>16</b>

#### Semester-V

Course Code	Course Title	Credits
EC-310	Microprocessor and Microcontroller Based Design	3-1
EC-330	Computer Networks	3-1
MATH-351	Numerical Methods	3-0
EE-232	Signals & Systems	3-1
ME-100	Engineering Mechanics	3-0
	<b>Total</b>	<b>18</b>

#### Semester-VI

Course Code	Course Title	Credits
EC-313	Digital Signal Processing (CE Depth Elective-I)	3-1
EE-371	Linear Control Systems	3-1
EC 312	Digital Image Processing	2-1
HU 222	Professional Ethics	2-0
MATH 361	Probability and Statistics	3-0
*CSL 401	Community Service Learning	0-2
	<b>Total</b>	<b>18</b>

## Semester-VII

Course Code	Course Title	Credits
EC-350	AI and Decision Support System	3-1
ECO-130	Engineering Economics	2-0
OTM 455	Engineering Project Management	2-0
EC-410	Digital System Design (CE Depth Elective-II)	3-1
EC-240	Database Engineering	3-1
EC 499	Final Year Project - I	0-2
<b>Total</b>		<b>18</b>

## Semester-VIII

Course Code	Course Title	Credits
MGT-271	Entrepreneurship	2-0
EC 431	Digital Communication	2-1
EC 430	Mobile Networks (CE Depth Elective-III)	2-1
EC 499	Final Year Project-II	0-4
EC-360	Software Engineering (CE Depth Elective-IV)	3-0
<b>Total</b>		<b>15</b>
<b>Grand Total</b>		<b>137</b>

## Electives

Course Code	Course Title	Credits
CS-380	Introduction to Computer Security	3-0
CS-474	Computer Vision	2-1
EC-301	Computer Graphics	2-1
EC-303	Mobile Application Development for SME's	2-1
EC-313	Digital Signal Processing	3-1
EC-360	Software Engineering	3-0
EC-410	Digital System Design	3-1
EC-411	Digital Instrumentation and Systems	2-1
EC-430	Mobile Networks	2-1
EC-432	Wireless Communication	2-1
EC-433	Integrated Services over Packet Networks	2-1
EC-434	Cloud Computing	2-1
EC-435	Introduction to IoTs	2-1
EC-440	Data Mining	3-0
EC-452	Machine Learning	3-0
EC-460	Software Design & Testing	2-1
EE-216	Electrical Machines	2-1
EE-416	Energy Conversion & Power Electronics	3-1
EE-439	Laser & its Applications	2-0
EE-473	Fuzzy Logic	3-0
EM-430	Introduction to Robotics	3-0
EM-440	Industrial Automation	2-1
CEM-300	Procurement Management	3-0

\*CSL-401 is not counted towards GPA Calculation



The objective of this programme is to train students to contribute towards advanced Computer Engineering technology research and to apply emerging research results for development of computer systems. Graduates will have advanced knowledge and skills to perform more effectively in the application, evaluation, design and technical competence in the foundation areas of computer systems engineering. The subjects with modular course structure are taught by leading researchers. The courses focus on coherent computer systems in engineering themes, providing a balance, coordinated and application-oriented coverage of up-to-date topics.

## Why join this programme?

The programme prepares students to gain advanced knowledge and skills to meet present-day challenges. The faculty is PhD qualified from renowned universities of the world.

## Scheme of Studies

Programme Code: W708/W808

### Core courses

Course Code	Course Title	Credits
CE-825	Advanced Digital System Design	3
CE-820	Advanced Computer Architecture	3
CE-866	Advanced Digital Signal Processing	3
CE-899	MS Thesis	6

### Computer Engineering (Any Five)

Course Code	Course Title	Credits
CE-803	Computer Vision	3
CE-812	Advanced Operating System	3
CE-822	Parallel Processing Computer Systems	3
CE-830	Adaptive Control	3
CE-833	Pattern Recognition and Analysis	3
CE-835	Digital Image Processing	3
CE-847	Digital Communication	3
CE-848	Wireless Communication	3
CE-849	Bio-inspired Telecommunications	3
CE-863	Analysis of Stochastic System	3
CE-880	Advanced Software Engineering	3
CE-910	Selected Topics in Computer Network and Distributed Systems	3
CE-912	Advanced Topics in Wireless Networks	3
CSE-804	Machine Learning	3
CSE-881	Advanced Object Oriented Analysis and Design	3
EE-833	DSP Hardware System Design	3
EE-853	Advanced Wireless Communication	3
MATH-851	Numerical Analysis	3
RM-896	Research Methodologies	3
SE-801	Artificial Neural Network	3
CE-999	PhD Thesis	30

### Additional Courses

RM-898	Research Methodology	2
SEM/WKSP-897	Seminar / Workshop	1
SEM/WKSP-997	Seminar / Workshop	1

## MS/PhD in Software Engineering

The objective of computer software engineering programme is to prepare students for a variety of rewarding careers. Innovation and creativity is the major focus of the programme. A range of subjects help students in acquiring skills and qualities needed to contribute to this very attractive discipline. Knowledge gained through this programme prepares students for professional competence of software applications in the field of computing, communication and information systems.

### Why join this programme?

Software engineering programme prepares students to gain advanced knowledge and to meet present-day challenges. The curriculum has been designed to match the skills and aspiration of the students and to keep pace with rapid advancement to meet growing needs of software and computing technologies. The faculty teaching the courses is PhD qualified from renowned universities of the world.

### Scheme of Studies

Programme Code: W705/W805

#### Core courses

Course Code	Course Title	Credits
SE-860	Advanced Software Engineering	3
SE-861	Software System Design & Architecture	3
SE-862	Software Requirement Engineering	3
SE-863	Software Quality Engineering	3
SE-899	MS Thesis	6

#### List of Electives (Any Four)

SE-864	Team-Based Software Development	3
SE-865	Human Computer Interface	3
SE-867	Formal Methods	3
SE-868	Software Project Management	3
SE-869	Model Driven Software Engineering	3
SE-871	Business Process Re-engineering	3
SE-897	Empirical Software Engineering	3
SE-870	Agile Software Engineering Methods	3
CS-822	Data Mining	3
CS-825	Information Retrieval	3
CS-833	Cloud Computing	3
SE-876	Web-Engineering	3
SE-877	Software Development for Web	3
SE-825	Adv Computer Network	3
SE-826	Adv Computer Network Design & System Security	3
SE-827	Wireless Communication	3
SE-828	Network Security	3
SE-801	Artificial Neural Network	3
SE-802	Pattern Recognition	3
SE-803	Computer Vision	3
SE-805	Adv Artificial Intelligence	3
SE-807	Machine Learning	3
SE-808	Bio Informatics System	3
SE-830	Adv Algorithm Analysis	3

SE-835	Adv Algorithmic Graph Theory	3
SE-810	Data Engineering	3
SE-880	Adv Database Systems	3
SE-812	Adv Operating Systems	3
SE-813	Design of Parallel & Distributed Systems	3
SE-820	Adv Computer Architecture	3
SE-850	Digital Image Processing	3
SE-851	Wavelet Compression	3
SE-900-919	Selected topics in relevant Area	3
RM-896	Research Methodologies	3
SE-899	MS Thesis	6
SE-999	PhD Thesis	30
EE-800	Stochastic Systems	3
IS-810	Secure Coding	3
IS-820	Computer Security	3
IS-821	Network Security	3
EE-821	Advanced Embedded System Design	3
IS-822	Wireless Network Security	3
IS-824	Biometrics	3
IS-825	Vulnerability Exploitation & Defence	3
IS-827	Electronic Warfare – Principles and Techniques	3
IS-830	Information Security Management	3
IS-831	Information Security Project Management	3
IS-833	IT Security Evaluation & Auditing	3
IS-843	Advanced Cryptography	3
IS-851	Secure Communications	3
IS-852	Data Communication Networks & Security	3
EE-852	Information and Coding Theory	3
IS-853	Cloud Computing Security	3
EE-853	Advanced Wireless Communication	3
IS-854	Advanced Web Security	3
IS-855	Information Hiding	3

IS-856	Access Control and Database Security	3
IS-863	Cellular and Mobile Network Security	3
EE-876	Robotics	3
EE-883	Wireless Sensor and Mesh Networks	3
EE-888	Broadband Networks	3
EE-926	System Validation	3
EE-937	Advanced Topics in Computer Vision and Image Processing	3
EE-887	Network Switching and Routing	3
<b>Additional Course</b>		
RM-898	Research Methodology	2
SEM/WKSP-897	Seminar / Workshop	1
SEM/WKSP-997	Seminar / Workshop	1



# Department of Mechatronics Engineering

## Bachelors in Mechatronics Engineering

Mechatronics refers to a flexible, multi-technological approach for integration of mechanical engineering, computer engineering, electronics and information sciences. Mechatronics is essential in the design of intelligent products. It allows engineers to transform their virtual concepts into real life applications. It is a relatively new concept relating to the design of systems, devices and products aimed at achieving an optimal balance between basic mechanical structure and its overall control. The programme involves research and coursework that will push the frontiers of technology in intelligent product design and development. The research activities involve design and control of intelligent robotic systems and automated machines.

### Why join this programme?

Modern state-of-the-art industries have changed rapidly from pure mechanical-, manufacturing-, and process-controlled type to electro-mechanical, fully automated and computerised. It has become the requirement for people working on those processes and production lines to have knowledge of all the related systems.

### Associated Careers

Graduates will have strong command on engineering principles as well as sound capability of converting concepts to reality. They could find themselves in industry engaged with maintenance and operation of plant equipment such as boilers, compressors, turbines, instrumentation, automation and control of advanced industrial processes using such tools as PLC and microcontroller-based control systems, process simulation for plant modifications, defence and R&D applications, engineering management, or a variety of similar areas.

Many of our alumni have gone on to pursue further studies in renowned institutions of the world, in a variety of fields, such as Control Engineering, Digital Signal Processing, Power Electronics, Robotics, Artificial Intelligence, Mobile Robotics, Machine Vision and Distributed Robotics.

### Scheme of Studies

Programme Code: W615

Semester-I			Semester-II		
Course Code	Course Title	Credits	Course Code	Course Title	Credits
MATH- 101	Calculus and Analytical Geometry	3-0	MATH-121	Linear Algebra & ODEs	3-0
HU-100	English	2-0	CS-110	Fundamentals of Programming	2-1
HU-107	Pakistan Studies	2-0	HU-101	Islamic Studies	2-0
ME-112	Engineering Statics	3-0	PHY-102	Applied Physics	2-1
EE-116	Electric Circuits Analysis	3-1	HU-109	Communication Skills	2-0
ME-109	Engineering Drawing	0-2	ME-204	Thermodynamics	3-1
			ME-105	Workshop Practice	0-1
<b>Total</b>		<b>13-3</b>	<b>Total CHs</b>		<b>14-4</b>

### Semester-III

### Semester-IV

Course Code	Course Title	Credits	Course Code	Course Title	Credits
MATH-243	Vector calculus	3-0	MATH-232	Complex Variables and Transforms	3-0
EE-231	Signals and Systems	3-0	MTS-226	Materials and Manufacturing Processes	3-0
HU-212	Tech & Business Writing	2-0	EE-215	Electronic Devices and Circuits	3-1
MTS-220	Solid Modeling	0-1	ME-206	Mechanics of Materials	2-1
EE-223	Digital Logic Design	2-1	ME-210	Engineering Dynamics	3-0
EC-204	Data Structures and Object Oriented Programming	3-1	MTS-231	Actuating Systems	3-1
<b>Total CHs</b>		<b>13-3</b>	<b>Total CHs</b>		<b>17-3</b>

### Semester-V

### Semester-VI

Course Code	Course Title	Credits	Course Code	Course Title	Credits
MATH-361	Probability & Statistics	3-0	MATH-351	Numerical Methods	3-0
MTS-311	Microcontroller and Embedded Systems	2-2	XX-XXX	Engineering Elective I	3-0



MTS-322	Design of Machine Elements	3-0	MTS-315	Mechatronics System Design	2-2
MTS-336	Instrumentation and Measurements	3-1	ME-334	Theory of Machines	2-0
EE-313	Electronics Circuit Design	3-1	OTM-455	Engineering Project Management	2-0
ECO-130	Engineering Economics	2-0	M&S-321	Modeling and Simulation	2-1
<b>Total CHs</b>		<b>16-4</b>	<b>Total CHs</b>		<b>14-3</b>

### Semester-VII

Course Code	Course Title	Credits	Course Code	Course Title	Credits
MTS-417	Introduction to Robotics	3-1	XX-XXX	Elective III	3-0
XX-XXX	Engineering Elective II	3-0	ME-407	Fluid Mechanics	2-1
EE-379	Linear Control Systems	3-1	MTS-499	Senior Design Project II	0-4
MGT-271	Entrepreneurship	2-0	MTS-419	Manufacturing Automation	2-1
MTS-499	Senior Design Project I	0-2			<b>7-6</b>
HU-222	Professional Ethics	2-0		<b>Total</b>	<b>13</b>
<b>Total</b>		<b>13-4</b>			

### Semester-VIII

#### List of Electives

Course Code	Course Title	Credits	Course Code	Course Title	Credits
EE-484	Elect Instrumentation	3-0	EC-335	Digital Signal Processing	3-0
EE-370	Digital Control Systems	3-0	MTS-415	Special Topics in Mechatronics	3-0
EE-470	Fuzzy Logic	3-0	ME-439	Internal Combustion Engine	3-0
MTS-418	Applied Robotics	3-0	ME-443	Automotive Technology	2-1
ME-450	Laser and its Applications	3-0	MTS-444	Mechatronics Modeling for Automotive Systems	3-0
MGT-174	Elements of Business	3-0	ME-483	Power Train Systems	3-0
MTS-337	Industrial Electronics	2-1	ME-421	Mechanical Vibrations	3-0
EE-333	Digital Image Processing	3-0	EE-418	Electro Optics and IR	3-0
ME-464	Renewable Energy Technologies	3-0	ME-462	Power Plant Engineering	3-0
ME-446	Computer Aided Engineering	1-2			

## MS/PhD in Mechatronics Engineering

Mechatronics engineering blends the disciplines of mechanical, electrical and software engineering around the principles of control systems and automation. Mechatronics engineers create and work with systems that have various degrees of automation, which are increasingly becoming common such as robots and automobiles. The Masters / PhD programme in the department combines in-depth technical knowledge required to work in this fast-changing discipline with broader aspects of engineering. The programme is strongly influenced by industrial perspectives and has state-of-the-art facilities, which includes equipment related to Robotics, Manufacturing, Machine Vision, Embedded Systems Labs, Brain Controlled Interface and Prosthetics.

Although the discipline of Mechatronics Engineering is relatively new in Pakistan, yet it has been able to successfully integrate with the demands of major main stream industry. In the industrial sector employers are looking for specialized skill set and their perception of these expertise are directly gauged from the courses that are studied by a particular applicant in his Master's degree. Moreover, majority of mechatronics related indigenous as well as international jobs are available under the umbrella of Robotics, Automation, Smart Systems, Autonomous Systems, Bio-Medical/Bio-Engineering, Machine Vision and Instrumentation. Currently, department is offering MS degree in Robotics and Industrial Automation Stream with blend of Smart Electro-Mechanical Systems and Bio-Mechatronics.

» **Robotics and Industrial Automation:** Robotics and Industrial Automation are the hallmark areas of specialisation for mechatronics engineers. Whether operating a small company or a big business, there are a number of robotic component solutions available for performing a large number of different functions and the industry in Pakistan is now beginning to take cognizance of this fact. In addition, presently there are a number of highly specialized companies that are fully geared up to provide complete end to end automation solutions to major local industries (e.g., the Oil & Gas industry, Cement Industry, Sports Goods Industry, etc.).

### Why join this programme?

This programme enables graduates to acquire training in the theory and practice of a broad range of industrially relevant topics within the fields of Mechatronics Engineering. It is designed specifically to meet the needs of the modern engineer both in industry and in research or education establishments. One of the foremost and most popular programme of studies, offered by almost all leading universities in the world, is specialisation in the field of robotics and automation. Another widely accepted and dominant area of industrial research is the field of Smart Electromechanical Systems, which is used in a very wide cross-section of industrial systems in different domains. Finally, Biomechatronics is the latest emerging technology that is based on the principles of mechatronics engineering. The department of Mechatronics Engineering has taken cognizance of the latest trends and after completion of the MS programme our students will be able to make substantial contributions in all the above mentioned focus areas in the academic as well as industrial sector.

### MS/PhD Coursework

Students will be required to take a total of eight courses in each stream. Out of these eight courses the students will have to take the specified four core courses (same for all streams) and chose four elective courses that will be offered in each semester. The scheme of studies including the Core and Elective courses with credit hours for is given below:

### Scheme of Studies

Programme Code: W715/W815

#### Core Courses

Course Code	Course Title	Credits
MTS 800	Advanced Robotics I	3
MTS 840	Data Acquisition and Control	3
MTS 811	Image Processing for Intelligent Systems	3
MTS 841	Advanced Embedded Systems	3
<b>MTS 899</b>	<b>MS Thesis</b>	<b>6</b>

#### Elective Courses MS

##### Robotics and Industrial Automation Stream

Course Code	Course Title	Credits
BMES 813	Biomedical Instrumentation	3
DME 823	Advanced Manufacturing Technologies	3

DME 827	Special Topics in Manufacturing Engineering	3
EE 818	Micro-Electro Mechanical Systems	3
EE 838	Filtering & Tracking	3
EE 871	Linear Control Systems	3
EE 872	Optimal Control	3
EE 873	Fuzzy Control	3
EE 874	Adaptive Control	3
EE 875	Discrete Time Control Systems	3
EE 877	Mobile Robotics	3
EE 879	Robust Control	3
EM 843	Advanced Research Methods	3
ME 801	Optimization of Engineering Systems	3

ME	831	Computational Fluid Dynamics – I	3
ME	854	Computer Integrated Manufacturing	3
ME	858	Laser Material Processing	3
MTS	801	Advanced Robotics II	3
MTS	804	Motion Planning for Mobile Robots	3
MTS	805	Kinematics of Mobile Robotic Systems	3
MTS	809	Cognitive Robotics	3
MTS	812	Machine Vision	3
MTS	817	Computational Geometry	3
MTS	820	Advanced Manufacturing Design Techniques	3
MTS	822	Industrial Control Technology	3
MTS	823	Micro and Nano Robotics	3
MTS	851	Precision Manufacturing Systems	3
MTS	852	Advanced Measurement Techniques	3
MTS	857	Micro-Manufacturing Systems and Technology	3
RIME	852	Digital Control Systems	3
SE	896	Research Methodologies	3
CSE	804	Machine Learning	3
SE	807	Machine Learning	3
ME	853	Manufacturing System Design & Management	3
ME	852	Rapid Prototyping, Tooling & Manufacturing	3
SE	801	Artificial Neural Networks	3
SE	802	Pattern Recognition	3
EE	832	Pattern Recognition	3
CE	833	Pattern Recognition and Analysis	3
BMES	833	Prosthetics and Rehabilitation	3
BMES	842	Advanced Biomaterials	3
EE	897	Detection and Estimation	3
CS	867	Computer Vision	3
CE	803	Computer Vision	3
SE	803	Computer Vision	3
ME	814	Digital Control Systems	3
RM	896	Research Methodologies	3
SE	865	Human Computer Interface	3
EE	831	Advanced Digital Signal Processing	3
MTS	810	Artificial Intelligence	3
MTS	813	Paradigms of Artificial Intelligence	3
ME	815	Advanced Modelling and Simulation	3
MTS	843	Sensor and Sensing Technology	3

MTS	845	Real Time Systems	3
MTS	842	Programming of Embedded Systems	3
MTS	863	Optomechatronic Systems	3
ME	802	Finite Element Methods	3
CE	866	Advanced Digital Signal Processing	3
MTS	846	Fuzzy Logic Hybrid Systems	3
MTS	818	Natural Language Processing	3
MTS	858	Smart Materials and Structures	3
EE	891	Stochastic Systems	3
EE	808	Digital Integrated Circuit Design	3
MTS	862	Biomedical Clinical Information Systems	3
SE	808	Bio-Informatics Systems	3
BMES	811	Signals and Images in Medicine	3
BMES	832	Biomechanics	3
BMES	815	Biosensors and instrumentation	3
BME	822	Selected Topics in Biomedical Engineering	3
BMES	812	Medical Devices Design and Standards	3
MTS	860	Human Machine Interaction	3
CSE	888	Computational Modelling of Physiological Systems	3
CSE	805	Introduction to Modelling and Analysis	3

**Additional Course**

Course Code	Course Title	Credits	
RM	898	Research Methodology	2
SEM/WKSP	897	Seminar / Workshop	1

**PhD Courses**

Course Code	Course Title	Credits	
MTS	951	Micro and Nano Fabrication	3
MTS	961	Photonic Devices	3
EE	902	Nano-Electronics	3
EE	970	Advanced Robotics	3
EE	977	Non-Linear Control Systems	3
EE	979	Selected Topics in Control Systems	3
DME	931	Advances in Manufacturing Technologies	3
DME	932	Rapid Prototyping and Manufacturing	3
DME	934	Advanced Information Systems for Manufacturing	3
BMES	932	Image and Vision Computing in Medicine	3
BMES	934	Advanced Bio-signal Processing	3
BMES	941	Advances in Biomedical Materials	3
BMES	951	BioNanotechnology	3

RIME	922	Microfluidics and BioMEMS	3
RIME	913	Robotic Manipulation	3
RIME	914	Robot Motion Planning	3
RIME	916	Special Topics for PhD programme (Robotics)	3
RIME	923	Special Topics for PhD programme (Mechatronics)	3
RIME	934	Special Topics for PhD programme (Artificial Intelligence)	3
RIME	943	Special Topics for PhD programme (Machine Vision)	3
RIME	955	Special Topics for PhD programme (Control Systems)	3

#### PhD Dissertation

MTS	999	PhD Thesis	30
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#### Additional Course

SEM/ WKSP	997	Seminar / Workshop	1
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\*All the level-8 approved courses of MS in Mechatronics Engineering may also be opted during PhD in Mechatronics Engineering Programme.



# MS/PhD in Engineering Management

Engineering graduates of any discipline have to be adequately prepared to shoulder the responsibilities of technical leadership positions in today's technology driven organizations. The engineers, so prepared, are the ultimate candidates for the positions of Chief Executive Officer (CEO), Chief Operating Officers (COOs), Chief Technical Officers (CTOs), and other Technical Management positions in technically oriented industrial and service organizations. Their services are utilized by national public enterprise and defense organizations along with international firms to conduct their functions efficiently and effectively.

Today's fast moving technical organizations in industrial and service sectors require technical personnel having knowledge of hard core engineering disciplines as well as management skills necessary to steer the organization to success.

Department of Engineering Management at the College of E&ME provide an opportunity to graduate engineers to prepare themselves with latest principles and techniques of management of a technical enterprise through MS and PhD programmes.

## Why join this programme?

This programme enables graduates to acquire management skills in the fundamentals of their chosen engineering branch. It is designed specially to meet the needs of modern engineer both in industry and academic establishment with research projects. It is an interdisciplinary and flexible programme with a focus on application, global awareness, and the engineering/management experience. After completion of this course, the students will be able to analyze and plan various engineering projects in more efficient and cost-effective ways.

## Coursework

Programme Code: W723/W823

### Core Courses

Course Code	Course Title	Credits
EM-801	Project Management	3
EM-811	Quality Engineering	3
EM-817	Accounting and Financial Management	3
EM-818	Operations Research	3
<b>EM-899</b>	<b>MS Thesis</b>	<b>6</b>

### Elective Courses

Course Code	Course Title	Credits
EM-804	Technology Management	3
EM-809	Management of Technical Organizations	3
EM-807	Problem Solving and Decision Making in Engineering Organizations	3
HRM-542	Human Resource Management	3
EM-816	Strategic Management	3
EM-826	Supply Chain Management	3
EM-827	Innovation & New Product Management	3
EM-829	Maintenance Management	3
EM-812	Design, Patents, Contract and Legal Engineering	3
EM-821	Engineering Ergonomic and Work Study	3
EM-822	Production System Design and Analysis	3
EM-843	Advanced Research Methods	3
EM-844	Marketing of Technology and Industrial Products	3
EM-846	Probability & Statistics for Engineers	3
EM-848	Managerial Analytics	3
EM-849	Industrial IOT	3
EM-850	Leadership and Organizational Behavior	3
EM-851	High Performance Work Systems (HPWS)	3
EM-852	Industrial Psychology	3
EM-853	Shipping and Port Management	3
EM-854	Sustainability in Engineering Management	3
EM-855	Occupational Health and Safety Environment	3
ESE-821	Energy Resources and Technologies	3
OTM-739	Global Logistics and Transportation	3
CE-836	Construction Management	3
CE-886	Water Resource Economics, Planning & Management	3
DME-813	Product Life Cycle Management	3
DME-811	Product Design and Development	3
<b>EM-999</b>	<b>PhD Thesis</b>	<b>30</b>
<b>Additional Course</b>		
RM-898	Research Methodology	2
SEM/WKSP-897	Seminar / Workshop	1
SEM/WKSP-997	Seminar / Workshop	1



**PNEC**

Pakistan Navy Engineering  
College, Karachi

# Pakistan Navy Engineering College

Pakistan Navy Engineering College (PNEC) is the only constituent college of National University of Sciences & Technology (NUST) at Karachi. The history of PNEC is more than five decades old. Initially in 1962 it was established as Officer Training School at PNS KARSAZ. It became part of NUST in 1995. Since then PNEC-NUST is making all out efforts to provide best engineering education to its students in different disciplines.

The mission of the college is to pursue excellence in education and lifelong learning through highly qualified faculty and dynamic curriculum. PNEC is committed to prepare student's professional as well as ethical values for a career with wide ranging opportunities in production, R&D, management and solutions related to the future technological challenges.

## Programmes

### Undergraduate

- » Mechanical Engineering (with option to choose electives from industrial & Manufacturing Engineering)
- » Electrical Engineering
- » Naval Architecture Engineering
- » Maritime Sciences (for Service Officers only)
- » Electrical Engineering
- » Mechanical Engineering
- » Manufacturing Engineering & Management

### MS

- » Mechanical Engineering (with specialisation in Thermal Power and Fluids Engineering and Computational Mechanics)
- » Electrical Engineering (with specialisation in Control and Communication).
- » Cyber Security
- » Manufacturing Engineering & Management
- » Naval Architecture

### PhD

#### Fact file

It is the only constituent College of NUST in the southern region. All army officers of the Corps of Mechanical and Electrical engineers studied in PNEC till late eighties.

## Faculty Profile

### Electronic & Power Engineering

#### Dr Gul Shahzad, HoD

PhD, (Hanyang University), South Korea

**Discipline:** Electronics & Communication

**Specialisation:** Wireless Optical Fiber Communication

#### Dr Attaullah Memon

PhD (Michigan State University) USA

**Discipline:** Electrical Engineering

**Specialisation:** NonLinear Systems, Control and Automation

#### Dr Tariq Mairaj Rasool Khan

PhD (Michigan State University) USA

**Discipline:** Electrical Engineering

**Specialisation:** Non- Destructive Testing

#### Dr Syed Sajjad Haider Zaidi

PhD (Michigan State University) USA

**Discipline:** Electrical Engineering

**Specialisation:** Power Engineering

#### Dr Adeel Yusuf

PhD (Georgia Institute of Technology) USA

**Discipline:** Electrical Engineering

**Specialisation:** Machine Learning

#### Dr Hammad Raza

PhD (Michigan state university) USA

**Discipline:** Computer Engineering

**Specialisation:** Computer Vision

#### Dr Aleem Mushtaq

PhD (Georgia Institute of Technology) USA

**Discipline:** Electrical Engineering

**Specialisation:** Signal Processing

#### Dr Arshad Aziz

PhD (NUST) Pakistan

**Discipline:** Electrical Engineering

**Specialisation:** Information Security, Configurable Computing  
Configurable Computing

#### Dr Khawaja Bilal Ahmed Mahmood

PhD (University of Bristol) UK

**Discipline:** Electrical Engineering

**Specialisation:** Optical RF & Telecom

**Dr Bilal Muhammad Khan**

PhD (University of Suxxes) UK

**Discipline:** Electrical Engineering**Specialisation:** Wireless Sensor Networks**Dr Dur-e-Shahwar**

PhD (NUST) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Cryptography/FPGA**Mr Abdul Samiah**

MS (PAF-KIET) Pakistan

**Discipline:** Computer Science**Specialisation:** Computer Networking**Engr Najeeb Iqbal**

MS (Hamdard University) Pakistan

**Discipline:** Electronic Engineering**Specialisation:** Digital Electronic Systems**Engr Nawshad Aziz**

MS (NED University) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Telecom. Engineering**Engr Muhammad Usman**

MS (Nottingham Trent University) UK

**Discipline:** Electrical Engineering**Specialisation:** Engineering Management**Muhammad Samiullah Awan**

MS (Iqra University) Pakistan

**Discipline:** Computer Science**Specialisation:** Artificial Intelligence**Engr Rashida Ali Memon**

MS (NUST) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Communication**Muhammad Mustaqeem**

MS (PAF KIET), Pakistan

**Discipline:** Electronic Engineering**Specialisation:** Telecom and Networks**Engr M Armoghan Khan**

MS (North China Electric Power University) China

**Discipline:** Electrical Engineering**Specialisation:** Power**Mr Mukhtar Ahmed**

MS (Indus University) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Power Distribution**Mr Muhammad Afzal**

MS (Indus University) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Power Distribution**Mubashir Tariq**

MS (University of Sunder Land) UK

**Discipline:** Electrical Engineering**Specialisation:** Computer Networks**Furqan Shafi**

MS (NUST) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Control Engineering**Mr Liaquat Ali Khan**

MS (NED University) Pakistan

**Discipline:** Computer Science**Specialisation:** Information Security**Engr Sajid Mehmood**

MS (Bahria University ) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Power System**Dr Lubna Moin**

PhD (NUST) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Control Engineering**Dr Ashraf Yahya**

PhD (NED University) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Power Electronics**Dr M Farhan Khan**

PhD (PAF KIET), Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Signal Processing**Dr Nusrat Hussain**

PhD (NED University) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Electrical Power & Power Electronics**Dr Sajid Saleem**

PhD, (UCL) University College of London

**Discipline:** Electronic & Electrical Engineering**Specialisation:** Nanotechnology, Superconducting Electronics**Dr Fayyaz Ahmad**

PhD, COMSATS University, Islamabad, Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Power Engineering**Engr M Shujaat Kamal**

MS (Sir Syed University) Pakistan

**Discipline:** Electronics Engineering**Specialisation:** Industrial Automation**Engr Mujahid Hussain**

MS (University of Gujrat) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Power Systems**Engr Muhammad Saad Hamid**

MS (NUST) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Control Systems**Engr Zain ul Hassan**

MS (COMSAT) Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Power & Energy



**Engr Ahsan Baig**  
MS (COMSAT) Pakistan  
**Discipline:** Electronics Engineering  
**Specialisation:** Advanced Electronics

**Engr Adil Masud**  
MS (NUST) Pakistan  
**Discipline:** Electrical Engineering  
**Specialisation:** Comm & Network

## Mechanical Engineering

**Engr Zulfiqar Ahmed Khan, HoD**  
MS (PNEC, NUST) Karachi  
**Discipline:** Mechanical Engineering  
**Specialisation:** Thermal Power Engineering

**Dr Asif Mansoor**  
MS (NUST University) Pakistan  
**Discipline:** Computational Mathematics  
**Specialisation:** CFD / Predictive Model & Optimization

**Dr Khurram Kamal**  
PhD (Loughorogh University) UK  
**Discipline:** Mechanical Engineering  
**Specialisation:** Artificial Intelligence/ML, Intelligent Machines, Embedded information. Health Monitoring / Machine Vis

**Dr Tahir Ratlamwala**  
PhD (University of Ontario Institute of Technology) Canada  
**Discipline:** Mechanical Engineering  
**Specialisation:** Renewable Energy  
Desalination Absorption Coating / Heating

**Engr Muhammad Shakeel**  
MS (NED University) Pakistan  
**Discipline:** Mechanical Engineering  
**Specialisation:** Applied Mechanics

**Engr Khurram Jamal Hashmi**  
MS (University of Minnesota) USA  
**Discipline:** Mechanical Engineering  
**Specialisation:** Applied Thermodynamics

**Engr Saeed Ahmed**  
MS Design & Manuf (Concordia University) Canada  
MS Metallurgy (NED University) Karachi  
**Discipline:** Mechanical Engineering  
**Specialisation:** Metallurgy, Design & Manufacturing

**Engr Zia uddin Siddiqi**  
MS (NED University) Pakistan  
**Discipline:** Mechanical Engineering  
**Specialisation:** Nuclear Power

**Engr Naeem Raza**  
MS (NUST University) Pakistan  
**Discipline:** Mechanical Engineering  
**Specialisation:** Thermal Fluids

**Engr Sidra Zahid**  
MS, (NUST), Karachi  
**Discipline:** Mechanical Engineering  
**Specialisation:** Adv. Fluid Mechanics

**Engr Muhammad Sufiyan**  
ME (NED University) Pakistan  
**Discipline:** Mechanical Engineering  
**Specialisation:** Design Engineering

**Engr Arif Hussain**  
BE (Balochistan University of Engineering & Technology, Khuzdar) Pakistan  
**Discipline:** Mechanical Engineering  
**Specialisation:** Mechanical Engineering

**Dr Asad Ali Zaidi**  
PhD (Harbin Engineering University) China  
**Discipline:** Mechanical Engineering  
**Specialisation:** Renewable Energy

**Dr Abbas Hussain**  
PhD (KOC University) Turkey  
**Discipline:** Mechanical Engineering  
**Specialisation:** Manufacturing, Micro-Machining

**Dr Muhammad Asif**  
PhD (Auckland University of Technology) New Zealand  
**Discipline:** Mechanical Engineering  
**Specialisation:** Mechanical characterization of 3D printed polymer nanocomposites, Viscoelasticity and Fatigue

**Dr Antash Najeeb**  
PhD (University of California) USA  
**Discipline:** Mechanical Engineering  
**Specialisation:** Green Buildings, HVAC, Thermal Power Systems (Solar & Conventional)

**Engr Sereen Atif**  
MS (Air University) Islamabad  
**Discipline:** Mechanical Engineering  
**Specialisation:** Robotics and Control Systems

**Engr Elyia Abbas Jafri**  
MS (NED University) Karachi  
**Discipline:** Industrial and Manufacturing Engineering  
**Specialisation:** Quality Management

**Engr Muhammad Bilal Asif**  
MS (UCL, London) UK  
**Discipline:** Mechanical Engineering  
**Specialisation:** Marine Engineering

**Engr Tahir Raza Memon**  
MS (Universiti Teknologi Petronas) Malaysia  
**Discipline:** Mechanical Engineering  
**Specialisation:** Maintenance

**Engr Hafiz Abdullah Zafar**  
MS (HITEC University) Taxila  
**Discipline:** Mechanical Engineering  
**Specialisation:** Solar Thermal Systems, Thermo-Fluids

**Engr Ghulam Mehdi Bhutto**

MS (Mehran UET) Jamshoro

**Discipline:** Mechanical Engineering**Specialisation:** Mechatronics**Engr Wajahat Khan**

BE (NED University) Karachi

**Discipline:** Mechanical Engineering**Specialisation:** Mechanical Engineering**Engr Muhammad Dawood**

BE (PNEC, NUST) Karachi

**Discipline:** Mechanical Engineering**Specialisation:** Mechanical Engineering**Engr Waqas Baqar**

BE (NED University) Karachi

**Discipline:** Mechanical Engineering**Specialisation:** Mechanical Engineering**Engr Arsalan Ahmed Khan**

BE (Mehran UET) Jamshoro

**Discipline:** Mechanical Engineering**Specialisation:** Mechanical Engineering

---

## Management Information Systems

**Dr Muhammad Junaid SI(M)**

PhD (NUST) Pakistan

**Discipline:** Information Security**Specialisation:** Information Security**Dr Akbar Ali Awan HoD**

PhD (University of Karachi) Pakistan

**Discipline:** Management & Administrative Sciences**Specialisation:** HRM**Uzma Khalid**

MCS from National Institute of Information Technology (NIIT) Islamabad

**Discipline:** Computer Science**Specialisation:** Software**Ayesha Saleem**

MBA (Bahauddin Zakiriya University) Multan

**Discipline:** Management Sciences**Specialisation:** Finance**Waqas Ahmad Hayat**

BE (NUST-PNEC) Pakistan

**Discipline:** Computer Science**Specialisation:** Networking**Mr Ubiadullah Saleem**

MS (University of Hertfordshire)

**Discipline:** Electronic Engineering**Specialisation:** Telecom ,IT**Mr Syed Muhammad Adil**

MBA (Virtual University)

**Discipline:** Management Sciences**Specialisation:** IHRM Marketing**Amena Zafar**

BS (SW Engg) (Bahria University) Pakistan

**Discipline:** Computer Science**Specialisation:** Software**Dr Zeeshan Riaz**

PhD (University College London) UK

**Discipline:** Naval Architecture**Specialisation:** Marine Hydrodynamics**Nabila Hassan**

M.Phil (Iqra University, Karachi) Pakistan

**Discipline:** Management Sciences**Specialisation:** Marketing**Dr Aqueel Shah**

PhD (UET Lahore) Pakistan

**Discipline:** Manufacturing**Specialisation:** Non-Traditional Machining (WEMD)**Dr Novera Ansar**

PhD (University of Karachi) Pakistan

**Discipline:** Management Sciences**Specialisation:** Management

## Industrial & Manufacturing Engineering

### Dr Zeeshan Riaz (HOD)

PhD (University College London) UK

**Discipline:** Naval Architecture

**Specialisation:** Hydrodynamics

### Dr Syed Aqueel Shah

PhD (UET Lahore) Pakistan

**Discipline:** Manufacturing Engineering

**Specialisation:** Non-Traditional Machining (WEDM)

### Dr Aasim Munir Dad

PhD (University of Gloucestershire) UK

**Discipline:** Management

**Specialisation:** Digital Management

## Basic Sciences & Humanities

### Ms. Abida Mehmood (HoD)

M.Sc Statistics

M.Sc War Studies (Maritime)

**Discipline:** Statistics

**Specialisation:** Statistics

### Dr Gul e Hina Aslam

PhD (NUST) Pakistan

**Discipline:** Mathematics

**Specialisation:** Pure Mathematics

### Ms Hina Irum

M.Sc (GC University) Lahore

**Discipline:** Mathematics

**Specialisation:** Applied Mathematics

### Mr Zafar Ali

M Sc (University of Karachi) Pakistan

**Discipline:** Statistics

**Specialisation:** Statistics

### Ms Somia Aslam

MA (National University of Modern Languages) Islamabad

**Discipline:** English

**Specialisation:** Language and Literature

### Humera Sabir

M.Sc (University of Karachi) Pakistan

**Discipline:** Physics

**Specialisation:** Electronics

### Mr M Absar Ahmed

M Phil (Karachi University) Pakistan

**Discipline:** Mathematics

**Specialisation:** Applied Mathematics

### Mr M Saqib Nauman

M Sc (Karachi University) Pakistan

**Discipline:** Mathematics

**Specialisation:** Pure Mathematics

### Mr. Rehan Ali Syed

M.Sc (Hons) Mathematics

**Discipline:** Mathematics

**Specialisation:** Mathematic

### Dr Salman Nisar

PhD (The University of Manchester) UK

**Discipline:** Manufacturing Engineering

**Specialisation:** Laser Processing of Materials

### Engr Syed Ali Hassan

MS: (NUS) Singapore

**Discipline:** Industrial & Systems Engineering Specialisation:

Industrial & Systems Engineering

### Engr Nosheen Khushnood

MS (NED University) Pakistan

**Discipline:** Industrial & Manufacturing Engineering

**Specialisation:** Manufacturing Engineering

### Mr Naveed Qayyum

M.Sc Statistics

**Discipline:** Statistics

**Specialisation:** Statistics

### Mr Arsalan Dilbaraiz

M.Phil Chemistry

**Discipline:** Chemistry

**Specialisation:** Inorganic / Analytical Chemistry

### Mr Arshad Khan

M.Sc Mathematics

**Discipline:** Mathematics

**Specialisation:** Mathematics

### Mr Mubashir Shahzad

M.Sc Physics

**Discipline:** Physics

**Specialisation:** Physics

### Mr Sabtain Younas

BS (Hons) Physics

**Discipline:** Physics

**Specialisation:** Physics

### Mr Zunnorain Amer Ali Baig

M.Sc Electrical Engineering

**Discipline:** Electrical Engineering

**Specialisation:** Electrical Engineering

### Mr Sharjeel Ahmed

M.A English

**Discipline:** English

**Specialisation:** English

### Mr Talha Abdullah

BBA/Dar-se-Nizami

**Discipline:** Islamiyat

**Specialisation:** Islamiyat

### Mr Waheed Ullah Khan

M.A Islamiyat

**Discipline:** Islamiyat

**Specialisation:** Islamiyat

## Maritime Sciences

### Dr Nadeem Kureshi

PhD (UET Taxila)

**Discipline:** Engineering Management

**Specialisation:** Strategic Management

### Mustafa Jan

MS Telecommunication (Military College of signals NUST)  
Rawalpindi

**Discipline:** Electrical Engineering

**Specialisation:** Telecommunication

### Rajab Ali Jafri

MS Mechanical Engineering  
NED University, Karachi

**Discipline:** Mechanical Engineering

**Specialisation:** Manufacturing Engineering

### Ayesha Saleem

MBA (Bahauddin Zakiriya University) Multan

**Discipline:** Management Sciences

**Specialisation:** Finance

### Sumaira Irum

MPhil (Baharia University) Karachi

**Discipline:** Management Sciences

**Specialisation:** Management Sciences

### Israr Ahmed

MPhil (Iqra University) Karachi

**Discipline:** HRM

**Specialisation:** HRM

### Sajid Khan

MS (UET Taxila)

**Discipline:** Electrical

**Specialisation:** Control System

### Mr Syed Muhammad Adil

MBA (Virtual University)

**Discipline:** Management Sciences

**Specialisation:** IHRM Marketing

### Mr Abdul Wajid

MA Eco (UoK)

M.Com (FUUAST)

**Discipline:** Economics

**Specialisation:** Economics

## Cyber Security

### Prof. Dr Arshad Aziz

PhD (NUST) Karachi

**Discipline:** Electrical Engineering

**Specialisation:** Information Security

### Mr Yasir Khan

MS (NUST) Karachi

**Discipline:** Electrical Engineering

**Specialisation:** Control System

## Naval Architecture

### Dr Zeeshan Riaz (HOD)

PhD (University College London) UK

**Discipline:** Naval Architecture

**Specialisation:** Hydrodynamics

### Dr M Saeed Khalid

PhD (University of Michigan) USA

**Discipline:** Naval Architecture & Marine Engineering

**Specialisation:** Rigid Body Dynamics, Hydrodynamics

### Dr Hassan Khalid

PhD (University of Strathclyde) UK

**Discipline:** Naval Architecture & Marine Engineering

**Specialisation:** Ship Seakeeping

### Atta ur Rehman Hashmi

MSc (Harbin Engineering University) China

**Discipline:** Naval Architecture

**Specialisation:** Hydrodynamics

### Hasnain Ali

MSc (University College London) UK

**Discipline:** Naval Architecture

**Specialisation:** Design Analyses

### Imran Akhtar

MSc (Harbin Engineering University) China

**Discipline:** Naval Architecture

**Specialisation:** Submarine Structure

### Usman Shafique

MSc (University College London) UK

**Discipline:** Naval Architecture

**Specialisation:** Marine Structure

### Imran Khan

MSc (University College London) UK

**Discipline:** Naval Architecture

**Specialisation:** Design Analyses

# Research and Development

Research and Development Department of PNEC aims to perform quality research using a combination of metrics focused on researchers, research outputs, Industrial collaboration, and applied measures. PNEC has the honor of achieving approval of maximum research proposals sent to different national and international funding agencies. A few ongoing research projects are listed below:

- Development of Health and Monitoring Systems for Distribution of Transformer using Non Intrusive and Intrusive Methods (HEC)
- National Centre of Big Data and Cloud Computing (HEC)
- Prototype Development of Electronic Gas Flow Meter (RIC NUST)

Researchers are conducting world-class research across a broad range of fields, including such diverse areas as underwater research facility, robotics, non-destructive testing etc. Lists of major Research laboratories at PNEC include.

- Robotics and Dynamic Systems Research Lab
- Non-Destructive Testing Lab
- Advance Video Analytics Lab
- Power Research Lab
- Embedded System Research Lab
- Wind Tunnel Lab
- Intelligent System Lab

In 2020, PNEC has published 48 publications in research journals and 8 conference papers in proceedings of international conferences.



# Student Support Facilities

## Laboratories and Workshops

- » Applied Mechanics Laboratory
- » Fluid Mechanics Laboratory
- » Control Engineering – PLCs Laboratory
- » Thermodynamics Laboratory
- » Composite Materials Laboratory
- » Electrical Engineering Laboratory
- » Radar and Microwave Engineering Laboratory
- » Microprocessor Laboratory
- » Power Electronics Laboratory
- » Communication Engineering Laboratory
- » Computer Integrated Manufacturing Laboratory
- » Robotics and Automation Laboratory
- » Advance CAD Laboratory
- » Materials Testing Laboratory
- » Heat Treatment Laboratory
- » Innovative Product Development Laboratory
- » Work and Methods Study Lab
- » CADAM Center
- » Machine Shop
- » Boiler shop
- » Welding shop
- » Applied Chemistry Laboratory
- » Applied Physics Laboratory
- » High Performance Computing Laboratory
- » Digital Signal Processing Laboratory
- » Electronics – DSP – IC Laboratory
- » PCB Design and Development Laboratory
- » Material Science & Engineering Laboratory
- » Fitting Shop
- » UG Research Laboratory

The college library remains open round-the clock prior one month of exams. PNEC library is also connected to Pakistan Education and Research Network (PERN). From this facility library members can access thousands of research papers, research articles, E-books, E-journals and all, E-Recourses available in HEC Digital library. NUST-PNEC Library has 32000 books in the field of Engineering, Maritime Sciences, Computer Sciences, Applied Sciences and Humanities. In addition 21000 E-Books, 821 Project Reports, 442 MS Theis, 1962 CDs/ DVDs, 450 HEC Digital Library articles (softcopies) and 12 local and international magazines are available in NUST- PNEC Library

Text books are available in Book Bank section, which are issued the under graduate student for the whole semester. Continues acquisition of the latest editions of books in various engineering disciplines is made to meet the teaching and research needs of students and faculty members



## Transport

Pick and drop services to students is provided.

## Cafeterias

The College cafeteria provides hygienic food and operate throughout the day from where students can purchase refreshments.

## Counselling

PNEC students are divided into small groups of approximately 35 students in each group. Each group is supervised by a Course Officer (faculty member). These officers liaise with each other to guide and counsel students. They also update parents about their wards performances regularly. In addition, a team of Center for Career Counselling and Advisory (C3A) from NUST Islamabad regularly visit & guide the student for Career Counselling

## Accommodation & Allied Facilities

Separate hostel accommodation is available for male and female students within the College premises. These hostels are capacious and can accommodate a large number of male and female students.

These hostels have dedicated dining facilities. Besides, the College has a vast range of indoor and outdoor sports facilities, a students' cafeteria, a mosque, and a dispensary, which provides

## Internet

Internet is available round-the-clock, in all labs and offices, through a comprehensive Local Area Network with a fiber optics backbone link for fast connectivity. The entire college is networked with a common internet facility of 200 + (plus) MB bandwidth.



## Video Conferencing

The College has hi-tech video conferencing technology through PERN Video conferencing setup thus facilitating the students to attend live delivery of lectures by eminent scholars worldwide.

## Library

medical services round-the-clock with a permanently posted medical officer and the necessary paramedical staff.

## Contact Us

The College is located on Habib Ibrahim Rehmatullah Road, off Shahra-e-Faisal, in Karachi. It is approximately seven kilometers away from the City Center and Quaid-e-Azam International Airport.

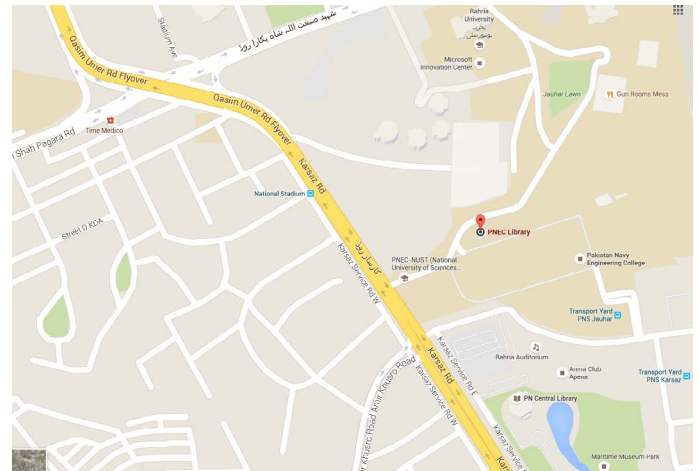
## Employability

PNEC has a Directorate of NUST Student Affairs (DNSA) which looks after the employability with up-to-date data. PNEC alumni, acting as its ambassadors, contributing in different leading engineering firms and organizations such as:

- » SUPARCO
- » SHELL
- » ENGRO
- » LOTTE Chemical Pvt Ltd
- » POWER CHINA
- » PTCL
- » K-ELECTRIC
- » HINOPAK MOTORS LTD
- » ATLAS Honda

The active member list is continuously increasing, with members contributing positively and constructively by helping out through internships and placements.

## Location Map



## Contacts

Commandant	commandant@pniec.nust.edu.pk	+92-21-99240152 / +92-21-48503001
Deputy Commandant	dc@pniec.nust.edu.pk	+92-21-48503021
Dean Maritime Sciences	dms@pniec.nust.edu.pk	+92 21 48503214
Registrar	registrar@pniec.nust.edu.pk	+92-21-48503215
Dean Electronics and Power Engineering	depe@pniec.nust.edu.pk	+92-21-99245093 / +92-21-48503024
Dean Engineering Sciences	des@pniec.nust.edu.pk	+92-21-99245084 / +92-21-48503023
Dean Industrial & Manufacturing Engineering	dime@pniec.nust.edu.pk	+92-21-992400751 / +92-21-48503039
Dean Naval Architecture	dna@pniec.nust.edu.pk	
Dean Applied Sciences	das@pniec.nust.edu.pk	+92-21.99245095 / +92-21-48503022
Training Commander	trgcdr@pniec.nust.edu.pk	+92-21-48503253
Staff Officer NUST Affairs	sona@pniec.nust.edu.pk	+92-21-99240113 / +92-21-48503043
Director Quality Assurance (DQA)	qmd@pniec.nust.edu.pk	+92-21-48503035
Civilian Students Advisor	csa@pniec.nust.edu.pk	+92-21-48503029
<b>Fax</b>	+92-21 99240112	
<b>Website</b>	www.pniec.nust.edu.pk	

# Major Events

PNEC

## Global Special Prize at Altair Global Digital Twin Contest 2021

A team of NUST students has been awarded the Global Special Prize at “Altair Global Digital Twin Contest 2021.” The team comprised Abdul Muizz Jamal and Sania Shujaat from Pakistan Navy Engineering College (PNEC), NUST, and Daud Abdullah Khan from NUST College of Electrical & Mechanical Engineering (CEME).

The contest was a digital twin Mechatronics simulation competition that tested the creativity, technical ability and presentation skills of the participants. The challenge was to create a model which involved balancing a ball and manipulating the tray so that the ball traces the outline of an image by using servo motors and control systems.



## Second position in SiMERGE 2021

A team of students from Pakistan Navy Engineering College (PNEC), NUST has secured 2nd position in SiMERGE 2021, a national case study and simulation competition by Karachi School of Business & Leadership (KSBL) and Engro Corporation. The three-day event tested the mettle of participants in core business functions of Marketing, Analytics, Finance, HR and Strategy.

The PNEC Team “OddBall” comprised of Ali Ahmed, Danyal Atif Murtaza, Sobia Khanam, Saniya Mazhar and Ayesha Quddus, from BE Electrical Batch of 2019, PNEC. The team competed with 18 teams from all over Pakistan. The team also received Rs. 100,000/- cash award and a special mention for being the only team, among the winners, with an engineering background.



## REMARKABLE PERFORMANCE OF NUST-PNEC STUDENTS IN FORMULA STUDENT UK (FSUK) COMPETITION 2020

Formula Student (FS) is Europe’s most established educational engineering competition, celebrated its 22nd anniversary in 2020. Backed by industry and high-profile engineers such as Patron, Ross Brawn OBE, the competition aims to develop enterprising and innovative young engineers and encourage more young people to take up a career in engineering.

The project usually forms part of a degree-level project and is viewed by the motorsport industry as the standard for engineering graduates to meet, transitioning them from university to the workplace. It is a kite-mark for real-world engineering experience, combining practical engineering experience with soft skills including business planning and project management. Each year, Formula Student sees over 100 university teams from around the globe travel to Silverstone to compete in static and dynamic events that will test their preparation and hard work.

Two teams from NUST-PNEC participated in 05x events of Formula Student UK (FSUK) Competition. Due to COVID-19 pandemic, competition held virtually from 21-26 July 2020. Dr. Ziauddin Siddiqui from Department of Engineering Sciences is faculty advisor of NUST Formula Student Team (NFST) and Dr. Muhammad Bilal Khan from Department of Electronics and Power Engineering is faculty advisor of Formula Electric Racing NUST (FERN). All 46 students were ready to travel to UK and Travel Visas were ready but unfortunately, due to COVID-19 competition was restricted to virtual events only.

Summary of teams and their remarkable achievement is as under:





Sr No	Team Name	Title in the Competition	Total Members	Event(s)	Achievement(s)
1	NUST Formula Student Team (NFST)	National University of Science & Technology	29	Design Event	3rd Position out of 66 teams
				Acceleration Event	3rd Position out of 34 teams
				Cost Event	10th Position out of 66 teams
				Skid Pad Event	10th Position out of 34 teams
				Business Event	32nd Position out of 66 teams
<b>Overall 7th position out of 66 teams</b>					
2	Formula Electric Racing NUST (FERN)	Pakistan Navy Engineering College	17	Design Event	44th Position out of 66 teams
				Cost Event	10th Position out of 66 teams
				Business Event	4th Position out of 66 teams
<b>Overall 21st position out of 66 teams</b>					

### Honorary Mention in Technical Innovation Award Shell Eco Marathon 2019, Malaysia

Shell Eco-marathon Asia is an annual competition held for teams in the Asia Pacific and International Circuit. 2019 competition held at Malaysia (29 April – 02 May 2019) and a seven member team participated from Pakistan Navy Engineering College NUST. Team was titled as Official Flag Bearer of Pakistan.



### Grand Champions of Unmanned Aircraft Systems (UAS) Challenge Competition 2019, Wales UK

Unmanned Aircraft Systems (UAS) Challenge Competition 2019 held at Wales UK on 16-18 June 2019. Total 32 x teams of various universities around the world participated and competed in the event. Pakistan Navy Engineering College Airworks Team Beta comprising of 15 members was declared as "Grand Champions of UAS Challenge 2019". Along with being grand champions, team won following four awards:

- Safety and Airworthiness
- Scrutineers
- Media engagement
- Best business proposal

### 1st Position in Asian Regional Rankings during Formula Student UK 2019, UK

Formula Student (FS) is Europe's most established educational engineering competition. Pakistan Navy Engineering College's 11x members Team participated in FS UK 2019 held on 17 - 21 July 2019. Total 121 x teams participated in business plan event where PNEC team won 10th position. Team achieved 1st Position in Asian Regional Rankings in the competition.



### Selection in Women Engineers Pakistan (WEP) Monthly Webinar Series 2019 New York USA

Samiya Khaliq, is an intelligent student of PNEC. In July 2019, she was granted a Summer Undergraduate Research Internship (SURP) at the Material Design and Innovation Lab at the State University of New York. Her research was about new ways to integrate machine learning to material informatics. She has also had the opportunity to learn about nano-scale material characterization techniques and their significance in material design. Samiya has been an active Women Engineers Pakistan's member for quite long time and campus ambassador of Women Engineers Pakistan at NUST-PNEC as well. While in USA, she has conducted a webinar with the CEO of Woman Engineers Pakistan on "The Role of Research Internships at Buffalo, USA. Thus inspiring many girls of her age to proceed their career in STEM.

Women Engineers Pakistan's  
MONTHLY WEBINAR SERIES  
2019

### The Importance of Research Internships



#### with Samiya Khaliq

Samiya Khaliq is a WEP veteran. She has been involved with Women Engineers Pakistan for the last few years, and throughout her undergraduate education in electrical engineering. Samiya has also set the precedent for exploring research opportunities while pursuing an undergraduate degree. Currently, she's researching the role of AI and machine learning in material informatics on nanoscale at The State University of New York, USA.

Wednesday August 14, 2019 - 6.00 pm PST LIVE



### Selection in Google Woman Techmaker Scholars Programme 2019

Maham Siddiqui is an intelligent student of PNEC. In August 2019, she was one of the 75 x Scholars selected from a pool of over 25,000 applicants and only one of the four women from Pakistan. At Google she further developed her scholarly skills and gained insights into careers at Google. She wants to share her experience with friends. She is massively talented and ambitious young women of Pakistan looking to enter in the field of Technology and innovation.



### Participation in Harvard Project for Asian and International Relations (HPAIR) – Nur-Sultan University Kazkhstan

Anum Ammad Siddiqui is an intelligent student of PNEC who participated in Harvard Project for Asian and International Relations (HPAIR) – Asia Conference held in Nur-Sultan University Kazkhstan on 16-20 August 2019. The aim and objective of (HPAIR) is to provide a dynamic forum of exchange on international issue vital to Asia and to connect the talented young leaders from around the globe with leaders in business, academia and government.

HPAIR hosts one of the largest student-run conferences in Asia every year and organized students from Harvard University and overseen by Harvard's top Asia experts. Anum Siddiqui was selected as one of the 30 x Scholars from a total of 300x delegates who were selected to take part in the conference. She was part of the 'Energy and Environmental Sustainability Track'.



### Silver Medal in 34th IEEP Multi-topic International Symposium, Pearl Continental, Karachi

IEEP Multi-topic International Symposium is the largest International Symposium of Electrical, Electronics and Allied Disciplines on Latest Trends and Technologies held at Hotel Pearl Continental, Karachi on 20-21 February 2019. 5x members PNEC student's team participated in the competition and presented Paper Titled "Design and development of battery health monitoring system using deep neural networks". The team won Silver Medal and a cash prize of Rs. 10,000/-



### Runner up award with Rs. 50,000/- cash prize in IBA INVENT Competition, IBA Karachi

The IBA Entrepreneurship Society in collaboration with Center for Entrepreneurial Development conducted a business start-up competition 'INVENT -2019' on 20 – 21 April 2019. The objective of the event was to foster a start-up friendly ecosystem for young innovators from across Pakistan.

Two members PNEC team stood Runner up and won cash prize of Rs 50,000/ -.



### 3rd position in Computer Project Exhibition and Competition (COMPPEC 2019)

A four members team from NUST PNEC titled "Brain Computer Interface" took part in an all Pakistan inter-university competition titled as "Computer Project Exhibition and Competition 2019 (COMPPEC 2019)" held at NUST EME (Rawalpindi) from 19 – 21 April 2019. The competition hosted more than 200x teams from all around Pakistan. The team won 3rd Position and was awarded with a cash prize of Rs.10,000/-.



## 1st prize in GEEKS 2019 (Exhibit of final year projects), Bahria University Karachi

The PNEC-NUST student's final year project "IOT based Structural Health Monitoring & Traffic Intelligence System for Concrete Bridges using Wireless Sensor Network" was presented in All Karachi Inter-University Open House Exhibition & Project Competition (GEEKS 2019). The students won 1st prize and cash award of Rs 15000/-



## 1st position in NASA International Space Apps Challenge, Karachi University

NASA International Space Apps Challenge held at Karachi University on 18-20 October 2019. In the competition NASA host the biggest global hackathon of the year. In this NASA opened its portal for everyone to generate solutions for the problems related to Space and Earth and gave opportunity to everyone from scientists, coders, designers, technologists, storytellers and developers from all age groups as well. Three members PNEC team won 1st position in the challenge.



## 1st position in Major Adeel Shahid Shaheed Memorial Symposium:

### Robotics & Drone Competition held at Sir Syed University of Engineering & Technology, Karachi

Major Adeel Shahid Shaheed Memorial Symposium: Robotics & Drone Competition" was held at Sir Syed University of Engineering & Technology on 18 December, 2019. Three members team from PNEC won the first prize in the competition for their project titled "Visible Light Communication". The team was appreciated by the judges who complimented their unique approach. A cash prize of Rs.10,000 was also awarded to the team along with shield and certificate.



## 32nd Virtual Convocation PNEC

To venerate the academic accomplishments of students, 32nd Virtual Convocation of the Pakistan Navy Engineering College (PNEC), a constituent college of National University of Sciences and Technology (NUST) was held on 04 December 2020 via NUST Official YouTube Channel <https://www.youtube.com/watch?v=LMApZfn3kD4>. Mr Najeeb Ghauri, Chairman & CEO of NetSol Technologies Inc. was the Chief Guest. 406 undergraduates and post graduates were awarded degrees in their respective disciplines. A total of 35 medals were awarded to the high performers in various categories. Moreover, certificates to faculty for Best Researcher, Best Teacher and Community Service were also awarded as per following details:

- Best Researcher Capt Dr Syed Sajjad Haider Zaidi PN
- Best Teacher Dr Bilal Muhammad Khan
- Community Service Cdr Abdul Rehman TI(M) PN
- Best in Academics 14 President Gold Medals
- Best Graduating PN Officer of Course 08 CNS Gold Medals
- 2nd Best Graduating PN Officer of Course 10 Chancellor Silver Medals
- Best Projects (Discipline-wise) 03 Rector Gold Medals



## Bachelors in Electrical Engineering

### Programme Description

The programme is designed to meet the dictates of modern trends in the field of electrical technology, encompassing a wider technological perspective. The programme includes basic sciences and humanities courses, electrical and microwave technology, electronics, signal processing, control systems, communications, microprocessor and computer courses, with the final semester specifically emphasising power generation, transmission, distribution and protection. The element of electrical power enables the graduate engineer to effectively take on his/her job in the power generation and distribution sector. With a significant design element of 6 credit hours for project work, students are able to apply their theoretical knowledge in research and developmental activities.

### Associated Careers

Electrical Engineering at NUST opens up numerous career paths for graduates. Students holding this degree have access to various opportunities to commence their careers as design engineers, production managers, plant engineers, and quality engineers for various private/government engineering organisations.

### Scheme of Studies

Programme Code: P 603

#### Semester-I

Course Code	Course Title	Credits	Course Code	Course Title	Credits
HU-100	English	2-0	HU-107	Pakistan Studies	2-0
CS-114	Fundamentals of Programme	2-1	MATH-121	Linear Algebra and ODEs	3-0
HU-101	Islamic Studies	2-0	ME-109	Engineering Drawing	0-2
MATH-101	Calculus and Analytical Geometry	3-0	HU-109	Communication Skills	2-0
ME-105	Workshop Practice	0-1	*ME-100	Engineering Mechanics	3-0
PHY-102	Applied Physics	2-1	*EE-211	Electrical Network Analysis	3-1
*EE-111	Linear Circuit Analysis	3-1			
	<b>Total</b>	<b>14-4</b>		<b>Total</b>	<b>13-3</b>

#### Semester-II

#### Semester-III

Course Code	Course Title	Credits	Course Code	Course Title	Credits
*CS-212	Object Oriented Programme (OOP)	3-1	EE-215	Electronic Devices and Circuits	3-1
ME-102	Thermodynamics	2-0	EE-241	Electromagnetic Field Theory	3-0
EE-221	Digital Logic Design	3-1	EE-222	Microprocessor Systems	3-1
HU-212	Technical & Business Writing	2-0	MATH-232	Complex Variable and Transforms	3-0
MATH-243	Vector Calculus	3-0	ECO-130	Engineering Economics	2-0
	<b>Total:</b>	<b>15+4=19</b>		<b>Total:</b>	<b>14-2</b>

Note: Transfer students will take one additional course EE-111 Linear Circuit Analysis (3-1) in 3rd Semester

Note: Transfer students will take one additional course (EE-211 Electrical Network Analysis (3-1) or ME-100 Engineering Mechanics (3-0)) in 4th Semester. 1x left over will be taken in next Summer.

#### Semester – V

Course Code	Course Title	Credits	Course Code	Course Title	Credits
EE-383	Instrumentation and Measurements	3-1	EE-351	Communication Systems	3-1
EE-260	Electrical Machines	3-1	EE-371	Linear Control Systems	3-1
EE-313	Electronic Circuit Design	3-1	EE-330	Digital Signal Processing	3-1

#### Semester – VI

EE-232	Signals and Systems	3-1	MATH-351	Numerical Methods	3-0
MATH-361	Probability & Statistics	3-0	EC/EE- XXX	Elective-I	3-X
	<b>Total</b>	<b>15-4</b>		<b>Total</b>	<b>15-(3+X)</b>

## Semester – VII

## Semester – VIII

Course Code	Course Title	Credits	Course Code	Course Title	Credits
OTM-455	Engineering Project Management	2-0	HU-222	Professional Ethics	2-0
EE-498	Senior Design Project-I	0-2	MGT-271	Entrepreneurship	2-0
EC/EE-XXX	Elective-II (Tfr from sem VI)	3-X	XX-XXX	University Elective	3-X
EC/EE-XXX	Elective-III	3-X	EC/EE-XXX	Elective-V	3-X
EC/EE-XXX	Elective-IV	3-X	EE-499	Senior Design Project-II	0-4
	<b>Total</b>	<b>11-(2+X)</b>		<b>Total</b>	<b>10-(4+X)</b>
<b>Grand Total</b>					<b>105+24+X (129+X)</b>

## Elective Courses

Course Code	Course Title	Credits	Course Code	Course Title	Credits
<b>Elective-I Offered in 6<sup>th</sup> Semester</b>			EE-464	Power Systems Protection	3-0
EE-317	Integrated Circuits	3-0	EE-465	Power Economics and Management	3-0
EE-321	Computer Architecture and Organization	3-1	EE-423	Embedded System Design	3-1
EE-362	Power Generation	3-0	CS-470	Machine Learning	3-0
EE-368	Power Electronics	3-1	CS-475	Computer vision	3-0
EE-352	Communication Systems II	3-1	EE-443	Electromagnetic Compatibility	3-0
EE-341	Transmission Lines, Antennas & Wave Propagation	3-1	EE-452	Satellite Communication Systems	3-0
EE-344	Wave Propagation and Antennas	3-1	EE-455	Optical Fiber Communication	3-0
SE-200	Software Engineering	3-0	EE-378	Introduction to Non-Linear Control	3-0
<b>Elective-II, III, and IV Offered in 7<sup>th</sup> Semester</b>					
EE-318	Solid State Electronics	3-0			
EE-414	Digital Electronics	3-1			
EE-364	Power Distribution and Utilization	3-0			
EE-366	Power Engineering	3-0			
EE-461	Power System Analysis and Design	3-0			
EE-363	Power Transmission	3-0			
EE-367	Electrical Power Transmission & Distribution	3-1			
EE-356	Wireless Communication	3-0			
EE-357	Computer and Communication Networks	3-1			
EE-451	Mobile Communication Systems	3-0			
EE-381	Robotics-I	3-1			
EE-384	Digital Instrumentation	3-1			
EE-385	Industrial Electronics	3-1			
EE-342	Microwave Engineering	3-1			
EE-421	Digital System Design	3-1			
EE-333	Digital Image Processing	3-0			
<b>Elective V and University Elective Offered in 8<sup>th</sup> Semester</b>					
EE-428	Industrial Process Control	3-1			
EE-365	Renewable Energy Systems	3-0			
EE-462	Electrical Machine Design & Equip. Training	3-0			

## MS/PhD in Electrical Engineering (Evening)

The Department of Electrical Engineering offers programmes leading to the Master of Science and Doctor of Philosophy degrees. Graduate study in the department is organized into following streams:

- » Control Systems
- » Signal Processing
- » Communication Systems
- » Solid State Electronics & Circuits
- » RF & Microwave MS

### MS Electrical Engineering Degree Requirements:

The student must complete a total of 30 credits and meet the requirements specified below:

- » MS students are required to take at least 3 core courses (9 Cr Hrs) out of the pool of core courses. Selection of core courses will be based on their relevance to the stream the student has been admitted to, and will be subject to prior approval of concerned Head of Department.
- » In addition to the core courses an MS Student must complete a minimum of 3 courses (9 Cr Hrs) from the list of approved EE courses, of the approved streams.
- » Furthermore, a Student will be allowed to take a maximum of 2 courses (6 Cr Hrs) from all the approved courses of other engineering and basic sciences disciplines of NUST Schools / Institutes / Colleges with prior approval of HOD.
- » However a student may, in addition to completing 6 courses(18 Cr Hrs), to fulfill the requirements specified in para (a) and (b) above, and in lieu of courses defined in para (c) above, may choose to complete the remaining 2 courses (6 Cr Hrs), by studying approved EE courses from any of the streams.

### Scheme of Studies

Programme Code: P 703/P803

Course Code	Course Title	Credits	Course Code	Course Title	Credits
EE-801	Semiconductor Device Physics	3	EE-807	Thin Film Characterization	3
EE-802	Quantum Mechanics	3	EE-808	Digital Integrated Circuit Design	3
EE-803	Physical Electronics	3	EE-809	Analog Integrated Circuit Design	3
EE-826	Advanced VLSI Design	3	EE-900	Optoelectronic Devices & Materials	3
EE-847	Microwave Networks & Passive Components	3	EE-901	Power Electronics & Electric Drives	3
EE-849	Electromagnetic Field Analysis	3	EE-902	Nano-Electronics	3
EE-851	Advanced Digital Communication Systems	3	EE-903	Advanced Semiconductor Device Theory	3
EE-852	Information & Coding Theory	3	EE-904	Microchip Fabrication Technology	3
EE-863	Power System Analysis	3	EE-905	Advanced Power Electronics	3
EE-871	Linear Control Systems	3	EE-906	Solid State Electronics	3
EE-891	Stochastic Systems	3	EE-907	Micro & Nano Fabrication	3
EE-862 EEE-800	Power System Operation & Control OR Power System Operation, Control and Optimization	3	EE-908	Ultra High Speed Nanoelectronic Devices	3
EE-823 CE-825	Advanced Digital System Design	3	EE-909	Selected Topics in Electronics	3
EE-831 CE-866	Advanced Digital Signal Processing	3	EE-898	Nanotechnology	3
EEE-801	Clean Energy Generation, Integration and Storage	3	EE-818	Micro-Electro-Mechanical Systems	3
EEE-802	Advanced Power System Stability and Transient Studies	3	EE-893	Data Acquisition & Mixed Signal Design	3
EE-877	Mobile Robotics	3	NSE-821	Nano Fabrication by Self Assembly	3
SE-807	Machine Learning	3	NSE-845	Nano Lithography and Device Fabrication	3
<b>Solid State Electronics and Circuits</b>			<b>Electro - Medical Stream</b>		
MATH-816	Applied Linear Algebra	3	MATH-816	Applied Linear Algebra	3
EE-804	Photonic Devices	3	EE-811	Biomedical Imaging	3
EE-805	Semiconductor Processing	3	EE-812	Medical Image Processing & Analysis	3
EE-806	Thin Film Processing	3	EE-813	Computational Pathology	3
			EE-814	Cardiac Signal Processing	3
			EE-815	Computational Molecular Biology	3
			EE-816	Telemedicine Systems	3
			EE-817	Tissue & Cell Engineering	3
			EE-819	Biomedical Electro Mechanical Systems	3

EE-910	Biomaterials & Drug Delivery	3
EE-919	Selected Topics in Biomedical Engineering	3
CSE-888	Computational Modeling of Physiological Systems	3
MM-895	Bio-Informatics	3
BMES-811	Signals & Images in Medicine	3
BMES-812	Medical Devices Design & Standards	3
BMES-813	Biomedical Instrumentation	3
BMES-815	Biosensors and Instrumentation	3
BMES-821	Human Physiology and Anatomy	3
BMES-833	Prosthetics and Rehabilitation	3
BMES-842	Advanced Biomaterials	3
BME-822	Selected Topics in Biomedical Engineering	3
BME-831	Bio Fluid Mechanics	3

## Digital Systems

MATH-816	Applied Linear Algebra	3
"EE-821 MTS-841"	Advanced Embedded System Design Advanced Embedded Systems	3 3
EE-822	ASIC Design Methodology	3
EE-824	Real Time Systems	3
EE-825	System Level Packaging	3
EE-827	Mixed Signal IC Design	3
EE-828	Computerized Tomography Systems	3
EE-829	Digital Data Acquisition & Control	3
EE-920	System Validation	3
EE-921	System on Chip Architecture	3
EE-922	Design of Fault-Tolerant Systems	3
EE-929	Selected Topics in Digital Systems	3
CSE-811	Advanced Computer Architecture	3
CE-820		

## Signal Processing

MATH-816	Applied Linear Algebra	3
EE-832	Pattern Recognition	3
EE-833	DSP Hardware System Design	3
EE-834	Applied Signal Processing	3
EE-835	Multirate Systems & Filter Banks	3
EE-836	Advanced Digital Image Processing	3
EE-837	Advanced Topics in Computer Vision & Image Processing	3
EE-838	Filtering & Tracking	3
EE-839	Adaptive Filters	3
EE-930	Spatial Array Processing	3
EE-931	DSP Software System Design	3
EE-932	Speech Processing	3
EE-933	Time Frequency Analysis	3
EE-939	Selected Topics in Signal Processing	
CS-867	Computer Vision	3
CE-803		

## RF & Microwave

MATH-816	Applied Linear Algebra	3
EE-840	RF MEMS: Theory and Applications	3
EE-841	Electromagnetic Theory	3
EE-842	Microwave Communication System Design	3
EE-843	Microwave Transmission Lines & Waveguides	3
EE-844	Antennas & Wave Propagation	3
EE-845	EMC/EMI	3
EE-846	Microwave Photonics	3
EE-848	Radiating Systems & Antennas	3
EE-940	Advanced RF Measurements	3
EE-941	RF Transceiver Design	3
EE-942	Microwave Integrated Circuit Design	3
EE-943	Microwave Devices I	3
EE-944	Microwave Devices II	3
EE-945	Computational Electromagnetics	3
EE-946	Advanced Antenna Theory and Design	3
EE-947	Microwave Devices & Systems	3
EE-948	Advance Electromagnetic Fields	3
EE-949	Selected Topics in Microwave Engineering	3
EE-896	Electrodynamics of Plasmas	3
EE-895	Analysis of Measurement Environment	3

## Telecommunication/Communication Systems

MATH-816	Applied Linear Algebra	3
EE-853	Advanced Wireless Communication	3
EE-854	Optical Communication Systems	3
EE-855	Error Control Coding	3
EE-856	Software Defined Radio	3
EE-857	Advanced Satellite Communication Systems	3
EE-858	Communication Project Management	3
EE-859	Performance Analysis of Communication Networks	3
EE-950	Advanced Data Communication Systems	3
EE-951	Radar Systems	3
EE-959	Selected Topics in Communication Systems	3
EE-897	Detection & Estimation	3

### Note:

1. Offering of Elective Courses in all the specialisation streams is subject to the availability of faculty and class strength.
2. PhD students will complete additional requirement of 800/900 level coursework (18 credit hours) other than the courses studied during their Masters Programme as recommended by the doctoral Guidance and Examination Committee. They would also carryout original and independent research work to produce PhD thesis (EE-999 PhD Thesis) which is a mandatory requirement for award of PhD degree.

CSE-812	RF Communication System Design	3
EE-881	Advanced Communication Networks	3
EE-882	Cognitive Radio Networks	3
EE-883	Wireless Sensor & Mesh Networks	3
EE-884	Photonic Networks	3
EE-885	Broadband Networks	3
EE-886	Advanced Wireless Networks	3
EE-887	Network Switching & Routing	3
EE-888	Advanced Computer Network Design & System Security	3
EE-889	Network and Service Management and Control	3
EE-989	Selected Topics in Networks	3
CSE-820	Advanced Computer Networks	3
CSE-879	Network Performance Analysis	3

## Power

MATH-816	Applied Linear Algebra	3
EEE-811	Electric Power Quality	3
EEE-812	Advanced Power System Protection	3
EEE-813	Computer Modelling of Electrical Power Systems	3
EEE-814	Advanced Power Electronics	3
EEE-815	Electric Power Generation Transmission and Distribution	3
EEE-816	Electric Power Markets	3
EEE-817	High Voltage Engineering	3
EE-861	Alternating Current Electrical Machines and Drives	3
ESE-803	Photovoltaic Devices	3
ESE-813	Energy Economics and Policy	3
ESE-814	Fuel Cells	3
ESE-817	Wind Energy	3
ESE-820	Energy and Environment	3
ESE-824	Nuclear Energy Engineering	3
ESE-835	Materials Science and Engineering	3
ESE-836	Li-ion and Next Generation Batteries	3
ESE-837	Electrochemical Energy Storage and Conversion	3
ESE-838	Development and Evaluation of Energy Projects	3
ESE-909	Smart Grid Architecture	3
EE-861	Alternating Current Electrical Machines and Drives	3
EE-864	Advanced Machines	3
EE-865	Power Generation Operation & Control	3
EE-969	Selected Topics in Power Systems	3

## Control Systems

MATH-816	Applied Linear Algebra	3
EE-872	Optimal Control	3
EE-873	Fuzzy Control	3
EE-874	Adaptive Control	3

EE-875	Discrete Time Control Systems	3
EE-876	Probabilistic Robotics	3
EE-877	Mobile Robotics	3
EE-878	System Identification	3
EE-879	Robust Control	3
EE-970	Advanced Robotics	3
EE-971 ME-816	"Modeling & Simulation of Dynamic Systems Modeling and Simulation of Dynamic Systems "	3 3
EE-972	Advanced Digital Control Systems	3
EE-973	Control System Optimization	3
EE-974	Networked & Embedded Control Systems	3
EE-975	Robust & Multivariable Control	3
EE-976	Optimal & Multivariable Control	3
EE-977	Nonlinear Control Systems	3
EE-978	Convex Optimization	3
EE-979	Selected Topics in Control Systems	3
EE-894	Cognitive Robotics	3
EE-892	Instrumentation & Systems	3
EM-800	Robotics - 1	3
EM-805	Robotics - 2	3
MTS-800	Advanced Robotics I	3
MTS-801	Advanced Robotics II	3
MTS-840	Data Acquisition and Control	3
ME-837	Nonlinear Dynamics	3
ME-812	Advanced Control Systems-I	3

## AI Autonomous Systems

EE-836	Advanced Digital Image Processing	3
EE-876	Probabilistic Robotics	3
EE-837	Advanced Topics in Computer Vision & Image Processing	3
EE-897	Detection & Estimation	3
EE-970	Advanced Robotics	3
EE-839	Adaptive Filters	3
EE-832	Pattern Recognition	3
EE-871	Linear Control Systems	3
EE-821	Advanced Embedded System Design	3
EE-878	System Identification	3
SE-801	Artificial Neural Networks	3
CS-867	Computer Vision	3
SYSE-804	Modeling, Simulation & Optimization	3
MATH-816	Applied Linear Algebra	3

## Energy Policy & Management

## Energy Policy & Economics Pool

CE-886	Water Resources, Economics, Planning and Management	3
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ECO-682	Economics of Environment and Natural Resources	3
ECO-704	Applied Microeconomics	3
ECO-726	Applied Econometrics	3
ECO-932	Development Policy and Planning	3
EEE-816	Electric Power Markets	3
ESE-813	Energy Economics and Policy	3
ESE-831	Energy Policy Analysis and Planning	3
ESE-838	Development and Evaluation of Energy Projects	3

### Energy Management Pool

ESE-819	Environmental Impact Assessment	3
ESE-820	Energy and Environment	3
ESE-832	Energy and Climate Change	3
ESE-833	Industrial Energy Management	3
ESE-834	Sustainable Buildings	3

### Thesis / Research

EE-899	MS Thesis	6
EEE-899	MS Thesis (MS EEP)	6
EE-999	PhD Thesis	30
RM-898	Research Methodology	2
SEM/WKSP-897	Seminar / Workshop	1
SEM/WKSP-997	Seminar / Workshop	1

### Courses of other Departments (Information / Systems / Computational & Software Engineering) approved for MS/PhD Electrical Engineering

MATH-812	Advanced Engineering Mathematics	3
MATH-816	Applied Linear Algebra	3
MATH-850	Advanced Numerical Analysis	3
IS-820	Computer Security	3
IS-822	Wireless Network Security	3
IS-827	Electronic Warfare – Principles and Techniques	3
IS-851	Secure Communications	3
IS-852	Data Communication Networks & Security	3
IS-855	Information Hiding	3
IS-863	Cellular and Mobile Network Security	3
IS-893	Micro & Nano Fabrication	3
SYSE-804	Modeling, Simulation & Optimization	3
SYSE-844	Communication System Engineering	3

SYSE-845	Advanced Communication System and Network Security	3
SYSE-861	Introduction to C4I2SR System Engineering	3
SYSE-862	Architecting C4I System of Systems	3
CS-882	Advanced Information Security	3
CSE-812	Distributed Systems and Resource Optimization	3
CSE-842	Communication Systems & Networks	3
CSE-843	Performance Analysis of Communication Systems	3
CSE-844	Performance Analysis of Networks	3
SE-801	Artificial Neural Networks	3
SE-807	Machine Learning	3
SE-808	Bio Informatics Systems	3
SE-826	Advanced Computer Network Design and System Security	3
SE-828	Network Security	3
SE-851	Wavelet Compression	3
SE-865	Human computer Interface	3
SE-898	Research Methodologies	3

# Bachelors in Mechanical Engineering

## Programme Description

The undergraduate programme is designed to inculcate a comprehensive understanding of the fundamentals of design and analysis of structural mechanics, thermodynamics, fluid mechanics and properties of materials. It attempts to provide students with broad intellectual tools and skills, essential for professional practice as well as for continuing studies in all engineering specialties. This discipline largely includes concepts of metallurgy, heat treatments and welding/cutting/other Forms of workability on materials. In a nut-shell, it is the science of taking material from market and processing it to form useful items.

## Associated Careers

Given the fact that mechanical engineering plays a vital role in almost all industries, career options are manifold. Graduates may seek careers as design engineers, production managers, plant engineers and quality engineers for various private or government engineering companies, consultancies and R&D organisations. Pakistan can benefit from this discipline, as manufacturing of spares is a regular activity at almost all of its repair and maintenance operations. This aspect also enhances the career outcomes for graduates of this programme. What further adds to its appeal is the fact that it is one of the highest paid professions in developed economies of the world.

### Programme Educational Objectives (PEOs):

PEOs are broad statements which define the goals that are aimed to be achieved by the graduates few years after their graduation from the department. These goals are set in accordance with the requirements of the Mission statements of NUST, PNEC and the department, and are primarily focused on meeting the requirements of the stakeholders. The PEOs of Mechanical Engineering Programme are as follows:

PEO-1	Apply mechanical engineering knowledge to identify and address the technical and societal problems
PEO-2	Enhance their intellectual and analytical abilities in taking initiatives and/or develop innovative ideas for technological and professional growth in mechanical engineering and allied disciplines
PEO-3	Work effectively as a team member or lead multidisciplinary teams while demonstrating the interpersonal & management skills and ethical responsibilities

## Scheme of Studies

Programme Code: P 604

### Semester-I

### Semester-II

Course Code	Course Title	Credits	Course Code	Course Title	Credits
MATH-101	Calculus & Analytical Geometry	3-0	MATH-121	Linear Algebra & ODEs	3-0
HU-100	English	2-0	ME-221	Engineering Materials	3-0
HU-107	Pakistan Studies	2-0	ME-113	Engineering Mechanics-I: Statics	3-0
CH-109	Applied Chemistry	2-0	HU-101	Islamic Studies	2-0
PHY-102	Applied Physics	2-1	HU-109	Communication Skills	2-0
CS-114	Fundamentals of Programming	2-1	ME-109	Engineering Drawing	0-2
ME-105	Workshop Practice	0-1		<b>Total</b>	<b>13-2=15</b>
	<b>Total CHs</b>	<b>13-3=16</b>			

### Semester-III

### Semester-IV

Course Code	Course Title	Credits	Course Code	Course Title	Credits
MATH-232	Complex Variables and Transforms	3-0	MATH-351	Numerical Methods	3-0
ME-230	Fluid Mechanics-I	3-0	ME-210	Mechanics of Materials-I	3-0
ME-130	Thermodynamics-I	3-0	ME-330	Fluid Mechanics-II	3-0
ME-114	Engineering Mechanics-II: Dynamics	3-0	ME-231	Thermodynamics-II	3-0
EE-103	Electrical Engineering	2-1	EE-227	Electronics Engineering	2-1
ME-223	Advanced Workshop Practice	1-1	HU-212	Technical and Business Writing	2-0
ME-211	Computer Aided Drawing	0-1	ME-337	Fluid Mechanics Lab	0-1
ME-115	Engineering Mechanics Lab	0-1	ME-232	Thermodynamics Lab	0-1
	<b>Total</b>	<b>15-4=19</b>		<b>Total</b>	<b>16-3=19</b>

## Semester-V

Course Code	Course Title	Credits	Course Code	Course Title	Credits
ME-218	Machine Design-I	3-0	ME-310	Mechanics of Machines	3-0
ME-212	Mechanics of Materials-II	3-0	ME-327	Instrumentation and Measurement	2-1
ME-331	Heat & Mass Transfer	3-0	ME-320	Machine Design-II	2-0
ME-322	Manufacturing Processes	3-1	MATH-361	Probability & Statistics	3-0
ME-325	Engineering Economics	2-0	XXX-	Technical Elective-1	2-0
ME-216	Mechanics of Materials Lab	0-1	ME-326	Heating, Ventilating and Air Conditioning	3-0
ME-339	Control Engineering	2-1	ME-332	Heat Transfer and HVAC Lab	0-1
<b>Total CHs</b>		<b>16-3=19</b>	CSL-401	Community Service Learning	0-2*
			<b>Total CHs</b>		<b>15-2=17+2*</b>

## Semester-VII

Course Code	Course Title	Credits	Course Code	Course Title	Credits
MGT-271	Entrepreneurship	2-0	HU-222	Professional Ethics	2-0
ME-411	Introduction to Finite Element Analysis	2-1	ME-420	Project Management (Management Elective)	2-0
ME-421	Mechanical Vibrations	3-0	ME-424	Health, Safety and Environment	1-0
ME-433	Mechanisms and Mechanical Vibrations Lab	0-1	XXX	Technical Elective-3	2-0
XXX	Technical Elective-2	2-0	ME-439	Internal Combustion Engines	3-0
ME-430	Power Plants	3-0	ME-431	IC Engines & Power Plants Lab	0-1
ME-499	Final Year Project-1	0-3	ME-498	Internship (Pass/Fail basis)	-
			ME-499	Final Year Project-II	0-3
<b>Total</b>		<b>12-5=17</b>	<b>Total</b>		<b>10-4=14</b>

**Grand Total 136-2\***

\*CSL-401 (0-2) is not counted towards CGPA calculation.

## Electives

Course Code	Course Title	Credits
ME-401	Fundamentals of Aerodynamics	2-0
ME-408	Applied Heat Transfer	2-0
ME-409	Applied Thermodynamics	2-0
ME-412	Automotive Technology	2-0
ME-413	Basic Naval Architecture	2-0
ME-414	Computational Fluid Dynamics	2-0
ME-415	Computer Aided Engineering	1-1
ME-416	Computer Aided Thermal System Design	1-1
ME-424	Introduction to Oil and Natural Gas Engineering	2-0
ME-429	Laser & its applications	2-0
ME-438	Mechanical Engineering Design	2-0
ME-470	Marine Environment Issues	2-0
ME-471	Optimization Techniques	2-0
ME-473	Power Generation and Distribution	2-0
ME-474	Electrical Machines	2-0
ME-475	Energy Conversion and Power Electronics	2-0
ME-476	Engine Tribology	2-0
ME-477	FEM applications in Automobile	2-0
ME-478	Finite Element Methods	2-0
ME-479	Gas Dynamics	2-0
ME-484	Gas Turbines	2-0
ME-485	Fuel Cell Technology	2-0
ME-384	Operations Management	2-0
ME-427	Operations Research	2-0
ME-486	Power Plant Engineering	2-0
ME-487	Power System Analysis	2-0
ME-488	Renewable Energy Technologies	2-0
ME-489	Robotics and Automation	2-0
ME-490	Ship Propulsion Engineering	2-0
ME-491	Solar Energy Systems	2-0
ME-492	Vehicle Design Performance	2-0
ME-493	Production Tooling & Automation	2-0
ME-496	Vehicle Dynamics	2-0
ME-497	Advanced Engineering Design	2-0
ME-498	Power Train Systems	2-0
DME-480	Automotive Manufacturing Systems	2-0

DME-481	Computer Applications in Automobile Manufacturing	2-0
DME-482	Computer Applications in Manufacturing Systems	2-0
DME-483	Industrial Maintenance Management	2-0
DME-484	Logic Design & Micro-processors	2-0
DME-485	Logistics and Inventory Management	2-0
DME-486	Ergonomics, Work Study and Methods Engineering	2-0
DME-487	FEM applications in Manufacturing	2-0
M&S-402	Introduction to Modeling and Simulation	1-1
RIME-222	Introduction to Mechatronics Design Fundamentals	2-0
ME-425	Total Quality Management	2-0
ME-428	Engineering Law	2-0

# MS/PhD in Mechanical Engineering (Evening)

**Focus Areas:** Dynamics & Control/Computational Mechanics/Product & Manufacturing Systems Design/Thermofluids

The curriculum of the programme has been developed to build upon the foundation of their mechanical engineering and technical skills learnt in their bachelor's course. A blend of coursework and research tailored to the needs of industry and students will equip the student to carry out R&D in industry or pursue a career in academia.

## Why join this programme?

Mechanical engineering is the backbone for technical development of any country. The demand for competent mechanical engineers is never satiated. This programme will enable the student to improve his knowledge as well as inculcate in him research capabilities, as well as communication skills. The faculty members are professional engineers and scientists, each actively engaged in research work in his chosen field.

## Scheme of Studies

Course Code	Course Title	Credits
MATH-812	Advanced Engineering Mathematics	3
ME-801	Optimization of Engineering Systems	3
ME-802	Finite Element Methods	3
ME-803	Continuum Mechanics	3
ME-899	MS Thesis	6

Minimum 2 courses from one stream & any Two NUST approved courses (duly recommended by the concerned department & GEC)

Course Code	Course Title	Credits
EE-873	Fuzzy Control	3
EE-977	Nonlinear Control Systems	3
EM-800	Introduction to Advanced Robotics	3
EM-806	Operations Research	3
MATH-850	Advanced Numerical Analysis	3
ME-811	Modeling & Artificial Intelligence	3
ME-812	Advanced Control Systems-I	3
ME-813	Advanced Control Systems-II	3
ME-814	Digital Control Systems	3
ME-815	Advanced Modeling & Simulation	3
ME-816	Modeling & Simulation of Dynamic Systems	3
ME-817	Advanced Theory of Vibrations	3
ME-818	Kinematics & Rigid Body Dynamics	3
ME-819	Instrumentation & Data Acquisition Systems	3
ME-820	Advanced Instrumentation and experimental methods	3
ME-831	Computational Fluid Dynamics-I	3
ME-837	Nonlinear Dynamics	3
ME-852	Rapid Prototyping, Tooling & Manufacturing	3

## Programme Code: P704/P804

ME-853	Manufacturing System Design & Management	3
ME-854	Computer Integrated Manufacturing	3
ME-898	Special Topics	3
MTS-852	Advanced Measurement Techniques	3
RM-896	Research Methodologies	3

### Computational Mechanics

EM-843	Advanced Research Methods	3
MATH-850	Advanced Numerical Analysis	3
ME-815	Advanced Modeling & Simulation	3
ME-817	Advanced Theory of Vibrations	3
ME-820	Advanced Instrumentation and experimental methods	3
ME-831	Computational Fluid Dynamics-I	3
ME-832	Parallel & Distributed Simulation for Research	3
ME-833	Computational Fluid Dynamics-II	3
ME-834	Fracture Mechanics	3
ME-835	Advanced Mechanics of Materials	3
ME-836	Theory of Elasticity	3
ME-837	Nonlinear Dynamics	3
ME-838	Advanced Stress Analysis	3
ME-839	Advanced Finite Element Analysis	3
ME-840	Computational Fluid Dynamics and Heat Transfer	3
ME-841	Finite Element Analysis of Composite	3
ME-851	Advanced Manufacturing Processes	3
ME-857	Product Design Fundamentals	3
ME-859	Mechanics of Fibre Reinforced Composites (FRC Materials)	3
ME-861	Theory of Plasticity	3
ME-874	Reliability Based Design	3
ME-881	Advanced Fluid Mechanics	3
ME-882	Heat & Mass Transfer	3
ME-883	Gas Dynamics	3

ME-898	Special Topics	3
MTS-858	Smart Materials & Structures	3
RM-896	Research Methodologies	3
<b>Product &amp; Manufacturing Systems Design</b>		
EM-806	Operations Research	3
EM-843	Advanced Research Methods	3
MATH-850	Advanced Numerical Analysis	3
ME-812	Advanced Control Systems-I	3
ME-816	Modeling & Simulation of Dynamic Systems	3
ME-818	Kinematics & Rigid Body Dynamics	3
ME-819	Instrumentation & Data Acquisition Systems	3
ME-834	Fracture Mechanics	3
ME-835	Advanced Mechanics of Materials	3
ME-836	Theory of Elasticity	3
ME-841	Finite Element Analysis of Composite	3
ME-842	Additive Manufacturing	3
ME-851	Advanced Manufacturing Processes	3
ME-852	Rapid Prototyping, Tooling & Manufacturing	3
ME-853	Manufacturing System Design & Management	3
ME-854	Computer Integrated Manufacturing	3
ME-855	Material Selection & Design	3
ME-856	Joining of Materials & Structures	3
ME-857	Product Design Fundamentals	3
ME-858	Laser Material Processing	3
ME-859	Mechanics of Fibre Reinforced Composites (FRC Materials)	3
ME-860	Form Synthesis & Stress Analysis of Machinery	3
ME-861	Theory of Plasticity	3
ME-862	Advanced Engineering Materials	3
ME-863	Product Lifecycle Management	3
ME-864	Advanced Manufacturing Technologies	3
ME-865	Lean and Agile Manufacturing	3
ME-866	Industrial Design and Human Factor	3
ME-867	Quality and Reliability Management	3
ME-868	Operations Management	3
ME-869	Project Management	3
ME-870	Supply Chain Management	3
ME-871	Product Design & Development	3
ME-874	Reliability Based Design	3
ME-875	Computer Aided Engineering Design	3
ME-876	Product Design and Development	3
ME-898	Special Topics	3
MTS-820	Advanced Manufacturing Design Techniques	3
MTS-851	Precision Manufacturing Systems	3

MTS-852	Advanced Measurement Techniques	3
MTS-858	Smart Materials & Structures	3
RM-896	Research Methodologies	3
<b>Design</b>		
EM-843	Advanced Research Methods	3
MATH-850	Advanced Numerical Analysis	3
ME-817	Advanced Theory of Vibrations	3
ME-818	Kinematics & Rigid Body Dynamics	3
ME-824	Engine Tribology	3
ME-834	Fracture Mechanics	3
ME-836	Theory of Elasticity	3
ME-837	Nonlinear Dynamics	3
ME-838	Advanced Stress Analysis	3
ME-851	Advanced Manufacturing Processes	3
ME-855	Material Selection & Design	3
ME-857	Product Design Fundamentals	3
ME-858	Laser Material Processing	3
ME-862	Advanced Engineering Materials	3
ME-865	Lean and Agile Manufacturing	3
ME-866	Industrial Design and Human Factor	3
ME-867	Quality and Reliability Management	3
ME-868	Operations Management	3
ME-869	Project Management	3
ME-870	Supply Chain Management	3
ME-871	Product Design & Development	3
ME-873	Advanced Engineering Design	3
ME-874	Reliability Based Design	3
ME-875	Computer Aided Engineering Design	3
ME-876	Product Design and Development	3
ME-898	Special Topics	3
RM-896	Research Methodologies	3
<b>Thermofluids</b>		
EM-806	Operations Research	3
MATH-850	Advanced Numerical Analysis	3
ME-816	Modeling & Simulation of Dynamic Systems	3
ME-819	Instrumentation & Data Acquisition Systems	3
ME-820	Advanced Instrumentation and experimental methods	3
ME-831	Computational Fluid Dynamics-I	3
ME-832	Parallel & Distributed Simulation for Research	3
ME-840	Computational Fluid Dynamics and Heat transfer	3
ME-855	Material Selection & Design	3
ME-858	Laser Material Processing	3
ME-881	Advanced Fluid Mechanics	3
ME-882	Heat & Mass Transfer	3
ME-883	Gas Dynamics	3
ME-884	Convection Heat Transfer	3

ME-885	Thermal System Design	3
ME-886	Power Plant Engineering	3
ME-887	Sustainable Energy Systems	3
ME-888	Radiation Heat Transfer	3
ME-889	Conduction Heat Transfer	3
ME-890	Advanced Turbo Machinery	3
ME-891	Internal Combustion Engines	3
ME-892	Advanced Propulsion	3
ME-893	Advanced Combustion	3
ME-894	Advanced Refrigeration and Airconditioning	3
ME-898	Special Topics	3
RM-896	Research Methodologies	3

### Thermal & Energy Stream

#### Core Courses

MATH-812	Advanced Engineering Mathematics	3
ME-884	Convection Heat Transfer	3
ME-881	Advanced Fluid Mechanics	3
ME-831	Computational Fluid Dynamics-I	3
ME-899	MS Thesis	6

#### Thermal Power & Fluids Engg

MATH-850	Advanced Numerical Analysis	3
ME-802	Finite Element Methods	3
ME-816	Modeling & Simulation of Dynamic Systems	3
ME-819	Instrumentation & Data Acquisition Systems	3
ME-832	Parallel & Distributed Simulation for Research	3
ME-855	Material Selection & Design	3
ME-867	Quality and Reliability Management	3
ME-869	Project Management	3
ME-883	Gas Dynamics	3
ME-885	Thermal Systems Design	3
ME-886	Power Plant Engineering	3
ME-887	Sustainable Energy Systems	3
ME-888	Radiation Heat Transfer	3
ME-889	Conduction Heat Transfer	3
ME-890	Advanced Turbo Machinery	3
ME-891	Internal Combustion Engines	3
ME-898	Special Topics	3
MEA-801	Fundamentals of Maintenance	3
MEA-802	Maintenance Planning & Control	3
MEA-803	Failure Analysis & Condition Based Maintenance	3
RM-896	Research Methodologies	3

#### Energy Systems Engg

ENV-804	Energy & Environment	3
ESE-800	Clean Coal Technologies	3
ESE-801	Biofuel Engineering	3
ESE-802	Photobioreactor Engineering & Bio-Processing	3

ESE-803	Photovoltaic Devices	3
ESE-810	Computer Applications in Energy Systems	3
ESE-811	Solar Energy	3
ESE-812	Energy Management in Buildings	3
ESE-813	Energy Economics & Policy	3
ESE-814	Fuel Cells	3
ESE-816	Development & Evaluation of Energy Projects	3
ESE-817	Wind Energy	3
ESE-818	Power Distribution Systems	3
ESE-819	Environment Impact Assessment	3
ESE-821	Energy Resources & Technologies	3
ME-898	Special Topics	3
RM-896	Research Methodologies	3

#### PhD Courses (Any Six)

ME-931	Internal Combustion Engine Technology	3
ME-932	Combustion and Pollution Chemistry	3
ME-933	Industrial Energy Management	3
ME-934	Economical Aspects of Energy Conversion	3
ME-935	Renewable Energy	3
ME-936	Solar Technologies	3
ME-937	Vehicle Design and Analysis	3
ME-938	Mechanical Vibration and Noise	3
ME-939	Mechatronics and Robotics Applications	3
ME-940	Vehicle Dynamics and Control	3
ME-941	Analytical Dynamics	3
ME-942	Advanced Stress Analysis	3
ME-943	Laser Manufacturing	3
ME-944	Special topics for PhD programme	3
ME-999	PhD Thesis	30

#### Additional Course PhD

SEM/WKSP-997	Seminar / Workshop	1
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#### Additional Courses MS

RM-898	Research Methodology	2
SEM/WKSP-897	Seminar / Workshop	1

#### Note:

- Offering of Elective Courses in all the specialisation streams is subject to the availability of faculty and class strength.
- Students to take a minimum of two courses from the corresponding stream, and maximum two courses from any other NUST approved school/college.
- For all the specialisation streams, course(s) from other departments/constituent colleges, schools or institutions of NUST, may be recommended, if considered necessary by Department of Mechanical Engineering, NUST College of E&ME.
- PhD students will complete additional requirement of 800/900 level coursework (18 credit hours) other than the courses studied during their Masters Programme as recommended by the doctoral Guidance and Examination Committee. They would also carryout original and independent research work to produce PhD thesis (ME-999 PhD Thesis) which is a mandatory requirement for award of PhD degree.

# MS/PhD in Manufacturing Engineering and Management

## Programme Description

This programme is designated to equip engineers with latest development, along with developing their managerial acumen. This is an applied programme with state-of-art manufacturing laboratories available for the students. The programme has been tailored keeping industry requirement in view.

## Associated Careers

The programme has a management perspective, thus it offers broad career opportunities for students. With the high ranking NUST enjoys in the country and around the world, this programme is an ideal launching pad for an engineer's career. This market-driven course opens a multitude of opportunities for engineers besides the canonical jobs. The development of managerial strengths in graduates enables them to meet tough market demands and provides them with stronger and more realistic growth opportunities in their professional careers.

## Scheme of Studies

Programme Code: P728/P828

### Core Courses

Course Code	Course Title	Credits
MEM-802	Production and Manufacturing Processes	3
MEM-803	Productional and Operations Management	3
MEM-804	Computer Integrated Manufacturing	3
<b>MEM-899</b>	<b>MS Thesis</b>	<b>6</b>

### Elective Courses Stream wise

#### Manufacturing Engineering

Course Code	Course Title	Credits
MEM-800	Manufacturing Strategies and Technologies	3
MEM-805	Product Development Management and Economics	3
MEM-811	Advanced Manufacturing Processes	3
MEM-812	Advanced Materials Engineering	3
MEM-813	Surface Engineering	3
MEM-814	Special Topics in Manufacturing Engineering (Introduction to Nondestructive Testing)	3
MEM-821	Manufacturing Systems Design and Management	3

#### Industrial and Engineering Management

MEM-801	Project Management	3
MEM-806	Quality and Reliability Management	3
MEM-822	Supply Chain Management	3
MEM-823	Financial Management	3
MEM-824	Leadership and Entrepreneurship	3
MEM-825	Operation Research	3
MEM-826	Special Topics in Industrial / Engineering Management	3



## General Electives

EM-843	Advanced Research Methods	3
MEM-831	Principles of CAD	3
MEM-832	Finite Element Methods	3
MEM-833	Advanced Numerical Methods	3
SE-807	Machine Learning	3

## Additional Courses

RM-898	Research Methodology	2
SEM/WKSP-897	Seminar / Workshop (for MS)	1
SEM/WKSP-997	Seminar / Workshop (for PhD)	1

## PhD Courses

Course Code	Course Title	Credits
MEM-911	High Performance Machining	3
MEM-912	Advanced Metal Forming	3
MEM-913	Recent Advances in Machining Technology	3
MEM-914	Advanced Coating Technology	3
MEM-915	Rapid prototyping and Manufacturing	3
MEM-921	Design and Analysis of Allocation Mechanism	3
MEM-922	Advanced-Topics in System Engineering	3
MEM-923	System Safety Engineering and Management	3
MEM-924	Engineering Ethics	3
MEM-925	Facility Planning and Layout	3
MEM-926	Production Planning and Control	3
MEM-927	Production Scheduling Techniques	3
MEM-928	Service Engineering	3
MEM-929	Advanced Topics in Quality Management	3
MEM-916	Advanced Materials for Engineering Components	3
MEM-917	Laser Materials Processing	2
MEM-918	Adv Maintenance Engineering & Process Improvement	3
MEM-919	Tribology & Advanced Surface Engineering	3
MEM-931	Non-linear Finite Element Methods	3
MEM-932	Modelling of Machining Operations	3
MEM-933	Modelling of Metal Forming Operations	3
MEM-981	Special topics for PhD programme (Any subject on the research interests of the faculty available)	3
<b>MEM-999</b>	<b>PhD Thesis</b>	<b>30</b>



## Programme Description

The undergraduate programme is designed to inculcate comprehensive knowledge of the fundamentals of design and analyses of ship structure, ship dynamics, ship hydrodynamics and ship synthesis. Aim is to equip students with broad intellectual tools and skills required for professional practice and continuing studies in broader domain of Naval Architecture.

## Associated Careers

This programme is aimed to help meet the HR requirements of maritime sectors besides defence sector of Pakistan in the fields of ship design and marine engineering. It is designed to prepare a pool of professionals in Pakistan to serve local as well as international marine industry and maritime institutions.

## Scheme of Studies

Programme Code: P669

### Semester-I

Course Code	Course Title	Credits
HU-100	English	2-0
CS-114	Fundamentals of Programming	2-1
MATH-101	Calculus & Analytical Geometry	3-0
PHY-102	Applied Physics	2-1
ME-105	Workshop Practice	0-1
CH-109	Applied Chemistry	2-0
HU-107	Pakistan Studies	2-0
	<b>Total CHs</b>	<b>13-3</b>

### Semester-II

Course Code	Course Title	Credits
HU-101 / HU-119*	Islamic Studies/ Islamic Studies and Quranic Learning	2-0
HU-109	Communication Skills	2-0
ME-109	Engineering Drawing	0-2
MATH-121	Linear Algebra & ODEs	3-0
ME-113	Engineering Mechanics-I Statics	3-0
NA-213	Marine Material Science & Engineering	3-0
	<b>Total CHs</b>	<b>13-2</b>

### Semester-III

Course Code	Course Title	Credits
NA-250	Marine Electrical Engineering	2-1
NA-210	Introduction to Ship Structure	3-0
ME-230	Fluid Mechanics-I	3-0
MATH-232	Complex Variables and Transforms	3-0

ME-114	Engineering Mechanics-II: Dynamics	3-0
ME-115	Engineering Mechanics Lab	0-1
ME-211	Computer Aided Drawing	0-1
	<b>Total CHs</b>	<b>14-3</b>

### Semester-IV

Course Code	Course Title	Credits
NA-211	Ship Structure I	3-0
HU-212	Technical and Business Writing	2-0
NA-212	Ship Structures Lab	0-1
NA-240	Basic Naval Architecture	3-0
NA-130	Marine Thermodynamics**	3-0
NA-231	Hydrodynamics	3-0
NA-232	Hydrodynamics Lab	0-1
NA-241	Introduction to Marine Manufacturing Processes	1-1
	<b>Total CHs</b>	<b>15-3</b>

### Semester-V

Course Code	Course Title	Credits
NA-351	Marine Control System	2-1
NA-320	Ship Hydrostatics & Stability	3-0
NA-332	Ship Resistance	3-1
NA-352	Marine Engineering	3-0
NA-321	Ship Dynamics	3-0
ME-325	Engineering Economics	2-0
CSL-401	Community Service Learning	0-2*
	<b>Total CHs</b>	<b>16-2</b>

## Semester-VI

Course Code	Course Title	Credits
NA-314	Ship Structure-II	3-0
NA-333	Ship Propulsion	3-0
NA-XXX	Technical Elective – I	2-0
NA-334	Ship Maneuvering	3-1
MATH-361	Probability and Statistics	3-0
MATH-352	Numerical Methods	2-1
NA-498	Internship(Pass/Fail basis)	-
	<b>Total CHs</b>	<b>16-2</b>

## Semester-VIII

Course Code	Course Title	Credits
HU-222	Professional Ethics	2-0
ME-XXX	Management Elective	2-0
NA-XXX	Technical Elective – 3	2-0
NA-444	Marine Fabrication Method	3-1
NA-499	Ship Design (FYP)	0-3
	<b>Total CHs</b>	<b>9-4</b>
	<b>Grand Total</b>	<b>133</b>

## Electives

Course Code	Course Title	Credits
NA-445	Submarine and Submersible Design	2-0
NA-446	Design of small Crafts	2-0
NA-435	UUV and Submarine Control and Manoeuvring	2-0
NA-447	Design of Offshore Marine Structure	2-0
NA-448	Ship Survey & Incident Investigation	2-0
NA-416	Submarine Structure	2-0
NA-336	Computational Fluid Dynamics and Marine Applications	2-0
NA-417	Advanced Marine Structures	2-0
NA-418	Design of Foundations for Marine Structures	2-0
NA-353	Ocean Environmental Engineering	2-0
NA-354	Port and Harbor Engineering	2-0
NA-355	Underwater Work Systems	2-0

## Semester-VII

Course Code	Course Title	Credits
MGT-270	Entrepreneurship	2-0
NA-415	Finite Element Methods and Marine Applications	2-1
NA-422	Ship Seakeeping	3-1
NA-XXX	Technical Elective – 2	2-0
NA-443	Ship Design and Production	2-0
NA-499	Ship Design (FYP)	0-3
NA-342	Advanced Marine Vehicle	2-0
	<b>Total CHs</b>	<b>13-5</b>

NA-456	Coastal Engineering	2-0
NA-457	Marine Production Tooling & Automation	2-0
NA-419	Advanced Marine Manufacturing Processes	2-0
ME-470	Marine Environment Issues	2-0
NA-458	Fuel Cell Technology for Marine Applications	2-0

## Management Electives

ME-384	Operations Management	2-0
ME-427	Operations Research	2-0
ME-425	Total Quality Management	2-0
ME-428	Engineering Law	2-0
ME-420	Project Management	2-0

## Programme Description

The programme is designed to provide the required knowledge and skills in Naval Architecture theory, analysis and design procedures applicable to both Naval and merchant ships. Aim is to equip students with the knowledge of core Naval Architecture subjects of marine hydrodynamics, marine dynamics and marine structure alongside a complete cycle of early stage ship designing using state of the art software, thus enabling them to get integrated into industrial ship design teams. Research skills are honed through project work undertaken in the above core specialized fields.

## Associated Careers

This programme is aimed to help meet the HR requirements of Ports and Shipping sectors besides defence sector of Pakistan in the fields of ship design and marine engineering. It is designed to prepare a pool of professionals in Pakistan to serve local as well as international marine industry and maritime institutions.

## Scheme of Studies

Programme Code: P 769

### Core Courses

Course Code	Course Title	Credits
NAE-842	Marine Hydrodynamics-I	3
NAE-850	Marine Structures-I	3
NAE-840	Advanced Marine Dynamics	3
NAE-843	Marine Hydrodynamics-II	3
NAE-899	MS Thesis	6

### Electives (Any Four)

Course Code	Course Title	Credits
NAE-845	Advanced Fluid Mechanics and Marine Applications	3
NAE-846	Computational Fluid Dynamics and Marine Applications	3
NAE-851	Marine Structures-II	3
NAE-855	Advanced Marine Materials	3
NAE-856	Advanced Marine Fabrication Methods	3
NAE-860	International Maritime Rules and Certifications	3
NAE-862	Green Ship: Principles and Technologies	3
NAE-866	Advanced Marine Vehicles	3
NAE-864	Naval Ship Conversion Design	3
NAE-875	Submarine and Submersible Design	3
NAE-868	Design of Small Craft	3
NAE-870	Ship Design	3
<b>Additional Course</b>		
RM-898	Research Methodology	2
SEM/WKSP-897	Seminar / Workshop	1

# MS Cyber Security

## (Specialisation: Communications)

### Programme Description

Ethical Hacking/ Penetration Testing/ Information System Auditing/ Digital Forensics

Master of Cyber Security is geared to teach cybersecurity theory and how to turn that theory into practice, gaining specific knowledge and skills in the areas of technology, law, policy, compliance, governance, intelligence, incident response and management. The goal is to keep pace with the information security demands of public and private sector at both local and international level.

### Associated Careers

Cybersecurity has become critical to the fabric of any modern business. As breach after breach hits the headlines, it is clear to everyone that organizations need more professionals focused on cybersecurity. This programme focuses on development of cross-disciplinary and technical skills in network security auditing, digital forensics, and penetration testing. Faculty is highly skilled in their respective areas. With an ever-expanding scope, cybersecurity presents the ultimate growth potential—both in your career path and for learning opportunities.

### Scheme of Studies

Programme Code: P 772

#### Core Courses

Course Code	Course Title	Credits
IS-820	Computer Security	3
IS-821	Network Security	3
IS-830	Information Security Management	3
IS-842	Advanced Cryptography – I	3
IS-899	MS Thesis	6

#### Elective Courses

Department will offer different combinations of following approved Elective courses:

Course Code	Course Title	Credits
CS-837	Advanced Operating Systems	3
CS-886	Number Theory	3
CS-887	Ethical Hacking	3
CS-888	Block-chain and Crypto Currencies	3
IS-822	Wireless Network Security	3
IS-823	Computer Forensics	3
IS-825	Vulnerability Exploitation and Defense	3
IS-826	Cyber Warfare	3
IS-827	Electronic Warfare – Principles and Techniques	3
IS-833	IT Security Evaluation & Auditing	3
IS-839	Critical Infrastructure Protection & Incident Management	3
IS-843	Advanced Cryptography – II	3
IS-844	Cryptanalysis	3
IS-845	Quantum Cryptography	3
IS-846	Formal Methods for Information Security	3
IS-852	Data Communication Networks & Security	3
IS-853	Cloud Computing Security	3
IS-854	Advanced Web Security	3
IS-859	Information Security Engineering	3
IS-861	Secure Electronic Commerce	3
IS-870	Network Forensics	3
IS-871	OS & File System Forensics	3
IS-874	Intrusion Detection	3
IS-880	Information Assurances	3
IS-890	Advanced Topics in Information Security	3
IS-891	Advanced Topics in Cryptology	3
IS-893	Advanced Topics in Systems Security	3
IS-895	Advanced Topics in Digital Forensics and Incident Response	3
IT-863	Internet of Things	3
IT-864	Software Defined Networking	3



**CAE**

College of Aeronautical  
Engineering

# College of Aeronautical Engineering

During the early years of Pakistan Air Force (PAF), aerospace and avionics engineers were trained abroad as the service lacked an in-country institution for aeronautical engineering. The initiative to establish facilities for educating PAF engineers to the level of at least a Bachelor's degree had to be taken by the PAF either in collaboration with one of the existing engineering institutions or by establishing its own engineering college. PAF set-up its own college at Korangi Creek, Karachi in 1965. For a concrete foundation and functioning of the College, the United States Air Force (USAF) lent the services of three qualified and experienced officers for the posts of the Principal and the Heads of the Department of Aerospace and Avionics Engineering. Colonel John H. Blakelock from USAF Institute of Technology arrived on 07 July, 1965 to be the first Principal. The first batch of students arrived at the College on 24 July, 1965 and instructions for the course started on 29 July, 1965. Graduation ceremony of the first-degree course was held on 09 November, 1968. Two USAF officers continued to serve in the faculty of the College till June, 1978. The College was initially affiliated with the University of Karachi. Later on, with the establishment of NED University of Engineering & Technology in March 1977, affiliation of the College was transferred to NED University. In 1986, CAE was relocated to Risalpur and since then it is an integral part of the PAF Academy. In 1994, the College became one of the constituent colleges of National University of Sciences and Technology (NUST), Islamabad. In 1997, MS programmes in Aerospace and Avionics Engineering commenced at CAE. In 2008, the College had undergone accreditation by the Pakistan Engineering Council (PEC). The objective of this accreditation was to ascertain that the curriculum meets the guidelines and benchmarks that have been stipulated by PEC. Outcome Based Education (OBE) programme was started at CAE in 2014 after PEC became a provisional signatory of the Washington Accord (WA) of International Engineering Alliance (IEA). BE degree programmes of CAE were successfully accredited on the basis of OBE in May, 2016. To keep pace with the international quality standards and requirements, CAE has undergone ISO 9000:2015 certification; therefore, it is also subjected to regular ISO audits to ensure conformity with the ISO standards. Currently, CAE is running two PEC accredited undergraduate programmes (BE Aerospace Engineering and BE Avionics Engineering) and six HEC approved graduate programmes (MS Aerospace, MS Avionics, MS ME, MS EE, PhD Aerospace and PhD Avionics).

## Academic Departments

The college has five academic departments:

- » Humanities & Sciences Department
- » Aerospace Engineering Department
- » Avionics Engineering Department
- » Industrial Engineering Department
- » Professional Continuing Education Department

All the departments have highly qualified faculty with rich academic, research and field experience. Most of them have acquired higher education from reputed institutions of USA, Europe, Australia and China. The research undertaken by the faculty and students comprises areas related to aerospace structures, computational fluid dynamics, communication, control, digital signal processing, microwave engineering, project management and optimisation.

### QUALITY POLICY

Commitment to make College of Aeronautical Engineering a center of excellence for quality education in the field of aeronautical engineering through an enabling environment, adaptive academic mechanisms and competent faculty.



## Faculty Profile

### Professor Dr Liaqat Ali Khan, **Commandant**

PhD (National University of Sciences & Technology) Pakistan

**Discipline:** Information Security

**Specialisation:** Information Security

### Professor Dr Jehanzeb Burki, **Dean**

PhD (Georgia Institute of Technology) USA

**Discipline:** Electrical & Computer Engineering

**Specialisation:** Radar Signal Processing, Synthetic Aperture Radar Signal Processing, Antenna Design & Analysis, Wave Propagation

### Dr Qasim Ali, **HoD PGS & Research**

PhD (University of Würzburg), Germany

**Discipline:** Control Engineering

**Specialisation:** Control and Navigation of Aerial Vehicles

### Engr Farrukh Mazhar, **Registrar**

MS (Air University) Pakistan

**Discipline:** Aerospace

**Specialisation:** Structurer

### Dr Kamran Asim

PhD (University of Michigan) USA

**Discipline:** Mechanical Engineering

**Specialisation:** Fatigue & Fracture

### Dr Zahid Mehmood, **Director LQEC**

PhD (Air University) Pakistan

**Discipline:** Mechanical Engineering

**Specialisation:** MEMS / Microsystems

### Tahir Ayub, **Director IT & Networking**

MS (University of Peshawar), Pakistan

**Discipline:** Computer Science

**Specialisation:** IT & Networking

### Zahoor Akhtar Butt, **Dy Registrar**

MA (University of Punjab) Pakistan

**Discipline:** History

**Specialization:** Indo-Pak History

## Department of Aerospace Engineering

### Dr Farooq Bin Akram, **Head of Department**

PhD (Georgia Institute of Technology) USA

**Discipline:** Aerospace Engineering

**Specialisation:** Aerospace Design, Multidisciplinary Design & Optimization.

### Engr Fareed Ahmad

MS (Institute of Material Sciences & Research) Pakistan

**Discipline:** Mechanical Engineering

**Specialisation:** Material Sciences

### Babar Shabbir

MSc Physics (Punjab University) Pakistan

**Discipline:** Aero-Sciences

**Specialisation:** Physics

### Dr Asad Hameed

PhD (Oxford University) UK

**Discipline:** Material Sciences

**Specialisation:** Material Characterization & Mechanical Behaviour"

### Dr Mohtashim Mansoor

PhD (Air University) Pakistan

**Discipline:** Aerospace Engineering

**Specialisation:** MEMS

### Dr Aamer Shehzad

PhD (University of New South Wales) AUS

**Discipline:** Mechanical Engineering

**Specialisation:** Flapping Wing Aerodynamics

### Dr Haris Ali Khan

PhD (Pennsylvania State University) USA

**Discipline:** Industrial Engineering

**Specialisation:** Manufacturing

### Dr M Nafees Mumtaz Qadri

PhD (Honk Kong Polytechnic University) Hong Kong

**Discipline:** Mechanical Engineering

**Specialisation:** Fluid Structure Interaction / Fluid

### Dr Tariq Amin

PhD (Zhejiang University) China

**Discipline:** Thermal Power Energy

**Specialisation:** Thermal Science and Engineering

### Engr Muhammad Jamil

MS (NUST CAE) Pakistan

**Discipline:** Aerospace Engineering

**Specialisation:** Aerodynamics

### Engr Waqas Razzaq

MS (Beijing University) China

**Discipline:** Aerospace Engineering

**Specialisation:** Space Propulsion

### Engr Nabeel Bhatti

MS (CAE NUST) Pakistan

**Discipline:** Aerospace Engineering

**Specialisation:** Structures

### Engr Muzaffar Habib

MS (Air University) Pakistan

**Discipline:** Aerospace Engineering

**Specialisation:** Aerodynamics (Flight Controls)

### Engr Khizer Ali Khan

MS (CAE NUST) Pakistan

**Discipline:** Aerospace Engineering

**Specialisation:** Structures

### Engr Khursheed Alam, **Lab Engineer**

BE (CAE NUST) Pakistan

**Discipline:** Aerospace Engineering

**Specialisation:** Aerospace

### Dr Omer Khan

PhD (Auburn University) USA

**Discipline:** Aerospace Engineering

**Specialisation:** Fluid Dynamics

### Dr Khawar Mohiuddin

PhD (Hanyang University) South Korea

**Discipline:** Mechanical Engineering

**Specialisation:** Propulsion

### Dr Syed Saad Javaid

PhD (Georgia Institute of Technology) USA

**Discipline:** Material Science & Engineering

**Specialisation:** Mechanical Behaviour of Materials



**Engr Adnan Maqsood**  
MS (Air University) Pakistan  
**Discipline:** Aerospace Engineering  
**Specialisation:** Fluid Dynamics

**Engr Ihtisham Khalid**  
MS (Air University) Pakistan  
**Discipline:** Aerospace  
**Specialisation:** Aerospace Vehicle Design

## Adjunct Faculty

**Dr Shuaib Salamat**  
PhD (Purdue University) USA  
**Discipline:** Micro-electronics and Nanotechnology  
**Specialisation:** Modeling and Simulation of Thermo-electric and Nano-Electric devices

**Dr Messam Abbas**  
PhD (Georgia University of Technology) USA  
**Discipline:** Aerospace Engineering  
**Specialisation:** Aircraft Design

**Dr Syed Irtiza Ali Shah**  
PhD (Georgia Institute of Technology) USA  
**Discipline:** Aerospace Engineering  
**Specialisation:** Aerial Robotics, Flight Mechanics & Control and Fluid Dynamics/ Aerodynamics

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## Department of Avionics Engineering

**Professor Dr Azhar Hassan, HOD**  
PhD (Georgia Institute of Technology), USA  
**Discipline:** Electrical and Computer Engineering  
**Specialty:** RF and Microwave

**Dr Hammad Munawar**  
PhD (Sabanci University) Turkey  
**Discipline:** Control Systems  
**Specialisation:** Autonomous Aerial and Ground Robots, Haptic Systems

**Dr Awais Munawar Qureshi**  
PhD (RCMS-NUST) Pakistan  
**Discipline:** Computational Science and Engineering  
**Specialisation:** Computational Electromagnetics

**Dr Imran Hafeez Abbasi**  
PhD (SEECS-NUST) Pakistan  
**Discipline:** Electrical Engineering  
**Specialisation:** Embedded System Security

**Dr Muhammad Muaz**  
PhD (Hong Kong)  
**Discipline:** Electronics & Information Engineering  
**Specialisation:** Statistical Signal Processing

**Engr Shafqat Ul Mulk**  
MS (University of Southampton) UK  
**Discipline:** Electrical Engineering  
**Specialisation:** Digital Design

**Engr Muhammad Asim Jan**  
MS (SEECS-NUST) Pakistan  
**Discipline:** Electrical Engineering  
**Specialisation:** Communications

**Engr Salah Ud Din**  
MS (SEECS-NUST) Pakistan  
**Discipline:** Electrical Engineering  
**Specialisation:** Control System

**Engr Muhammad Yahya**  
MS (Air University) Pakistan  
**Discipline:** Avionics Engineering  
**Specialisation:** Telecommunication

**Engr Jahanzeb Tariq Khan**  
MS (Lakehead) Canada  
**Discipline:** Control Engineering  
**Specialisation:** UAV Controls

**Engr Shahzad Arif**  
MS (Air University) Pakistan  
**Discipline:** Avionics Engineering  
**Specialisation:** Satellite Communication

**Engr Rizwana Kausar**  
MS (LUMS) Pakistan  
**Discipline:** Electrical Engineering  
**Specialisation:** Photonics and Semiconductor Devices

**Engr Aamir Fahad Malik**  
MS (NUST) Pakistan  
**Discipline:** Avionics Engineering  
**Specialisation:** Photonics

**Engr Raja Sohail**  
MS (NUST) Pakistan  
**Discipline:** Avionics Engineering  
**Specialisation:** Digital Signal Processing

**Dr Haibat Khan**  
PhD (Royal Holloway, University of London), UK  
**Discipline:** Information Security  
**Specialisation:** Privacy, Applied Cryptography, Protocol Security, Security Engineering

**Engr Husham Muhammad**  
MS (Air University), Pakistan  
**Discipline:** Avionics Engineering  
**Specialisation:** Wireless Communication

**Engr Muhammad Ali Khalid**  
BSc (UET Taxila) Pakistan  
**Discipline:** Electrical Engineering  
**Specialisation:** Power

## Department of Industrial Engineering

### Engr Muhammad Ahmad Khan, Head of Department

MS (NED UET Karachi) Pakistan

**Discipline:** Industrial & Manufacturing Engineering

**Specialisation:** Industrial & Manufacturing

### Asst Prof Ahmed Waqar Tehami

MS (NUST) Pakistan

**Discipline:** Mechanical Engineering

**Specialisation:** Computational Structural Analysis

### Muhammad Arsalan

MS (CAE NUST) Pakistan

**Discipline:** Material & Surface Engineering

**Specialisation:** Nano Thin Films

### Engr Ali Bin Naveed

MS (SMME NUST) Pakistan

**Discipline:** Design & Manufacturing Engineering, SMME

**Specialisation:** Manufacturing Engineering

### Engr Arshad Ali

BSc (UET Peshawar), Pakistan

**Discipline:** Industrial Engineering

**Specialisation:** Manufacturing Systems Engineering

## Department of Professional Continuing Education

### Engr M Irfan Aziz, HoD

MS (NUST) Pakistan

PhD (under progress)

**Discipline:** Electrical and Computer Engineering

**Specialisation:** Communication

### Muhammad Umer Qazzafi

MSc (University of Punjab) Pakistan

**Discipline:** Physics

**Specialisation:** General Physics

## Department of Humanities & Sciences

### Muhammad Ijaz, HoD

M Phil (Punjab University), Pakistan

**Discipline:** Physics

**Specialisation:** Solid State Physics

### Muhammad Amjad

M Phil (University of Leicester) UK

**Discipline:** Mathematics

**Specialisation:** Mathematical Biology

### M Kashif Ehsan

MA (Islamia University Bahawalpur), Pakistan

**Discipline:** English

**Specialisation:** Language & Literature

### Muhammad Amin

MSc (BZU), Pakistan

**Discipline:** Physics

**Specialisation:** Industrial Electronics

### Danish Ali

MS (COMSATS, Islamabad), Pakistan

**Discipline:** Mathematics

**Specialisation:** Applied Mathematics

### Muhammad Zubair Khan

MSc (University of Sargodha) Pakistan

**Discipline:** Mathematics

**Specialisation:** Applied Mathematics

### Farman Ullah

M Phil (Quaid e Azam University), Pakistan

**Discipline:** Pure Mathematics

**Specialisation:** Algebra (Rings Theory)

### Dr Muhammad Arslan Bashir

PhD (University of Karachi), Pakistan

**Discipline:** Chemistry

**Specialisation:** Organic Chemistry

### Shahid Safdar

MA (University of Sargodha), Pakistan

**Discipline:** English

**Specialisation:** Language & Literature

### Khair Ur Rehman

M Phil (QAU Islamabad) Pakistan

**Discipline:** Physics

**Specialisation:** Plasma Physics

### Dr Nasir Khan

PhD (University of Karachi), Pakistan

**Discipline:** Islamiyat

**Specialisation:** Seerat

### Shakil Aftab

MSc (Punjab University), Pakistan

**Discipline:** Mathematics

**Specialisation:** Applied Mathematics

### Muhammad Mumtaz

MSc (Islamia University), Pakistan

**Discipline:** Mathematics

**Specialisation:** Applied Mathematics

### Rab Nawaz Anwar Khan

MA (Bahauddin Zakariya University), Pakistan

**Discipline:** English

**Specialisation:** Language & Literature

### Arshad Khan

M Phil (Islamia College University) Pakistan

**Discipline:** Mathematics

**Specialisation:** Fluid Dynamics

# Student Support Facilities

## Laboratories

### Aerospace Department

- » Subsonic Wind Tunnel Lab
- » Supersonic Wind Tunnel Lab
- » Open Circuit Wind Tunnel Lab
- » Flow Visualization Lab
- » Fluid Mechanics Lab
- » Numerical Analysis Lab 1
- » Numerical Analysis Lab 2
- » CATIA Lab
- » Student Space Research Lab
- » Aerospace Vehicle Design Lab
- » Heat Transfer Lab
- » Combustion Lab
- » Thermodynamics Lab
- » Propulsion Lab
- » Material Analysis Center
- » Stress Analysis Lab
- » Material Analysis & Testing Lab
- » MEMS Lab
- » Composite Material Lab

### Avionics Department

- » Radar Lab
- » Communications Lab
- » Controls Lab
- » Avionics Systems Design Lab
- » Avionics Integration and Artificial Intelligence Lab
- » Basic Circuits Lab
- » Electrical Machines Lab
- » Antenna Lab
- » Microwave Lab
- » Flight Dynamics and Control Lab
- » Digital and Embedded Systems Lab
- » PCB Prototyping Lab
- » Digital Signals Processing Lab
- » Project Lab
- » Advanced Design System Lab
- » Thermal Imaging Lab

### Industrial Engineering Department

- » CNC Design Lab
- » CNC Machine Lab
- » Test & Measurement Lab
- » Machine Shop
- » Sheet Metal Shop
- » Electric Shop
- » Welding Shop
- » Carpenter Shop
- » Electro Discharge Machine Shop

### Humanities & Sciences Department

- » Chemistry Lab
- » Physics Lab
- » Computer Lab
- » English Language Lab

## Counselling

A tutor is appointed from the faculty for each student who acts as the local guardian and academic counselor of the student. The tutor monitors his ward's academic progress and provides him/her with assistance in dealing with personal issues that may be hampering his progress. He develops a close relationship with the student through frequent contacts in both formal and informal settings.

## Contacts

### Campus Address:

College of Aeronautical Engineering,  
PAF Academy, Risalpur, Pakistan

**Commandant:** +92-51-9280513  
+92-923-631391-7 Ext 7601

**Dean:** +92-923-631391-7 Ext 7607

**Web Site:** <http://www.nust.edu.pk>

**Email:** [cae@nust.edu.pk](mailto:cae@nust.edu.pk)

**SO NUST Affairs:** +92-923-631391-7, Ext 7613  
+92-923-631498

**Fax:** +92-937-873294

## Research and Development

Students and faculty of CAE regularly undertake projects related to Aeronautical Engineering. Our students recently completed about 100 projects with the collaboration of national organizations and local industry. CAE students regularly participate in various International / National competitions and bring laurels to the institution by achieving top positions. CAE student team was judged as first amongst the international teams in the Future Flight Design competition which was organized by the Turkish Air Force. In 2020, CAE has published 19 publications in research journals and 4 conference papers in proceedings of international conferences.

## Accommodation

### Administrative and Support Facilities

CAE is a fully residential institution where all students are provided accommodation. The conducive living environment enables the students to pursue their studies with single-mindedness. Well-furnished hostel accommodation is available in the close vicinity of the College which provides facilities for messing, accommodation, recreation and social activities. All resident members avail dining facilities where food is served as per a common menu decided by students' mess committee. Hostel also has a barber shop and a small gymnasium.

### Sport fields and Swimming pool

CAE offers opportunities to students to actively participate in sports. There are well maintained sport fields i.e. football, basketball, tennis, hockey and athletics. Moreover, facility of swimming pool is also available to students. Regular sport competitions are held at college and college teams also participate in National level competitions.

# Bachelors in Avionics Engineering (Electronics Engineering for Aviation)

## Career Opportunities

Bachelor of Avionics degree holders may seek careers as avionics, electrical or communication engineers, in the airline industry, defence-related R&D organisations or any other public or private sector organisations.

## Course Description

The Avionics Engineering programme is inter-disciplinary in nature wherein 51% (69 credit hours) pertain to subjects related to Avionics Engineering while 32% (43 credit hours) to Humanities & Sciences, 10% (13 credit hours) to Aerospace Engineering and 7% (09 credit hours) to Industrial Engineering. This inter-disciplinary composition of BE Avionics degree at CAE adds to the stature and distinction of this programme.

The Avionics Engineering Programme is designed with an objective to instil in students the knowledge and perspective appropriate both for a professional career and for pursuit of advanced degrees in the fields that rely on fundamental principles of electrical engineering. Such principles and practices include rigorous quantitative reasoning and robust engineering design. This is accomplished by ensuring that students achieve both depth and breadth of knowledge in their studies and by maintaining a high degree of flexibility in the curriculum.

This programme also seeks to provide a good preparation for life, including an ability to communicate in written and oral forms, and a desire to continue learning throughout life.

### Programme Educational Objectives (PEOs) – BE (Avionics)

For BE (Avionics), four Programme Educational Objectives (PEOs) have been defined, which are the attributes the programme graduates are expected to possess 3-5 years after graduation. The PEOs are to produce:-

- **PEO 1:** Employable graduates with the knowledge and competency in Avionics Engineering.
- **PEO 2:** Graduates demonstrating the capacity to assume social, environmental and ethical responsibility in the national and global perspective.
- **PEO 3:** Graduates with the capability to be effective team members and take a leadership role in research, design, innovation, implementation and operation of Avionics and related systems.
- **PEO 4:** Graduates who can communicate effectively and possess an enduring desire for enhancing knowledge.

### Programme Learning Outcomes (PLOs) – BE (Avionics)

- **Engineering Knowledge:** An ability to apply knowledge of mathematics, science and engineering to the solution of complex engineering problems.
- **Problem Analysis:** An ability to identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **Design/Development of Solutions:** An ability to design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
- **Investigation:** An ability to investigate complex engineering problems in a methodical way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data, and synthesis of information to derive valid conclusions.
- **Modern Tool Usage:** An ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities, with an understanding of the limitations.
- **The Engineer and Society:** An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solution to complex engineering problems.
- **Environment and Sustainability:** An ability to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
- **Ethics:** Apply ethical principles and commit professional ethics and responsibilities and norms of engineering practice.
- **Individual and Teamwork:** An ability to work effectively, as an individual or in a team, on multi-faceted and/or multidisciplinary settings.
- **Communication:** An ability to communicate effectively, orally as well as in writing, on complex engineering activities with the engineering community and with society at large. Such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **Project Management:** An ability to demonstrate management skills and apply engineering principles to one's own work, as a member and/or leader in a team, to manage projects in a multidisciplinary environment.
- **Lifelong Learning:** An ability to recognize importance of and pursue lifelong learning in the broader context of innovation and technological developments.

## Semester-I

Course Code	Course Title	Credits
MATH-101	Calculus & Analytical Geometry	3-0
PHY-108	Engineering Physics	3-1
HU-107	Pakistan Studies	2-0
IR-101	International Relations	1-0
HU-114	Functional English	3-0
CH-110	Engineering Chemistry	1-1
IE-103	Workshop Technology	1-1
OHS-101	Occupational Health and Safety	1-0
	<b>Total</b>	<b>18</b>

## Semester-II

Course Code	Course Title	Credits
MATH-121	Linear Algebra & ODE	3-0
MATH-232	Complex Variables & Transform	3-0
HU-101	Islamic Studies	2-0
AV-102	Engineering DC Circuit Analysis	2-1
MECH-101	Engineering Statics	3-0
DWG-102	Computer Aided Design	1-1
AE-101	Introduction to Aerospace	2-0
	<b>Total</b>	<b>18</b>

## Semester-III

Course Code	Course Title	Credits
MATH-243	Vector Calculus	3-0
MATH-361	Probability & Statistics	3-0
MECH-202	Engineering Dynamics	3-0
AV-203	Engineering Circuit Analysis- AC Circuits	2-1
AV-213	Digital System Logic Design	2-1
CS-201	Introduction to Computer Programming	1-1
IE-222	Industrial Instrumentation	0-1
	<b>Total</b>	<b>18</b>

## Semester-IV

Course Code	Course Title	Credits
AV-232	Electromagnetic Field Theory	2-0
AV-243	Electronic Devices & Basic Circuits	3-0
AV-262	Signal and Systems	2-0
AV-223	Introduction to Algorithm & Data Structures	1-1
AV-214	Computer System Architecture	2-0
IE-211	Engineering Economy	2-0
AERO-201	Applied Aerodynamics-I	2-0
MATH-352	Numerical Methods	2-1
	<b>Total</b>	<b>18</b>

## Semester-V

Course Code	Course Title	Credits
AV-313	Digital Signal Processing	2-1
AV-354	Analysis and Design of Control Systems	2-1
AV-335	Transmission and Waveguides	2-1
AV-342	Electronics-Integrated Circuits and OP Amp	3-1
AV-303	Electro Mechanical system	2-1
AV-323	Operating system	2-0
	<b>Total</b>	<b>18</b>

## Semester-VI

Course Code	Course Title	Credits
AV-336	Antenna Engineering	2-0
AV-355	Modern Control System	2-1
AV-314	Embedded System	2-1
AV-362	Analog and Digital Communication	3-1
AV-337	Microwave Devices	2-1
HU-304	Technical report writing	2-0
	<b>Total</b>	<b>17</b>

## Semester-VII

Course Code	Course Title	Credits
AV-492	Project-I	0-2
AV-464	Data Communication Satellite & Networks	2-1
AV-475	Radar System	2-1
AV-474	Avionics System design	2-1
IE-441	Engineering Management	2-0
HU-405	Communication Skill	2-1
AE-413	Astrodynamics	1-0
CBL-401	Character building and leadership	1-0
	<b>Total</b>	<b>18</b>

## Semester-VIII

Course Code	Course Title	Credits
AV-499	Project-II	0-4
AV-482	Emerging Aviation technologies	1-0
HU-222	Professional ethics	2-0
IE-452	Product Design & Development	2-0
CBL-402	Decision Making & Time Management	1-0
	<b>Total</b>	<b>10</b>
	<b>Grand Total</b>	<b>135</b>

# Master in Avionics Engineering

## Career Opportunities

PAF being the parent organization for CAE requires its engineers to remain abreast with the rapidly changing and fast growing technology. PAF is continually pursuing for excellence through up gradation of its fleet based on modern technology. By conducting MS at CAE, PAF can undertake indigenization through R&D projects of better quality, wider scope and classified nature. The curriculum of MS programme at CAE caters for specific defense and aviation related requirements maintaining prime focus on national interest.

## Course Description

The MS programme is leading to PhD in five specialties subject to adequate student enrolment and faculty availability, comprising of 24 credits hours of course work and 6 credit hours of thesis research. It includes 4 core courses and 4 elective courses. Each course is a 3.0 credit hour course. Typical Course Plan is presented below. Students are also required to take a leadership and/or community service seminar.

## Research Areas

The main focus of research is to benefit the areas of national interest. Research areas, relevant to Pakistan Air Force, Pakistan Aeronautical Complex, NESCOM, Defence, aviation and many industries around the country for indigenous product development and design include (but not limited to):

- » Radar signal processing systems
- » Phased array antenna
- » Airborne and ground Radar
- » Flight control systems of aircraft
- » Guidance & Navigation
- » Aerial Robotics
- » High Energy Materials
- » Image processing
- » Software Defined Radio
- » Cognitive Radio
- » Cryptographic Systems
- » Microwave Devices
- » Diagnostics and Prognostics

Programme Code: Z707

## Scheme of Studies

### Core Courses

Course Code	Course Title	Credits
AV-814	Flight Dynamics and Control	3
AV-820	Radar Signal Processing	3
EE-847	Microwave Networks and Passive Components	3
MATH-812	Advanced Engineering Math	3
AV-899	Thesis	6

### Elective Courses

General Electives		
Course Code	Course Title	Credits
EE-891	Stochastic Systems	3
EE-897	Detection and Estimation	3
AV-803	Instrumentation and Measurement for Aerospace Applications	3
SE-801	Artificial Neural Networks	3
AV-805	Avionics System Integration	3
IS-827	Electronic Warfare – Principles and Techniques	3
MATH-850	Advanced Numerical Analysis	3
EE-871	Linear Control Systems	3
EE-872	Optimal Control	3
EE-977	Non Linear Control Systems	3

AV-813	Advanced Flight Control	3
AV-815	Aircraft System Identification	3
AV-816	Navigation Systems	3
EE-979	Selected Topics in Control Systems	3
AV-822	Radar Tracking	3
AV-823	Missile Guidance	3
AV-824	Information Theory	3
EE-939	Selected Topics in Signal Processing	3
AV-831	Design and Analysis of Algorithms	3
AV-832	Optimization	3
AV-833	Introduction to Chaos	3
EE-959	Selected Topics in Communication Systems	3
AV-841	Electromagnetic Waves and Propagation	3
AV-842	Advanced Antenna Engineering	3
EE-948	Advanced Electromagnetic Fields	3
AV-845	Electro-Optics and IR Systems	3
EE-845	EMI/EMC	3
EE-945	Computational Electromagnetics	3
EE-949	Selected Topics in Microwave Engineering	3
RM-898	Research Methodology	2
SEM/ WKSP-897	Seminar/Workshop	1

IS-820	Computer Security	3	EE-950	Advanced Data Communication Systems	3
SE-828	Networks Security	3	EE-951	Radar Systems	3
IS-842	Advanced Cryptography-I	3	CSE-812	RF Communication System Design	3
IS-890	Advanced Topics in Information Security	3	CSE-820	Advanced Computer Networks	3
EM-800	Robotics – I	3	EE-886	Advanced Wireless Networks	3
RIME-913	Robotic Manipulation	3	EE-989	Selected Topics in Networks	3
CS-877	Artificial Intelligence & Machine Learning	3	EE-865	Power Generation Operation & Control	3
CE-820	Advanced Computer Architecture	3	EE-864	Advanced Machines	3
EE-823	Advanced Digital System Design	3	EE-969	Selected Topics in Power Systems	3
EE-821	Advanced Embedded System	3	EE-873	Fuzzy Control	3
EE-801	Semiconductor Device Physics	3	EE-875	Discrete Time Control Systems	3
EE-802	Quantum Mechanics	3	EE-877	Mobile Robotics	3
EE-803	Physical Electronics	3	EE-878	System Identification	3
EE-905	Advanced Power Electronics	3	EE-971	Modeling & Simulation of Dynamic Systems	3
EE-907	Micro & Nano Fabrication	3	EE-972	Advanced Digital Control Systems	3
EE-909	Selected Topics in Electronics	3	EE-973	Control System Optimization	3
EE-822	ASIC Design Methodology	3	EE-974	Networked & Embedded Control Systems	3
EE-826	Advanced VLSI Design	3	EE-975	Robust & Multivariable Control	3
EE-829	Digital Data Acquisition & Control	3	ME-837	Nonlinear Dynamics	3
EE-824	Real Time Systems	3	SYSE-804	Modeling, Simulation & Optimization	3
EE-825	System Level Packaging	3	SYSE-845	Advanced Communication System and Network Security	3
EE-827	Mixed Signal IC Design	3	CSE-812	Distributed Systems and Resource Optimization	3
EE-828	Computerized Tomography Systems	3	SE-865	Human Computer Interface	3
EE-920	System Validation	3	SYSE-861	Introduction to C4I2SR System Engineering	3
EE-921	System on Chip Architecture	3			
EE-922	Design of Fault-Tolerant Systems	3			
EE-929	Selected Topics in Digital Systems	3			
EE-831	Advanced Digital Signal Processing	3			
EE-832	Pattern Recognition	3			
EE-833	DSP Hardware System Design	3			
EE-837	Advanced Topics in Computer Vision & Image Processing	3			
EE-932	Speech Processing	3			
CS-867	Computer Vision	3			
CE-803	Computer Vision	3			
EE-842	Microwave Communication System Design	3			
EE-843	Microwave Transmission Lines & Waveguides	3			
EE-849	Electromagnetic Field Analysis	3			
EE-942	Microwave Integrated Circuit Design	3			
EE-946	RF/Microwave & Antenna Design	3			
EE-851	Advanced Digital Communication Systems	3			
EE-853	Advanced Wireless Communication	3			
EE-854	Optical Communication Systems	3			
EE-856	Software Defined Radio	3			
EE-857	Advanced Satellite Communication Systems	3			

# Master in Electrical Engineering (MS EE)

## Career Opportunities

The programme offers the opportunity for employment in the leading engineering industries of the world. Students successfully completing this postgraduate course will be able to design, develop, test and supervise the deployment of electrical systems and devices. They may subsequently utilize their knowledge to either pursue an advanced research degree or seek employment in technology companies, both local and foreign.

## Course Description

The postgraduate programme in electrical engineering aims to produce highly-skilled professionals focused on productive research and development in the vast domain of electrical engineering. The programme has been devised keeping in view the latest market demands and it encompasses a broad area covering communication, signal processing, advanced controls of robotics, RF systems, Artificial Intelligence and Machine Learning. Based on the availability of faculty, eight areas of specialisation are being offered at the department. These include Digital System, Signal Processing, RF & Microwave Engineering, Communication & Telecommunication Systems, Electrical Power Systems, Control Systems, Information Systems / Computational & Software Engineering and Artificial Intelligence & Autonomous Systems.

## Research Areas

Following are the broader area of specialisation:-

- » RF & Microwave devices
- » Autonomous Systems
- » Signal Processing
- » Embedded Systems
- » Image Processing
- » Software Define Radio
- » Cryptographic Systems
- » Hardware Security
- » Cognitive radio
- » Robotics
- » Haptics
- » Computational Electromagnetics
- » Radiating Systems & Antennas

## Scheme of Studies

Programme Code: Z703

### Core Courses

Course Code	Course Title	Credits
EE-801	Semiconductor Device Physics	3
EE-802	Quantum Mechanics	3
EE-803	Physical Electronics	3
EE-826	Advanced VLSI Design	3
EE-847	Microwave Networks and Passive Components	3
EE-849	Electromagnetic Field Analysis	3
EE-851	Advanced Digital Communication Systems	3
EE-852	Information and Coding Theory	3
EE-863	Power Systems Analysis	3
EE-871	Linear Control Systems	3
EE-891	Stochastic Systems	3
EE-862	Power System Operation and Control or	3
EEE-800	Power System Operation, Control and Optimization	
EE-823 CE-825	Advanced Digital System Design	3
EE-831 CE-866	Advanced Digital Signal Processing	3

EEE-801	Clean Energy Generation, Integration and Storage	3
EEE-802	Advanced Power System Stability and Transient Studies	3
EE-877	Mobile Robotics	3
SE-807	Machine Learning	3

### Solid State Electronics and Circuits

Course Code	Course Title	Credits
MATH 816	Applied Linear Algebra	3
EE-804	Photonic Devices	3
EE-805	Semiconductor Processing	3
EE-806	Thin Film Processing	3
EE-807	Thin Film Characterization	3
EE-808	Digital Integrated Circuit Design	3
EE-809	Analog Integrated Circuit Design	3
EE-900	Optoelectronic Devices & Materials	3
EE-901	Power Electronics & Electric Drives	3
EE-902	Nano-Electronics	3
EE-903	Advanced Semiconductor Device Theory	3



EE-904	Microchip Fabrication Technology	3
EE-905	Advanced Power Electronics	3
EE-906	Solid State Electronics	3
EE-907	Micro & Nano Fabrication	3
EE-908	Ultra High Speed Nanoelectronic Devices	3
EE-909	Selected Topics in Electronics	3
EE-898	Nanotechnology	3
EE-818	Micro-Electro-Mechanical Systems	3
EE-893	Data Acquisition & Mixed Signal Design	3
NSE-821	Nano Fabrication by Self Assembly	3
NSE-845	Nano Lithography and Device Fabrication	3

## Electro-Medical Stream

Course Code	Course Title	Credits
MATH 816	Applied Linear Algebra	3
EE-811	Biomedical Imaging	3
EE-812	Medical Image Processing & Analysis	3
EE-813	Computational Pathology	3
EE-814	Cardiac Signal Processing	3
EE-815	Computational Molecular Biology	3
EE-816	Telemedicine Systems	3
EE-817	Tissue & Cell Engineering	3
EE-819	Biomedical Electro Mechanical Systems	3
EE-910	Biomaterials & Drug Delivery	3
EE-919	Selected Topics in Biomedical Engineering	3
CSE-888	Computational Modeling of Physiological Systems	3
MM-895	Bio-Informatics	3
BMES-811	Signals & Images in Medicine	3
BMES-812	Medical Devices Design & Standards	3
BMES-813	Biomedical Instrumentation	3
BMES-815	Biosensors and Instrumentation	3
BMES-821	Human Physiology and Anatomy	3
BMES-833	Prosthetics and Rehabilitation	3
BMES-842	Advanced Biomaterials	3
BME-822	Selected Topics in Biomedical Engineering	3
BME-831	Bio Fluid Mechanics	3

## Digital Systems

Course Code	Course Title	Credits
MATH-816	Applied Linear Algebra	3
EE-821	Advanced Embedded System Design	3
MTS-841	Advanced Embedded Systems	3
EE-822	ASIC Design Methodology	3
EE-823	Advanced Digital System Design	3
CE-825		

EE-824	Real Time Systems	3
EE-825	System Level Packaging	3
EE-826	Advanced VLSI Design	3
EE-827	Mixed Signal IC Design	3
EE-828	Computerized Tomography Systems	3
EE-829	Digital Data Acquisition & Control	3
EE-920	System Validation	3
EE-921	System on Chip Architecture	3
EE-922	Design of Fault-Tolerant Systems	3
EE-929	Selected Topics in Digital Systems	3
CSE-811	Advanced Computer Architecture	3
CE-820		

## Signal Processing

Course Code	Course Title	Credits
MATH-816	Applied Linear Algebra	3
EE-832	Pattern Recognition	3
EE-833	DSP Hardware System Design	3
EE-834	Applied Signal Processing	3
EE-835	Multirate Systems & Filter Banks	3
EE-836	Advanced Digital Image Processing	3
EE-837	Advanced Topics in Computer Vision & Image Processing	3
EE-838	Filtering & Tracking	3
EE-839	Adaptive Filters	3
EE-930	Spatial Array Processing	3
EE-931	DSP Software System Design	3
EE-932	Speech Processing	3
EE-933	Time Frequency Analysis	3
EE-939	Selected Topics in Signal Processing	3
CS-867	Computer Vision	3
CE-803		

## RF & Microwave

Course Code	Course Title	Credits
MATH-816	Applied Linear Algebra	3
EE-840	RF MEMS: Theory and Applications	3
EE-841	Electromagnetic Theory	3
EE-842	Microwave Communication System Design	3
EE-843	Microwave Transmission Lines & Waveguides	3
EE-844	Antennas & Wave Propagation	3
EE-845	EMC/EMI	3
EE-846	Microwave Photonics	3
EE-848	Radiating Systems & Antennas	3
EE-940	Advanced RF Measurements	3
EE-941	RF Transceiver Design	3
EE-942	Microwave Integrated Circuit Design	3
EE-943	Microwave Devices I	3
EE-944	Microwave Devices II	3

EE-945	Computational Electromagnetics	3
EE-946	Advanced Antenna Theory and Design	3
EE-947	Microwave Devices & Systems	3
EE-948	Advance Electromagnetic Fields	3
EE-949	Selected Topics in Microwave Engineering	3
EE-896	Electrodynamics of Plasmas	3
EE-895	Analysis of Measurement Environment	3

## Telecommunication / Communication Systems

Course Code	Course Title	Credits
MATH-816	Applied Linear Algebra	3
EE-853	Advanced Wireless Communication	3
EE-854	Optical Communication Systems	3
EE-855	Error Control Coding	3
EE-856	Software Defined Radio	3
EE-857	Advanced Satellite Communication Systems	3
EE-858	Communication Project Management	3
EE-859	Performance Analysis of Communication Networks	3
EE-950	Advanced Data Communication Systems	3
EE-951	Radar Systems	3
EE-959	Selected Topics in Communication Systems	3
EE-897	Detection & Estimation	3
CSE-812	RF Communication System Design	3
EE-881	Advanced Communication Network	3
EE-882	Cognitive Radio Network	3
EE-883	Wireless Sensor & Mesh Networks	3
EE-884	Photonic Networks	3
EE-885	Broadband Networks	3
EE-886	Advanced Wireless Networks	3
EE-887	Network Switching & Routing	3
EE-888	Advanced Computer Network Design & System Security	3
EE-889	Network and Service Management and Control	3
EE-989	Selected Topics in Networks	3
CSE-820	Advanced Computer Networks	3
CSE-879	Network Performance Analysis	3

## Power Systems

Course Code	Course Title	Credits
MATH-816	Applied Linear Algebra	3
EEE-811	Electric Power Quality	3
EEE-812	Advanced Power System Protection	3

EEE-813	Computer Modelling of Electrical Power Systems	3
EEE-814	Advanced Power Electronics	3
EEE-815	Electric Power Generation Transmission and Distribution	3
EEE-816	Electric Power Markets	3
EEE-817	High Voltage Engineering	3
EE-861	Alternating Current Electrical Machines and Drives	3
ESE-803	Photovoltaic Devices	3
ESE-813	Energy Economics and Policy	3
ESE-814	Fuel Cells	3
ESE-817	Wind Energy	3
ESE-820	Energy and Environment	3
ESE-824	Nuclear Energy Engineering	3
ESE-835	Materials Science and Engineering	3
ESE-836	Li-ion and Next Generation Batteries	3
ESE-837	Electrochemical Energy Storage and Conversion	3
ESE-838	Development and Evaluation of Energy Projects	3
ESE-909	Smart Grid Architecture	3
EE-864	Advanced Machines	3
EE-865	Power Generation Operation & Control	3
EE-969	Selected Topics in Power Systems	3

## Control

Course Code	Course Title	Credits
MATH-816	Applied Linear Algebra	3
EEE-811	Electric Power Quality	3
EEE-812	Advanced Power System Protection	3
EEE-813	Computer Modelling of Electrical Power Systems	3
EEE-814	Advanced Power Electronics	3
EEE-815	Electric Power Generation Transmission and Distribution	3
EEE-816	Electric Power Markets	3
EEE-817	High Voltage Engineering	3
EE-861	Alternating Current Electrical Machines and Drives	3
ESE-803	Photovoltaic Devices	3
ESE-813	Energy Economics and Policy	3
ESE-814	Fuel Cells	3
ESE-817	Wind Energy	3
ESE-820	Energy and Environment	3
ESE-824	Nuclear Energy Engineering	3
ESE-835	Materials Science and Engineering	3
ESE-836	Li-ion and Next Generation Batteries	3
ESE-837	Electrochemical Energy Storage and Conversion	3

ESE-838	Development and Evaluation of Energy Projects	3
ESE-909	Smart Grid Architecture	3
EE-864	Advanced Machines	3
EE-865	Power Generation Operation & Control	3
EE-969	Selected Topics in Power Systems	3

## Control Systems

Course Code	Course Title	Credits
MATH-816	Applied Linear Algebra	3
EE-872	Optimal Control	3
EE-873	Fuzzy Control	3
EE-874	Adaptive Control	3
EE-875	Discrete Time Control Systems	3
EE-876	Probabilistic Robotics	3
EE-877	Mobile Robotics	3
EE-878	System Identification	3
EE-879	Robust Control	3
EE-970	Advanced Robotics	3
EE-971	Modeling & Simulation of Dynamic Systems	3
ME-816	Modeling and Simulation of Dynamic Systems	3
EE-972	Advanced Digital Control Systems	3
EE-973	Control System Optimization	3
EE-974	Networked & Embedded Control Systems	3
EE-975	Robust & Multivariable Control	3
EE-976	Optimal & Multivariable Control	3
EE-977	Nonlinear Control Systems	3
EE-978	Convex Optimization	3
EE-979	Selected Topics in Control Systems	3
EE-894	Cognitive Robotics	3
EE-892	Instrumentation & Systems	3
EM-800	Robotics - 1	3
EM-805	Robotics - 2	3
MTS-800	Advanced Robotics I	3
MTS-801	Advanced Robotics II	3
MTS-840	Data Acquisition and Control	3
ME-837	Nonlinear Dynamics	3
ME-812	Advanced Control Systems-I	3

## AI & Autonomous Systems

Course Code	Course Title	Credits
EE-836	Advanced Digital Image Processing	3
EE-876	Probabilistic Robotics	3
EE-837	Advanced Topics in Computer Vision & Image Processing	3
EE-897	Detection & Estimation	3

EE-970	Advanced Robotics	3
EE-839	Adaptive Filters	3
EE-832	Pattern Recognition	3
EE-871	Linear Control Systems	3
EE-821	Advanced Embedded System Design	3
EE-878	System Identification	3
SE-801	Artificial Neural Networks	3
CS-867	Computer Vision	3
SYSE-804	Modeling, Simulation & Optimization	3
MATH-816	Applied Linear Algebra	3

## Energy Policy & Management

Course Code	Course Title	Credits
CE-886	Water Resources, Economics, Planning and Management	3
ECO-682	Economics of Environment and Natural Resources	3
ECO-704	Applied Microeconomics	3
ECO-726	Applied Econometrics	3
ECO-932	Development Policy and Planning	3
EEE-816	Electric Power Markets	3
ESE-813	Energy Economics and Policy	3
ESE-831	Energy Policy Analysis and Planning	3
ESE-838	Development and Evaluation of Energy Projects	3

## Energy Management Pool

Course Code	Course Title	Credits
ESE-819	Environmental Impact Assessment	3
ESE-820	Energy and Environment	3
ESE-832	Energy and Climate Change	3
ESE-833	Industrial Energy Management	3
ESE-834	Sustainable Buildings	3

## Thesis / Research

Course Code	Course Title	Credits
EE-899	MS Thesis	6
EEE-899	MS Thesis (MS EEP)	6
EE-999	PhD Thesis	30
RM-898	Research Methodology	2
SEM/ WKSP-897	Seminar / Workshop	1
SEM/ WKSP-997	Seminar / Workshop	1

## Information / Systems / Computational & Software Engineering

CAE

Course Code	Course Title	Credits
MATH-812	Advanced Engineering Mathematics	3
MATH-816	Applied Linear Algebra	3
MATH-850	Advanced Numerical Analysis	3
IS-820	Computer Security	3
IS-822	Wireless Network Security	3
IS-827	Electronic Warfare – Principles and Techniques	3
IS-851	Secure Communications	3
IS-852	Data Communication Networks & Security	3
IS-855	Information Hiding	3
IS-863	Cellular and Mobile Network Security	3
IS-893	Micro & Nano Fabrication	3
SYSE-804	Modeling, Simulation & Optimization	3
SYSE-844	Communication System Engineering	3
SYSE-845	Advanced Communication System and Network Security	3
SYSE-861	Introduction to C4I2SR System Engineering	3
SYSE-862	Architecting C4I System of Systems	3
CS-882	Advanced Information Security	3
CSE-812	Distributed Systems and Resource Optimization	3
CSE-842	Communication Systems & Networks	3
CSE-843	Performance Analysis of Communication Systems	3
CSE-844	Performance Analysis of Networks	3
SE-801	Artificial Neural Networks	3
SE-807	Machine Learning	3
SE-808	Bio Informatics Systems	3
SE-826	Advanced Computer Network Design and System Security	3
SE-828	Network Security	3
SE-851	Wavelet Compression	3
SE-865	Human computer Interface	3
SE-898	Research Methodologies	3

# PhD in Avionics Engineering

## Course Description

PhD at CAE (Avionics Dept) is a 3-8 year programme. The students are required to undertake 18 credit hours coursework of 800/900 level in addition to the pre-requisite specified for the programme. In addition to the coursework, all doctoral students must register for at least 30 credits of doctoral research. These 18 credit hours are the courses which have not been counted towards any other degree. The GEC may specify additional subjects to be taken by the PhD student, if considered essential. These shall be notified as "Additional Courses" and shall not be counted towards calculation of CGPA. Minimum cumulative GPA of 3.5 out of 4.0 is required in the 18 credit hours of 800/900 level courses which are counted towards PhD. Coursework with required CGPA should be completed preferably within one year of enrolment for PhD. Maximum allowable time to complete the coursework is 18 months.

## PhD Qualifying Examination

After successful completion of 800/900 level courses (to be counted towards his PhD) with a minimum cumulative GPA of 3.5 out of 4.0, the student takes a qualifying/ comprehensive examination in the subjects specified by the GEC. The qualifying examination is conducted as soon as possible after completion of the coursework but, in any case, it is not delayed for more than 4 months. Each student must pass a PhD qualifying exam.

## Research Areas

Following are the broader areas of specialisation:

- » Radar Signal Processing
- » Air Borne and Ground Radar
- » Guidance and Navigation
- » Image Processing
- » RF MEMS
- » High Performance Computing Systems
- » Software Defined Radios
- » Microwave devices
- » High Energy Materials
- » Phased Array Antenna
- » Flight Control Systems
- » Aerial Robotics
- » Computer Vision
- » Computer Architecture
- » Artificial Intelligence
- » Cognitive Radio
- » Diagnostics and Prognostics

## Scheme of Studies

Programme Code: Z807

PhD Courses		
900 Level Courses		
Course Code	Course Title	Credits
AV-881	Machine Vision	3
AV-980	Advanced Topics in Machine/ Computer Vision	3
AV-950	Advanced Topics in Radar Engineering	3
AV-960	Advanced Topics in Micro-Electronics	3
AV-970	Advanced Topics in Micro and Nano Systems	3
EE-977	Non Linear Control Systems	3
EE-979	Selected Topics in Control Systems	3
EE-939	Selected Topics in Signal Processing	3
EE-959	Selected Topics in Communication Systems	3
EE-948	Advanced Electromagnetic Fields	3
EE-945	Computational Electromagnetics	3
EE-949	Selected Topics in Microwave Engineering	3
RIME-913	Robotic Manipulation	3
EE-905	Advanced Power Electronics	3
EE-907	Micro & Nano Fabrication	3

EE-909	Selected Topics in Electronics	3
EE-920	System Validation	3
EE-921	System on Chip Architecture	3
EE-922	Design of Fault-Tolerant Systems	3
EE-929	Selected Topics in Digital Systems	3
EE-932	Speech Processing	3
EE-942	Microwave Integrated Circuit Design	3
EE-946	RF/Microwave & Antenna Design	3
EE-950	Advanced Data Communication Systems	3
EE-951	Radar Systems	3
EE-989	Selected Topics in Networks	3
EE-969	Selected Topics in Power Systems	3
EE-971	Modeling & Simulation of Dynamic Systems	3
EE-972	Advanced Digital Control Systems	3
EE-973	Control System Optimization	3
EE-974	Networked & Embedded Control Systems	3
EE-975	Robust & Multivariable Control	3
<b>AV-999</b>	<b>PhD Thesis</b>	<b>30</b>

All 800 Level courses as approved under the MS Avionics Engineering

## Bachelors in Aerospace Engineering (Mechanical Engineering for Aviation)

### Course Description

The Aerospace Engineering programme is inter-disciplinary in nature wherein 55% (74 credit hours) pertain to subjects related to Aerospace Engineering while 31% (41 credit hours) to Humanities & Sciences, 8% (11 credit hours) to Industrial Engineering and 6% (8 credit hours) to Avionics Engineering. This inter-disciplinary composition of BE Aerospace degree at CAE adds to the stature and distinction of this programme.

### Career Opportunities

Bachelor of Aerospace degree holders may seek careers as aerospace, mechanical or design engineers, in airline industry, defence-related R&D organisations or any other public or private sector organisations.

#### Programme Educational Objectives (PEOs) – BE (Aerospace)

- **PEO 1:** Employable graduates with the knowledge and competency in Aerospace Engineering.
- **PEO 2:** Graduates demonstrating the capacity to assume social, environmental, and ethical responsibility in the national and global perspective.
- **PEO 3:** Graduates with the capability to be effective team members and take a leadership role in research, design, innovation, implementation, and operation of Aerospace and related systems.
- **PEO 4:** Graduates who can communicate effectively and possess an enduring desire for enhancing knowledge.

#### Programme Learning Outcomes (PLOs) – BE (Aerospace)

- **Engineering Knowledge:** Ability to apply knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems.
- **Problem Analysis:** Ability to identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions. Achieving aforesaid by using first principles of mathematics, natural sciences, and engineering sciences.
- **Design/Development of Solutions:** Ability to design solutions for complex engineering problems and design systems, components, or processes that meet specified needs with appropriate consideration for public health, safety, cultural, societal, and environmental considerations.
- **Investigation:** Ability to investigate complex engineering problems in a methodical way including literature survey, design, and conduct of experiments. Analysis and interpretation of experimental data and synthesis of the information to derive valid conclusions.
- **Modern Tool Usage:** Ability to create, select, and apply appropriate techniques, resources, modern engineering, and IT tools. This includes the prediction and modelling of complex engineering activities with an understanding of the limitations.
- **The Engineer and Society:** Ability to apply to reason informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues. The consequent responsibilities are relevant to professional engineering practice and solutions to complex engineering problems.
- **Environment and Sustainability:** Ability to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
- **Ethics:** Apply ethical principles and commit professional ethics, responsibilities, and norms of engineering practice.
- **Individual and Teamwork:** Ability to work effectively, as an individual or in a team, on multifaceted and/or multidisciplinary settings.
- **Communication:** Ability to communicate effectively, orally as well as in writing, on complex engineering activities with the engineering community and with society at large. Graduate students are expected to comprehend, write effective reports and design documentation, make effective presentations, and give/receive clear instructions.
- **Project Management:** Ability to demonstrate management skills and apply engineering principles to one's work, as a member and/or leader in a team, to manage projects in a multi-disciplinary environment.
- **Lifelong Learning:** Ability to recognize the importance and pursue lifelong learning in the broader context of innovation and technological developments.



## Semester-I

Course Code	Course Title	Credits
MATH-101	Calculus & Analytical Geometry	3-0
PHY-108	Engineering Physics	3-1
HU-107	Pakistan Studies	2-0
IR-101	International Relations	1-0
HU-114	Functional English	3-0
CH-110	Engineering Chemistry	1-1
IE-103	Workshop Technology	1-1
OHS-101	Occupational Health and Safety	1-0
	<b>Total</b>	<b>18</b>

## Semester-II

Course Code	Course Title	Credits
MATH-121	Linear Algebra & ODE	3-0
MATH-232	Complex Variables & Transform	3-0
HU-101	Islamic Studies	2-0
AV-102	Engineering DC Circuit Analysis	2-1
MECH-101	Engineering Statics	3-0
DWG-102	Computer Aided Design	1-1
AE-101	Introduction to Aerospace	2-0
	<b>Total</b>	<b>18</b>

## Semester-III

Course Code	Course Title	Credits
MATH-243	Vector Calculus (Elective)	3-0
MATH-361	Probability & Statistics	3-0
MECH-202	Engineering Dynamics	3-0
ME-203	Thermodynamics-I	2-0
AERO-212	Fluid Mechanics & Applied Aerodynamics	3-1
CS-201	Intro to Computer Programming	1-1
	<b>Total</b>	<b>17</b>

## Semester-IV

Course Code	Course Title	Credits
ME-207	Thermodynamics-II	3-0
AERO-221	High Speed Aerodynamics	3-0
MECH-204	Material Science & Engineering	2-0
STR-202	Mechanics of Materials	3-0
MATH-352	Numerical Methods	2-1
IE-211	Engg Economy	2-0
AV-204	Electrical Circuits and Machines	1-1
	<b>Total</b>	<b>18</b>

## Semester-V

Course Code	Course Title	Credits
ME-305	Heat Transfer	3-1
AERO-321	Aircraft Performance	3-0
AERO-314	Intro to Rotorcraft Dynamics	2-0
STR-305	Aircraft Loading & Structural Analysis	3-1
IE-321	Computer Aided Instrumentation	1-1
AV-356	Feedback Control Systems	2-1
	<b>Total</b>	<b>18</b>

## Semester-VI

Course Code	Course Title	Credits
ME-306	Propulsion & Turbo machinery	3-1
AERO-322	Aircraft Stability & Controls	3-0
AERO-331	Wind Tunnel Testing	0-1
STR-303	Structural Vibrations & Aeroelasticity	3-0
STR-306	Computational Structural Analysis	3-1
IE-303	Manufacturing Practices & CNC Machines	0-1
HU-304	Technical Report Writing	2-0
	<b>Total</b>	<b>18</b>

## Semester-VII

Course Code	Course Title	Credits
AE-492	Project-I	0-2
AE-432	Intro to CFD	1-1
AERO-441	Aerospace Vehicle Design	2-2
STR-441	Structure & Machine Design	3-0
IE-441	Engineering Management	2-0
HU-405	Communication Skills	2-1
AE-413	Astroynamics	1-0
CBL-401	Character Building & Leadership	1-0
	<b>Total</b>	<b>18</b>

## Semester-VIII

Course Code	Course Title	Credits
AE-499	Project-II	0-4
AE-482	Emerging Aerospace Technologies	1-0
HU-222	Professional Ethics	2-0
IE-452	Product Design & Development	2-0
CBL-402	Decision Making and Time Management	1-0
	<b>Total</b>	<b>10</b>
	<b>Grand Total</b>	<b>135</b>

# Master in Aerospace Engineering

## Career Opportunities

The Master of Aerospace Engineering degree holders may seek careers as Aerospace, Mechanical or Design Engineers in airline industry, R&D organizations or any other public or private sector organizations.

## Course Description

The MS Programme is leading to PhD initially in two specialties (Solid Mechanics / Structural Design & Analysis & Fluid Dynamics / Aerodynamics), extendable to four specialties subject to adequate student enrolment and faculty availability. The programme constitutes 24 credits hours of course work and 6 credit hours of thesis research. It will include 4 core courses and 4 elective courses. Each course is of 3.0 credit hours. The courses of each of the four streams are presented as follows. Students will also be required to take a research methodology course before starting research.

## Research Areas

The main focus of research will be the areas of national interest. Research areas, relevant to aviation and other industries in the country for indigenous product development and design, which includes, but not limited to following areas:-

- » Aircraft Aerodynamics Design
- » Methods & Analysis of Structures
- » Computational Fluid Dynamics
- » Compressible & Incompressible Aerodynamics
- » FEA Design & Analysis
- » Solid Mechanics
- » Advanced Composites
- » Aerospace Materials
- » Mechanical Behaviour of Materials
- » Fluid-Structure Interactions
- » Flight Stability and Controls
- » Aircraft Propulsion
- » Turbo Machinery
- » Aero-acoustics
- » Alternate Energy
- » Heat Transfer
- » Advanced Vibrations
- » High Energy Materials

## Scheme of Studies

Programme Code: Z706

### Core Courses

Course Code	Course Title	Credits
AE-821	Advanced Aerodynamics – I : Incompressible Flows	3
CSE-802	Turbo Machinery	3
MATH-812	Advanced Engineering Mathematics	3
CSE-834	Theory of Electricity	3
<b>AE-899</b>	<b>MS Thesis</b>	<b>6</b>

### Elective Courses

#### Solid Mechanics Structure

Course Code	Course Title	Credits
AE-810	Advanced Topics in Aerospace Structures	3
AE-811	Advanced Mechanics of Composites	3
AE-812	Advanced / Experimental Stress Analysis	3
AE-813	Design and Analysis of Aerospace Structures	3

#### Fluid Dynamics / Aerodynamics

Course Code	Course Title	Credits
AE-820	Advanced Topics in Aerodynamics / Fluid Dynamics	3
AE-822	Advanced Aerodynamics – II : Compressible Flows	3
AE-823	Viscous Flow	3
AE-824	Turbulent Fluid Flow	3



## Thermodynamics / Propulsion

Course Code	Course Title	Credits
AE-831	Rocket Propulsion	3
AE-832	Advanced Aerothermodynamics	3
AE-833	Advanced Topics in Aerospace Propulsion	3

## Mechanics / Flight Dynamics

Course Code	Course Title	Credits
AE-841	Advanced Flight Dynamics & Control	3
AE-842	Guidance and Navigation of Aerospace Vehicles	3
AE-843	Aerospace Vehicle Dynamics and Control	3
AE-844	Optimal Control	3
AE-845	Inertial and Integrated Navigation System	3
AE-846	Modern Feedback Control Theory	3
AE-847	Advanced Topics in Flight Dynamics & Control	3

## General Electives

Course Code	Course Title	Credits
MATH-813	Data Analytics (Advanced Numerical Techniques)	3
IE-801	Industrial Management & System Engineering	3
ME-810	Principles of Control Systems	3
CE-801	Advanced Structural Mechanics	3
CE-809	Structural Dynamics	3
CSE-831	Finite Element Methods	3
CSE-834	Theory of Elasticity	3
CSE-903	Advanced Heat Transfer	3
EM-806	Operations Research	3
MATH-850	Advanced Numerical Analysis	3
ME-803	Continuum Mechanics	3
ME-815	Advanced Mechanics of Materials	3
ME-819	Instrumentation & Data Acquisition Systems	3
ME-820	Advanced Instrumentation and Experimental Methods	3
ME-831	Computational Fluid Dynamics – I	3
ME-833	Computational Fluid Dynamics – II	3

## Additional Courses

Course Code	Course Title	Credits
RM-898	Research Methodology	2
SEM/WKSP-897	Seminar / Workshop	1

## Design / Optimization

Course Code	Course Title	Credits
AE-850	Advanced Topics in Aerospace Design	
AE-851	Aerospace Vehicle Design	
AE-852	Multidisciplinary Design Optimization for Aerospace Vehicles	

## Mechanics of Materials

Course Code	Course Title	Credits
AE-860	Advanced Topics in Aerospace Materials	3
AE-861	Mechanical Behaviour of Materials	3
AE-862	Advanced Topics in Aerospace Manufacturing	3

## MEMS

Course Code	Course Title	Credits
AE-891	Micro-Electro-Mechanical-Systems (MEMS) for Aerospace Applications	3

Course Code	Course Title	Credits
ME-834	Fracture Mechanics	3
ME-839	Advanced Finite Element Analysis	3
ME-840	Computational Fluid Dynamics and Heat Transfer	3
ME-854	Computer Integrated Manufacturing	3
ME-861	Theory of Plasticity	3
ME-867	Quality & Reliability Management	3
ME-869	Project Management	3
ME-875	Computer Aided Engineering Design	3
ME-881	Advanced Fluid Mechanics	3
ME-882	Heat & Mass Transfer	3
ME-884	Convection Heat Transfer	3
ME-888	Radiation Heat Transfer	3
ME-889	Conduction Heat Transfer	3
ME-892	Advanced Propulsion	3
ME-893	Advanced Combustion	3
MTS-858	Smart Materials & Structures	3
ME-817	Advanced Theory of Vibrations	3

## Course Description

PhD at CAE (Aerospace Dept) is a 3-8 year programme. The students are required to undertake 18 credit hours coursework of 800/900 level in addition to the pre-requisite specified for the programme. In addition to the coursework, all doctoral students must register for at least 30 credits of doctoral research. These 18 credit hours are the courses which have not been counted towards any other degree. The GEC may specify additional subjects to be taken by the PhD student, if considered essential. These shall be notified as "Additional Courses" and shall not be counted towards calculation of CGPA. Minimum cumulative GPA of 3.5 out of 4.0 is required in the 18 credit hours of 800/900 level courses which are counted towards PhD. The coursework with required CGPA should be completed preferably within one year of enrolment for PhD. Maximum allowable time to complete the coursework is 18 months.

## PhD Qualifying Examination

After successful completion of 800/900 level courses (to be counted towards his PhD) with a minimum cumulative GPA of 3.5 out of 4.0, the student takes a qualifying/ comprehensive examination in the subjects specified by the GEC. The qualifying examination is conducted as soon as possible after completion of the coursework but, in any case, it is not delayed for more than 4 months. Each student must pass a PhD qualifying exam.

## Research Areas

Following are the broader areas of specialisation:

- » Fluid dynamics/Aerodynamics
- » Thermo fluids / propulsion
- » Aerospace vehicle design
- » Aerospace sensing and instrumentation
- » Advanced Vibrations
- » Nano Technology / Nano materials for Aviation
- » Alternate Energy
- » Multi-Disciplinary Design Optimization
- » Computational Fluid Dynamics
- » Heat Transfer
- » CAD / CAM / Mechanical Design
- » Micro / Nano Electro Mechanical Systems
- » Space Technologies
- » Solid mechanics / Structural Design and Analysis
- » Flight dynamics and control
- » Aerospace materials
- » Advanced Composites
- » Turbo-Machinery
- » FEA Design and Analysis
- » Aircraft Aerodynamics Design
- » Aircraft Flight Stability and Control
- » Thermo Fluids
- » Cryogenics
- » Aircraft Structure Design
- » Materials Science

## Scheme of Studies

Programme Code: Z806

### PhD Courses (In addition to 800 level courses approved for MS Aerospace Engineering)

Course Code	Course Title	Credits
AE-815	Aero-Mechanical Integration	3
AE-814	Aero-Elasticity	3
AE-863	Advanced Materials	3
AE-864	Energetic Materials	3
AE-881	Orbital Mechanics	3
AE-882	Spacecraft System Design	3
AE-930	Advanced Topics in Aerospace Propulsion	3
AE-940	Advanced Topics in Flight Dynamics and Controls	3
AE-980	Advanced Topics in Space Technology	3
<b>AE-999</b>	<b>PhD Thesis</b>	<b>30</b>

### Additional Courses

Course Code	Course Title	Credits
SEM/WKSP-997	Seminar / Workshop	1

## Career Opportunities

The Master of Mechanical Engineering degree holders may seek careers as Mechanical or Design Engineers in mechanical industry, R&D organizations or any other public or private sector organizations.

## Course Description

The MS programme is constituting of 24 credits hours of course work and 6 credit hours of thesis research. It includes 4 core courses and 4 elective courses. Each course is a 3.0 credit hour course. The courses of each of the four streams are presented as follows. Students will also be required to take a research methodology course before starting research.

## Research Areas

The main focus of research will be the areas of national interest. Research areas, relevant to aviation and other industries in the country for indigenous product development and design, which includes, but not limited to following areas: -

- » Fluid dynamics/Aerodynamics
- » Advanced Materials
- » Advanced Vibrations
- » Advanced Composites
- » Thermo-fluids
- » Heat Transfer
- » Structure Design and Optimization
- » Methods and Analysis for Structures
- » Compressible and incompressible fluid mechanics

## Scheme of Studies

Programme Code: Z704

### Core Courses

Course Code	Course Title	Credits
MATH-812	Advanced Engineering Mathematics	3
ME-801	Optimization of Engineering Systems	3
ME-802	Finite Element Methods	3
ME-803	Continuum Mechanics	3
ME-899	MS Thesis	6

### Elective Courses

Course Code	Course Title	Credits
EE-873	Fuzzy Control	3
EE-977	Nonlinear Control Systems	3
EM-800	Introduction to Advanced Robotics	3
EM-806	Operations Research	3
MATH-850	Advanced Numerical Analysis	3
ME-811	Modeling & Artificial Intelligence	3
ME-812	Advanced Control Systems-I	3

ME-813	Advanced Control Systems-II	3
ME-814	Digital Control Systems	3
ME-815	Advanced Modeling & Simulation	3
ME-816	Modeling & Simulation of Dynamic Systems	3
ME-817	Advanced Theory of Vibrations	3
ME-818	Kinematics & Rigid Body Dynamics	3
ME-819	Instrumentation & Data Acquisition Systems	3
ME-820	Advanced Instrumentation and experimental methods	3
ME-831	Computational Fluid Dynamics-I	3
ME-837	Nonlinear Dynamics	3
ME-852	Rapid Prototyping, Tooling & Manufacturing	3
ME-853	Manufacturing System Design & Management	3
ME-854	Computer Integrated Manufacturing	3
ME-898	Special Topics	3

MTS-852	Advanced Measurement Techniques	3
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## Computational Mechanics

EM-843	Advanced Research Methods	3
MATH-850	Advanced Numerical Analysis	3
ME-815	Advanced Modeling & Simulation	3
ME-817	Advanced Theory of Vibrations	3
ME-820	Advanced Instrumentation and experimental methods	3
ME-831	Computational Fluid Dynamics-I	3
ME-832	Parallel & Distributed Simulation for Research	3
ME-833	Computational Fluid Dynamics-II	3
ME-834	Fracture Mechanics	3
ME-835	Advanced Mechanics of Materials	3
ME-836	Theory of Elasticity	3
ME-837	Nonlinear Dynamics	3
ME-838	Advanced Stress Analysis	3
ME-839	Advanced Finite Element Analysis	3
ME-840	Computational Fluid Dynamics and Heat Transfer	3
ME-841	Finite Element Analysis of Composite	3
ME-851	Advanced Manufacturing Processes	3
ME-857	Product Design Fundamentals	3
ME-859	Mechanics of Fibre Reinforced Composites (FRC Materials)	3
ME-861	Theory of Plasticity	3
ME-874	Reliability Based Design	3
ME-881	Advanced Fluid Mechanics	3
ME-882	Heat & Mass Transfer	3
ME-883	Gas Dynamics	3
ME-898	Special Topics	3
MTS-858	Smart Materials & Structures	3

## Product & Manufacturing Systems Design

EM-806	Operations Research	3
EM-843	Advanced Research Methods	3
MATH-850	Advanced Numerical Analysis	3
ME-812	Advanced Control Systems-I	3
ME-816	Modeling & Simulation of Dynamic Systems	3
ME-818	Kinematics & Rigid Body Dynamics	3
ME-819	Instrumentation & Data Acquisition Systems	3
ME-834	Fracture Mechanics	3
ME-835	Advanced Mechanics of Materials	3
ME-836	Theory of Elasticity	3

ME-841	Finite Element Analysis of Composite	3
ME-842	Additive Manufacturing	3
ME-851	Advanced Manufacturing Processes	3
ME-852	Rapid Prototyping, Tooling & Manufacturing	3
ME-853	Manufacturing System Design & Management	3
ME-854	Computer Integrated Manufacturing	3
ME-855	Material Selection & Design	3
ME-856	Joining of Materials & Structures	3
ME-857	Product Design Fundamentals	3
ME-858	Laser Material Processing	3
ME-859	Mechanics of Fibre Reinforced Composites (FRC Materials)	3
ME-860	Form Synthesis & Stress Analysis of Machinery	3
ME-861	Theory of Plasticity	3
ME-862	Advanced Engineering Materials	3
ME-863	Product Lifecycle Management	3
ME-864	Advanced Manufacturing Technologies	3
ME-865	Lean and Agile Manufacturing	3
ME-866	Industrial Design and Human Factor	3
ME-867	Quality and Reliability Management	3
ME-868	Operations Management	3
ME-869	Project Management	3
ME-870	Supply Chain Management	3
ME-871	Product Design & Development	3
ME-874	Reliability Based Design	3
ME-875	Computer Aided Engineering Design	3
ME-876	Product Design and Development	3
ME-898	Special Topics	3
MTS-820	Advanced Manufacturing Design Techniques	3
MTS-851	Precision Manufacturing Systems	3
MTS-852	Advanced Measurement Techniques	3
MTS-858	Smart Materials & Structures	3

## Design

EM-843	Advanced Research Methods	3
MATH-850	Advanced Numerical Analysis	3
ME-817	Advanced Theory of Vibrations	3
ME-818	Kinematics & Rigid Body Dynamics	3
ME-824	Engine Tribology	3
ME-834	Fracture Mechanics	3
ME-836	Theory of Elasticity	3
ME-837	Nonlinear Dynamics	3
ME-838	Advanced Stress Analysis	3

ME-851	Advanced Manufacturing Processes	3
ME-855	Material Selection & Design	3
ME-857	Product Design Fundamentals	3
ME-858	Laser Material Processing	3
ME-862	Advanced Engineering Materials	3
ME-865	Lean and Agile Manufacturing	3
ME-866	Industrial Design and Human Factor	3
ME-867	Quality and Reliability Management	3
ME-868	Operations Management	3
ME-869	Project Management	3
ME-870	Supply Chain Management	3
ME-871	Product Design & Development	3
ME-873	Advanced Engineering Design	3
ME-874	Reliability Based Design	3
ME-875	Computer Aided Engineering Design	3
ME-876	Product Design and Development	3
ME-898	Special Topics	3
RM-898	Research Methodologies	3

## Thermofluids

EM-806	Operations Research	3
MATH-850	Advanced Numerical Analysis	3
ME-816	Modeling & Simulation of Dynamic Systems	3
ME-819	Instrumentation & Data Acquisition Systems	3
ME-820	Advanced Instrumentation and experimental methods	3
ME-831	Computational Fluid Dynamics-I	3
ME-832	Parallel & Distributed Simulation for Research	3
ME-840	Computational Fluid Dynamics and Heat transfer	3
ME-855	Material Selection & Design	3
ME-858	Laser Material Processing	3
ME-881	Advanced Fluid Mechanics	3
ME-882	Heat & Mass Transfer	3
ME-883	Gas Dynamics	3
ME-884	Convection Heat Transfer	3
ME-885	Thermal System Design	3
ME-886	Power Plant Engineering	3
ME-887	Sustainable Energy Systems	3
ME-888	Radiation Heat Transfer	3
ME-889	Conduction Heat Transfer	3
ME-890	Advanced Turbo Machinery	3

ME-891	Internal Combustion Engines	3
ME-892	Advanced Propulsion	3
ME-893	Advanced Combustion	3
ME-894	Advanced Refrigeration and Airconditioning	3
ME-898	Special Topics	3
<b>Research</b>		
SEM/WKSP-997	Seminar/Workshop	1
RM-898	Research Methodology	2

# Library

CAE library is fully automated and provides excellent services and facilities to fulfill the information needs of faculty members as well as students. It has a collection of over 1,16,157 books including textbooks and general/reference books. It also provides a wide range of services that include automated issuance of books, online information searching, e-books and access to HEC online digital repository comprised 38 different databases. A digital library has been established with the 50 high speed All-in-One terminals, which are connected with PERN. To make the environment conducive for the readers, a Cafeteria is also established at the library. The library has the following Vision, Mission and Core Values.

- **Vision :** A fully automated online Information / Knowledge Resource Center to support Teaching / Learning, Research & Development activities at NUST CAE.
- **Mission:** Right information for the right person at the right time.
- **Core Values:** Reliable & Responsiveness, Steadfast and prompt service, cooperative team work & Futuristic outlook.





**NIT**

National Institute of  
Transportation

# National Institute of Transportation (NIT)

The National Institute of Transportation (NIT) is one of the pioneer constituent institute of NUST. The Institute was established in 1991 at Risalpur. The Institute's mandate is to develop manpower equipped with latest engineering knowledge and compatible skills to take on the challenges in the field of transportation. Since its inception, this National institute has been imparting advance higher education in core civil engineering fields (i.e. MS / PhD programs in Transportation Engineering, Structural Engineering and Geotechnical Engineering). NIT is focused to become a center of excellence of international repute by providing quality education, research and training. NIT has always played a leading role as a think tank by sharing expertise and suggesting long term solutions for complex engineering issues. The faculty of the institute has always been involved in national and international level research and development projects.

## Mission

- To educate its students to serve the industry, community and country at large through innovative, socially acceptable and environment friendly solutions.
- To develop technically competent manpower having requisite skills to meet the national needs in the transportation sector.
- Provide integrated teaching and research facility for postgraduate work leading to award of master's and doctoral degree in Transportation Engineering, Structural Engineering and & Geotechnical Engineering.
- Provide engineering research support to the problems identified by national organizations.
- Arrange international seminars, workshops and symposiums in areas of special national interest.
- Collaborate with national and international organizations for research and training.

## Location and Significance

Risalpur is connected with Islamabad and Peshawar through Grand Trunk (GT) Road and Islamabad-Peshawar Motorway M-1. It is located just 5 kms from Rashaki Interchange on M-1 and is just an hour distance from Islamabad. Risalpur has rich educational and diverse history. Apart from NIT, it harbours two NUST institutions, i.e., Military College of Engineering (MCE), College of Aeronautical Engineering (CAE) besides our national pride PAF Academy.

## Faculty Profiles

National Institute of Transportation is committed to quality education and research. Dedicated faculty and staff makes the learning experience both exciting and rewarding. The institute endeavors to provide support and facilities of the highest possible quality.

### Dr Waseem Irshad Kayani, **Principal / Dean**

PhD (Massouri University of Science & Technology), USA

**Discipline:** Civil Engineering

**Specialization:** Transportation Engineering

### Dr Hassan Farooq

PhD (UET Lahore), Pakistan

**Discipline:** Civil Engineering

**Specialisation:** Seismic Retrofitting of Structure

## Transportation Engineering Department

### Dr Muhammad Jawed Iqbal, **HoD**

PhD (MUET), Pakistan

**Discipline:** Civil Engineering

**Specialization:** Transportation Engineering

## Department of Geotech Engineering

### Dr Abdul Quddos, **HoD**

PhD (University of Illinois Urbana-Champaign), USA

**Discipline:** Civil Engineering

**Specialisation:** Geotechnical

### Dr Inamullah Khan

PhD (Southwest Jiaotong University), China

**Discipline:** Civil Engineering

**Specialization:** Transportation Engineering

### Dr Mazhar Arshad

PhD (Purdue), USA

**Discipline:** Civil Engineering

**Specialisation:** Geotechnical

## Department of Structural Engineering

### Dr Muhammad Naseem **HoD**

PhD (Tsinghua University Beijing), China

**Discipline:** Civil Engineering

**Specialization:** Structural Engineering

### Dr Usama Khalid

PhD (Shanghai Jiao Tong University), China

**Discipline:** Civil Engineering

**Specialisation:** Geotechnical

### Dr Muhammad Aqeel

PhD (Michigan State University), USA

**Discipline:** Civil Engineering

**Specialisation:** Structural Engineering



# Students Support Facilities

## Sports Center

Institute has both indoor and outdoor sports facilities including a Sports Complex. Apart from routine games, competitions are held in all the sports on a regular basis in order to inculcate sportsmanship amongst students. These competitions include inter-department and inter-college NUST competitions.

## Indoor Sports

Indoor facilities are available for table tennis, badminton, billiard, squash, body weight training and functional fitness etc. Recently, International standard squash courts have been constructed to provide best possible facilities to the students.



## Outdoor Sports

For outdoor sports, i.e. tennis, basket ball, volleyball courts and hockey, football and cricket grounds are available.



## Gymnasium

Our gymnasium provides a combination of top-of-the-line functional fitness, cardio and resistance equipment. Well-stocked free-weight area provides exercise programs for beginners and advanced individuals alike. Professionals are available to encourage and advise students.



## Swimming Pool

An international standard swimming pool is being maintained at the Institute so that students can participate in healthy and competitive swimming galas, besides using the pool as a recreational facility. A swimming gala is organized every summer for students. They can get membership at a nominal fee for an entire season.



## Student Counseling Service

A professional and confidential counseling service is available to all students. During counseling sessions, both personal and social issues like loneliness, family issues and worries pertaining to studies are discussed. Counseling is offered both in groups and on an individual basis. The Institute has established a special counseling cell, which is headed by an Officer. The cell undertakes the following responsibilities:

- It helps students make decisions regarding their study plans and provides relevant information on subjects offered in various semesters and their pre-requisites.
- It seeks to help students address and overcome their weaknesses in various subjects.
- The services of C3A Directorate are also solicited when required.

## Academic Evaluation Services

NIT has set procedures to evaluate the academic curriculum and monitor students' performance and provide proper mentoring to the students. Faculty, HoDs, Dean and Principal are fully involved in this process.

## Academic Learning Support

The academic tutors, under the supervision of the Dean, analyses and finds viable solutions for problems of the students. The service aims at the following:

- Helping students maximize their academic potential.
- Helping students in their individual and collective academic tasks. In this regard, workshops are arranged which focus on a wide range of activities including; developing academic writing skills, revision techniques, understanding learning styles and time management.
- Helping students in providing extra tutoring individually and / or collectively on requirement basis.

### IT Services

IT services are available to all students and staff. A local area network has been established at NIT. A Computer Center has also been set up to keep pace with modern trends and research in the engineering field. Students are provided with internet facilities at the Computer Center, the library and the residences. The Computer Center offers the following facilities to the students.

- A dedicated internet hall provides internet surfing facilities.
- 2 networking halls with 25 computers each, provide computer training facilities to students.
- The software engineering laboratory offers the latest professional civil engineering software in the market.

### Health Service

The Institute Health Service operates through a doctor hired by NUST for all students. The Nursing Advisor can advise on minor illnesses and injuries. In case of serious illness or detailed investigation, the services of the Combined Military Hospital, Risalpur are also available. This hospital has a medical ward, a surgical ward, an intensive-care unit and an eye-care service. A medical officer is available round-the-clock and in case of emergency, all specialists are on call. Moreover, lectures on health-related issues are regularly delivered to students by qualified physicians.

### Library Services

All students are granted library membership for the duration of their programs. The library comprises:

- Over 40,000 books
- An audio-visual section comprising TV's, VCR's, VCD's and tape recorders
- Training and technical CD's
- Scanning and printing services



### NIT Reproduction Cell

A state of the art reproduction services are provided to students at discounted rates. The services include:

- Printing facilities including colour prints
- Photocopier
- Lamination and binding services
- Provision of stationary items



### Laboratories

NIT is equipped with the most sophisticated post graduate research laboratory equipment for core civil engineering fields. It possesses the most modern and state-of-art equipment, which is calibrated regularly through certified calibrating firms. Quality, precision and accuracy are the hallmarks of NIT laboratories. The main laboratories are:

- Concrete Materials laboratory
- Geotechnical Engineering Laboratory
- Transportation Laboratory
- Strength of Materials Laboratory
- Computer Research Laboratory
- Structural Dynamics Lab

### Accommodation

NIT has a secure and comfortable student accommodation. The social aspect of life at the NIT is overwhelming as it offers great opportunities to meet new people and provides an intellectual student body which is varied in its interests.

The Institute provides excellent messing facilities including a modern cafeteria. The students dine at a well-furnished mess with the following facilities:

- Dining hall
- TV lounge
- Visitors lounge
- Indoor games



# Academic Programs

Presently NIT is offering MS / PhD in three core Disciplines: namely Structural Engineering, Transportation Engineering and Geo-technical engineering. All three Postgraduate programs cover a wide array of courses. Students must take minimum 4 core and 4 elective courses depending on the program requirement followed. In addition student has to take 6 credits for research thesis.

## MS Structural Engineering

### Coursework

Programme Code-X711

#### Core Courses

Course Code	Course Title	Credits
CE 801	Advance Structural Mechanics	3
CE 805	Advanced Concrete Design	3
CE 809	Structural Dynamics	3
CE 816	Advanced Structural Material	3
CE 899	MS Thesis	6

ME-812	Advance Control System	3
ME-815	Advance Modelling & Simulation	3
ME-820	Advance Instrumentation and Experimental Methods	3
STAT-835	Probability and Statistics	

#### Additional Courses

RM-898	Research Methodology	2
SEM/WKSP 897	Seminar / Workshop	1

#### Elective Courses

CE 804	Prestressed Concrete Structures	3
CE 807	Steel Structures Design	3
CE 808	Finite Element Method	3
CE 810	Earthquake Seismology and Earthquake Hazard	3
CE 811	Disaster Risk Evaluation and Retrofitting of Existing Structures	3
CE 814	Structural Fire Engineering	3
CE 818	Coastal Engineering	3
CE 819	Masonry Structures	3
CE 822	Disaster Risk Assessment and Mitigation	3
CE 836	Construction Management	3
CE 840	Nano Secrets in Concrete	3
CE 842	Performance Based Design	3
CE 851	Vibration Control of Structures	3
CE 854	Stability of Structures	3
CE 857	Theory of Plates and Shells	3
CE 874	Non-linear Structural Analysis	3
CE 879	Design of Hydraulic Structures	3
CE 882	Deep Foundation	3
CE 897	Special Topics in Civil Engineering	3
GIS 802	GIS & Remote Sensing Application for Civil Engineering	3

# MS Transportation Engineering

## Scheme of Studies

Programme Code-X712

### Core Courses

Course Code	Course Title	Credits
CE 860	Pavement Design and Analysis	3
CE 862	Pavement Materials Engineering	3
CE 863	Transportation Planning	3
CE 865	Traffic Engineering	3
CE 899	MS Thesis	6
<b>Elective Courses (any four)</b>		
CE 803	Concrete Materials and Technology	3
CE 806	Reinforced Concrete Members	3
CE 818	Coastal Engineering	3
CE 821	Soil & Site Improvement	3
CE 823	Slope Stability	3
CE 824	Mechanical Properties of Soil	3
CE 828	Advanced Geotechnical Design	3
CE 829	Geotechnical Site Investigation	3
CE 831	Advanced Soil Mechanics	3
CE 836	Construction Management	3
CE 859	Logistics and Supply Chain Management	3
CE 861	Pavement Rehabilitation & Management	3
CE 864	Geometric Design of Highways/ Freeways	3
CE 866	Airport Engineering	3
CE 867	Urban Transportation System Evaluation	3
CE 868	Public Mass Transportation	3
CE 869	Advanced Traffic Control & Management System	3
CE 870	Transportation Economics	3
CE 881	Soil Dynamics	3
CE 897	Special Topics in Civil Engineering	3
CE 898	Contract Management	3
CEM 801	Construction Project Administration	3
CEM 802	Construction Planning, Scheduling and Control	3
CEM 803	Economic Decision Analysis in Construction	3

CEM 804	Construction Cost Estimating and Control	3
CEM 805	Safety Management in Construction	3
CEM 806	Construction Equipment Management	3
CEM 807	Risk Management in Construction	3
ENE 802	Environmental Impact Assessment	3
GIS 802	GIS & Remote Sensing and Its Application For Civil Engineering	3
GIS 851	Land use Planning and Management	3
GIS 853	Urban Planning	3
GIS 854	Infrastructure and Transport Planning	3
GIS 862	Tourism Development	3
GIS 865	Land Information System	3
GIS 867	Demographic Analysis and Modeling	3
OTM 841	Operations Management	3
OTM 811	Supply Chain Management	3
OTM 842	Inventory and Warehouse Management	3
STAT 835	Probability & Statistics	3
URP 801	Advanced Planning Techniques	3
URP 802	Comparative Urban Planning	3
URP 804	Regional Development Planning	3
URP 805	Urban & Regional Transportation Systems	3
URP 806	Sustainable Urban Land-Use Planning	3
URP 807	Disaster Management	3
URP 810	Urban Environmental Systems Management	3
URP 901	Comprehensive Urban Planning Process	3
URP 902	Contemporary Urban Planning	3
URP 904	Urban Mass Transit	3

### Additional Courses

RM 898	Research Methodology	2
SEM/ WKSP 897	Seminar / Workshop	1

### Core Courses

Course Code	Course Title	Credits
CE-821	Soil and Site Improvement	3
CE-828	Advanced Geotechnical Design	3
CE-829	Geotechnical Site Investigation	3
CE-837	Design & Construction of Earthen Dams	3
<b>CE-899</b>	<b>MS Thesis</b>	<b>6</b>

### Elective Courses (Any Four)

Course Code	Course Title	Credits
CE-803	Concrete Materials & Technology	3
CE-804	Pre-stressed Concrete Structures	3
CE-806	Reinforced Concrete Members	3
CE-808	Finite Element Method	3
CE-818	Coastal Engineering	3
CE-830	Rock Mechanics-II	3
CE-824	Mechanical Properties of Soil	3
CE-835	Water Supply and Wastewater Engg	3
CE-823	Slope Stability	3
CE-831	Advanced Soil Mechanics	3
CE-836	Construction Management	3
CE-841	Earth Structures	3
CE-844	Hydropower Engineering	3
CE-860	Pavement Design and Analysis	3
CE-861	Pavement Rehabilitation & Management	3
CE-862	Pavement Materials Engineering	3
CE-872	Applied Hydrology	3
CE-873	River Engineering	3
CE-875	Computational Hydraulics	3

CE-876	Sediment Transport	3
CE-881	Soil Dynamics	3
CE-884	Rock Mechanics-I	3
CE-880	Groundwater Hydrology	3
CE-885	Groundwater Exploration	3
CE-886	Water Resources Economics, Planning & Management	3
CE-888	Watershed Management	3
CE-889	Irrigation & Drainage Engineering	3
CE-890	Ground Water Modeling	3
CE-897	Special Topics in Civil Engineering	3
CE-898	Contract Management	3
STAT-835	Probability & Statistics	3
CEM-802	Construction Planning, Scheduling and Control	3
CEM-806	Construction Equipment Management	3
CEM-807	Risk Management in Construction	3
URP-904	Urban Mass Transit	3
GIS-802	GIS & RS and Its Application for Civil Engg	3
GIS-807	Theory of GIS	3
GIS-815	Engineering Aspects of RS	3
GIS-833	Soil Geomorphology and Classification	3
GIS-842	Natural Hazards and Disaster Management	3
ENE-822	Solid & Hazardous Waste Management	3
ENE-921	Contaminated Site Remediation	3
ENV-848	Environmental Geology	3
RM-898	Research Methodology (additional Course)	2



**SEECS**

School of Electrical Engineering  
and Computer Science, Islamabad

## About the School

School of Electrical Engineering and Computer Science (formerly NIIT) chronicles an incredible tale of what focused efforts with a clear vision, singular commitment and a passionate quest for excellence are capable of achieving within a span of less than two decades. From its inception in 1999, as a tiny IT wing of NUST, this School has blossomed into one of the finest seats of higher education, of which not only NUST but the entire nation can be legitimately proud of. The philosophy of education at SEECS puts due premium on an essential blending of engineering and computing education with a sound orientation of social and humanitarian interests of the society. With the relocation of SEECS to H-12 campus, this school is striving to set a new pace for wholesome growth of its students.

## Academics

SEECS is known for its exclusive academic environment and dynamism to embody the best in engineering and computing education. All its undergraduate and graduate programmes have evolved as a result of pragmatic research so as to educate and groom the students in the best possible manner in their respective disciplines. The ultimate goal has always been to prepare sound professionals with a progressive vision, committed to pursuit of excellence. This is ensured through well-formulated academic programme with appropriate co-curricular activities. The format of academic training nurtures a passion for hard work so vitally needed for socio-economic development. Equal emphasis is laid on developing students' ability to think creatively, and analyze and solve practical problems.

## Research Environment

An active and potent research culture pertains at NUST-SEECS since the beginning. Since its inception, relentless efforts have been made to build a research environment of International stature. Here at NUST-SEECS, we place a high premium on quality research as a gateway to new horizons of scientific knowledge and discovery.

We are focusing on multi-disciplinary research and in that context research in SEECS has been broadly divided into seven Signature Research Clusters. These clusters include: Internet of Things, Wireless and Photonic Networks, Cyber Security, Smart Grid, Cloud Computing and Big Data Analytics and Artificial Intelligence & Machine learning. These research clusters work in close collaboration with national and international academics and industry partners.

As of Dec 2018, NUST-SEECS active research grants are worth PKR 290 M. These include funding from national and international bodies/agencies as well as industry. SEECS has established Pakistan's First EEG Lab in collaboration with Germany. Huawei Technologies and NUST-SEECS have jointly setup an IoT and Machine Learning Lab. Deep Learning Lab has been awarded to NUST-SEECS, with funding worth PKR 70 Million. The lab is part of the National Centre of Artificial Intelligence that is being established at NUST.

## Fact file

Promoting Innovation and Entrepreneurship, Entrepreneurial activities are one of the hallmarks of academic culture at NUST-SEECS. Students are encouraged, guided and inspired through innovative and creative programmes to become future business leaders with a dynamic vision. Students and faculty are encouraged and supported alike to engage in entrepreneurial ventures. Currently, 14 startups incubated at NUST Technology Incubation Center are founded and/or co-founded by NUST-SEECS students, former students and faculty.

NUST-SEECS enjoys extensive collaborations with some of the elite centers of excellence all over the globe including high profile universities and research nodes in USA, UK, Germany, Australia, Canada, UAE, Austria, Turkey, Saudi Arabia, Qatar, Russia, New Zealand, Italy, Spain, Cyprus, Malaysia, Sweden, Singapore, Portugal, Estonia, and China. Faculty has 52 active academic collaborations in 21 countries and 25 Industrial/Institutional Collaborations.

Our faculty is working on cutting edge research areas and is producing high-quality research publications. For the year 2020, our research output amounted to 186 publications in research journals and 57 conference papers in proceedings of international conferences.

NUST hosted flagship conference was organized and conducted by the School of Electrical Engineering and Computer Science (SEECS). The school hosted the conference with the title "International conference on Digital Futures & Transformative Technologies (ICoDT2) – 2021". The conference was held from the 20th-21st May 2021 in an online modality. The Conference Chief Guest were Dr. Rizwan Younis (CTO Zong) and Mr. Shahzad (CTO Huawei)

Recently, SEECS has signed a MoU with School of Cyber Science and Technology, Beihang University (BUAA), China for the Establishment of Cyber Security Research Center at NUST-SEECS.

In the very short period of time since its inception, it has made relentless efforts to build a research environment of international stature. To this end, the school has significantly expanded its faculty and student intake, raised considerable research funding, established high-tech research labs and a dedicated research complex developed active linkages with the industry, filed indigenous patents, and produced high-quality research publications. Research aptitude and capacity are the main criterion for evaluation and selection of faculty. Researchers are provided maximum logistical support to set up labs and are also introduced to relevant industry people as well as premier international research institutions so that they are able to work on research problems of national and international significance.

## Faculty Profile

### Dr Hassaan Khaliq Qureshi, Senior HoD

Ph.D (City University London), UK

**Discipline:** Electrical Engineering

**Specialisation:** Wireless Sensor Networks

## Head of Digital Signals and Signal Processing Group

### Dr M Shahzad Younis

Ph.D (University Technology Petronas), Malaysia

**Discipline:** Electrical Engineering

**Specialisation:** Signal and Image Processing

### Dr Usman Zabit

PhD (University of Toulouse, Toulouse), France

**Discipline:** Digital Signal Processing

**Specialisation:** Opto-electronics, INPT

### Dr Ahmad Salman

PhD (University of Manchester), UK

**Discipline:** Computer Science

**Specialisation:** Signal Processing, Speech Processing, Machine Learning

### Dr Khawar Khurshid

PhD (Michigan State University), USA

**Discipline:** Digital Signal Processing

**Specialisation:** Biomedical Imaging

### Dr Rehan Ahmed

PhD (The University of British Columbia), Canada

**Discipline:** Electrical and Computer Engineering

**Specialisation:** Low-Power FPGA Architectures/CAD

### Dr Wajahat Hussain

PhD (University of de Zaragoza), Spain

**Discipline:** Electrical Engineering

**Specialisation:** Systems Engineering & Computer Science

### Dr Wajid Mumtaz

PhD (University Teknologi PETRONAS) Malaysia.

**Discipline:** Electrical and Electronic Engineering

**Specialisation:** Biomedical Engineering

### Dr Arbab Latif

Ph.D (King Fahd University of Petroleum and Minerals), KSA

**Discipline:** Electrical Engineering

**Specialisation:** Digital Signal Processing

### Dr Muhammad Imran

PhD (Sungkyunkwan University), South Korea

**Discipline:** Electronic and Electrical Engineering

**Specialisation:** Reliable Computing Architectures

### Mr Arshad Nazir

MS (NUST), Pakistan

**Discipline:** Electrical Engineering

**Specialisation:** Telecommunication

### Mr Muhammad Imran Abeer

MS (NUST), Pakistan

**Discipline:** Electrical Engineering

**Specialisation:** DSSP

### Mr Nasir Mahmood

MS (BUAA), China

**Discipline:** Electrical Engineering

**Specialisation:** Control Systems

## Head of Communication Systems and Networks

### Dr Syed Ali Hassan

PhD (Georgia Institute of Technology), USA

**Discipline:** Electrical Engineering

**Specialisation:** Wireless Communications

### Dr S. M. Hassan Zaidi

PhD (University of South Florida) USA

**Discipline:** Computer Network

**Specialisation:** Computer Simulation of High Speed Communication Networks

### Dr Fahd Ahmed Khan

PhD (King Abdullah university of science and Technology), KSA

**Discipline:** Electrical Engineering

**Specialisation:** Wireless Communication

### Dr Saad Qaisar

PhD (Michigan State University), USA

**Discipline:** Electrical Engineering

**Specialisation:** Multimedia Coding and Communication

### Dr Huma Ghafoor

PhD (University of Ulsan), South Korea

**Discipline:** Communication Systems

**Specialisation:** Vehicular ad hoc networks

### Dr Salman Abdul Ghafoor

PhD (University of Southampton), UK

**Discipline:** Electrical Engineering

**Specialisation:** Radio Over Fiber Systems

### Dr Rizwan Ahmad

PhD (Victoria University), Australia

**Discipline:** Electrical Engineering

**Specialisation:** Wireless Communication & Networking

### Dr Syed Taha Ali

PhD (University of New South Wales), Australia

**Discipline:** Electrical Engineering

**Specialisation:** computer networks



**Dr Sajjad Hussain**

PhD (Dublin City University), Ireland

**Discipline:** Electronics Engineering**Specialisation:** Wireless Communication**Dr Mohaira Ahmad**

PhD (Jiangsu University), China

**Discipline:** Computer Applied Technology**Specialisation:** Computational Electromagnetics**Dr Naumana Ayub**

PhD (City University of London), UK

**Discipline:** Communication Engineering**Specialisation:** Wireless Communication**Engr Ahsan Azhar**

MS (University of Gävle), Sweden

**Discipline:** Electrical Engineering**Specialisation:** Electronics and Telecommunications

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## Electronics, Power and Control

**Dr Ammar Hasan**

PhD (Control Systems) Imperial College London, UK

**Discipline:** Electrical Engineering**Specialisation:** Control Systems**Dr Rana Iftikhar Ahmad**

PhD (University of Versailles), France

**Discipline:** Robotics and Automation**Specialisation:** Nonlinear Control and Automation**Dr Farid Gul**

PhD (Beihang University), China

**Discipline:** Electrical Engineering**Specialisation:** Navigation and Control**Dr Ahmed Rasheed**

PhD (Sun Yat-Sen University), China

**Discipline:** Electrical Engineering**Specialisation:** Electrical and Computer Engineering**Dr Kamran Zeb**

PhD (Pusan National University), Busan, South Korea.

**Discipline:** Electrical Engineering**Specialisation:** Power & Control**Dr Muhammad Latif Anjum**

PhD (Politecnico di Torino), Italy

**Discipline:** Electrical Engineering**Specialisation:** Computer Vision and Robotics**Dr Hasan Arshad Nasir**

PhD (The University of Melbourne), Melbourne, Australia

Post Doc (University of Melbourne), Australia

**Discipline:** Electrical Engineering**Specialisation:** Control Systems**Dr Mansoor Asif**

PhD (Hanyang University), South Korea

**Discipline:** Electrical and Electronic Engineering**Specialisation:** Power Systems**Dr Rameez Hayat**

PhD (Technical University of Munich), Germany

**Discipline:** Electrical Engineering**Specialisation:** Automation and Control**Dr Usman Khan**

PhD (University of Rome "Tor Vergata"), Italy

**Discipline:** Electrical Engineering**Specialisation:** Sensorial and Learning Systems Engineering**Mr Habeel Ahmad**

MS (Michigan State University), USA

**Discipline:** Electrical Engineering**Specialisation:** Embedded Systems**Mr Muhammad Ramzan**

ME (UNSW), Australia

**Discipline:** Electrical Engineering**Specialisation:** Communication and DSP**Engr Tassawar Kazmi**

MS (NCEPU), Beijing, China

**Discipline:** Electrical Engineering**Specialisation:** Electric Power System**Dr Usman Ali**

Assistant Professor

Ph.D (Georgia Institute of Technology), Atlanta GA

**Discipline:** Electrical Engineering**Specialisation:** Electrical and Computer Engineering**Dr Jawad Arif**

PhD (Imperial college London), UK

**Discipline:** Electrical Engineering**Specialisation:** Control Applications in Power Systems**Dr Mansoor Ali Khan**

PhD (The University of Sydney), NSW, Australia

**Discipline:** Electronics**Specialisation:** Nanotechnology**Dr Zubair Rehman**

PhD (Massey University), Palmerston North, New Zealand

**Discipline:** Electrical Engineering**Specialisation:** Power Electronics**Engr Shakeel Alvi**

MS (GWU), USA

**Discipline:** Telecommunication and Computer

MS (Air University), Pakistan

**Specialisation:** Strategic Studies**Mr Mansoor Shaukat**

MSc (University of Southampton), UK

**Discipline:** Electronics**Specialisation:** Computer Systems**Ms Neelma Naz**

MS (EME, NUST), Pakistan

**Discipline:** Electrical Engineering**Specialisation:** Control Systems

## Department of Computing

### Engr Dr Faisal Shafait, Senior HOD

PhD(TU Kaiserslautern),Germany

**Discipline:** Software Engineer

**Specialisation:** Machine Learning

## Software Engineering

### Dr Asad Waqar Malik, Head Software Engineering

PhD (NUST), Pakistan

**Discipline:** Software Engineering

**Specialisation:** Distributed Computing

### Dr Anis ur Rahman

PhD (Grenoble University, Grenoble), France

**Discipline:** Computer Science

**Specialisation:** Medical Imaging

### Engr Dr Omar Arif

PhD (Georgia Institute of Technology), USA

**Discipline:** Software Engineering

**Specialisation:** Computer Vision,

### Dr Hashir Moheed Kiani

PhD ( The University of Manchester), UK

**Discipline:** Software Engineering

**Specialisation:** Machine Learning

### Dr Muhammad Shahzad

PhD (TUM), Munich, Germany

**Discipline:** Software Engineering

**Specialisation:** Image Analysis

### Dr Sidra Sultana

PhD (NUST), Pakistan

**Discipline:** Software Engineering

**Specialisation:** Software Modeling & Verification

### Dr Seema Jehan

PhD (TU Graz), Austria

**Discipline:** Computer Science

**Specialisation:** Automated Software Testing & Debugging

### Engr Dr Muhammad Muneeb Ullah

PhD (University of Rennes), France

**Discipline:** Software Engineering

**Specialisation:** Computer Vision

### Engr Dr Rafia Mumtaz

PhD (University of Surrey, UK.)

**Discipline:** Software Engineering

**Specialisation:** Internet of Things

### Engr Taufeeq Ur Rehman

MS (NUST), Pakistan

**Discipline:** Software Engineering

**Specialisation:** E-Commerce Application Development

### Engr Dr Muhammad Ali Tahir

PhD (RWTH Aachen University), Germany

**Discipline:** Software Engineering

**Specialisation:** Automatic Speech Recognition

## Computer Science

### Dr Abdul Wahid, Head Computer Science

PhD (Kyungpook National University) Daegu, Rep of Korea

**Discipline:** Computer Science

**Specialisation:** Under water Sensor Networks

### Dr Arsalan Ahmad

PhD (Politecnico di Torino), Italy

**Discipline:** Computer Science

**Specialisation:** Wireless Network

### Dr Qaiser Riaz

PhD (University of Bonn), Germany

**Discipline:** Computer Science

**Specialisation:** Human motion analysis using inertial data

### Dr Muhammad Khuram Shahzad

PhD(Sungkyunkwan University), South Korea

**Discipline:** Computer Science

**Specialisation:** Data Science

### Dr Hasan Ali Khattak

PhD (Politecnico di Bari), Italy

**Discipline:** Computer Science

**Specialisation:** Internet of Things

### Dr Pakeeza Akram

PhD (University of Delaware) USA

**Discipline:** Computer Science

**Specialisation:** Applied Machine Learning

### Dr Shams Ud-Din Qazi

PhD (University of Wollongong)Australia

**Discipline:** Computer Science

**Specialisation:** Network and Computer

### Mr Maajid Maqbool

MBA (University of Windsor), Canada.

**Discipline:** Computer Science

**Specialisation:** Internet Technologies

### Dr Muhammad Zeeshan

PhD (NUST-SEECS), Pakistan

**Discipline:** Computer Science

**Specialisation:** Wireless Networks

### Mr Shah Khalid

PhD (Jiangsu University), China

**Discipline:** Computer Science

**Specialisation:** Wireless Networks

## Information Security

### Engr Dr Hasan Tahir

PhD (University of Essex), UK

**Discipline:** Software Engineering

**Specialisation:** Cyber Security

### Dr Mehdi Hussain

PhD (University of Malaya), Malaysia

**Discipline:** Computer Science

**Specialisation:** Information Hiding

**Dr Sana Qadir**

PhD (International Islamic University), Malaysia

**Discipline:** Computer Science**Specialisation:** Information Security**Dr Yousra Javed**

PhD (University of North Carolina at Charlotte), USA

**Discipline:** Computer Science**Specialisation:** Computing and Information Systems

## Head Innovative Technologies in Learning & Information Technology

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**Dr Muhammad Sohail Iqbal**

PhD (University of Paris-Est), France

**Discipline:** Computer Science**Specialisation:** Surgical Robotics**Dr Adnan Rashid**

PhD (NUST), Pakistan

**Discipline:** Computer Science**Specialisation:** Formal Methods**Dr Arham Muslim**

PhD (RWTH Aachen University), Germany

**Discipline:** Computer Science**Specialisation:** Data Analytics**Dr Safdar Abbas Khan**

PhD (University of Paris), France

**Discipline:** Computer Science**Specialisation:** Wireless Sensor Networks**Dr Tahira Anwar Lashari**

Ph.D (University Tun Hussein), Malaysia

**Discipline :** Computer Science**Specialisation:** Educational Psychology**Mr Jaudat Mamoon**

M.Sc (Munich), Germany

**Discipline:** Computer Science**Specialisation:** Communications Engineering

## Intelligence & Data Science

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**Dr Muhammad Moazam Fraz**

PhD (Kingston University), London

**Discipline:** Software Engineering**Specialisation:** Medical Imaging**Dr Seema Latif**

PhD (University of Manchester), UK

**Discipline:** Software Engineering**Specialisation:** Natural Language Processing**Engr Dr Rabia Irfan**

PhD (NUST), Pakistan

**Discipline:** Software Engineering**Specialisation:** Data Science**Dr Muhammad Imran Malik**

PhD (University of Technology, Kaiserslautern), Germany

**Discipline:** Software Engineering**Specialisation:** Machine Learning**Dr Yasir Faheem**

PhD (Université Paris Nord), France

**Discipline:** Computer Science**Specialisation:** Networks & Information Technologies

## Moin-ud-Din

M.Sc (Punjab University) Pakistan

**Discipline:** Statistics

MCS (SZABIST) Pakistan

**Discipline:** Software Engineering

## Dr Sajid Ali

PhD (NUST) Pakistan.

**Discipline:** Mathematics

**Specialisation:** Mathematical Physics

## Dr Ibrar Hussain

PhD (NUST) Pakistan.

**Discipline:** Mathematics

**Specialisation:** General Relativity

## Dr Quanita Kiran

PhD (NUST) Pakistan

**Discipline:** Mathematics

**Specialisation:** Fixed Point Theory/ Functional Analysis

## Dr Adnan Aslam

PhD (NUST) Pakistan

**Discipline:** Mathematics

**Specialisation:** Partial Differential Equations

## Dr Naila Amir

PhD (NUST) Pakistan

**Discipline:** Mathematics

**Specialisation:** Mathematical Physics

## Dr Muhammad Imran Malik

PhD (Beihang University) China

**Discipline:** Condensed Matter Physics

## Dr Rai Sajjad Saif

PhD International Islamic University, Islamabad, Pakistan

**Specialisation:** Fluid Dynamics

## Saeed Afzal

M.Phil (International Islamic University) Pakistan

**Discipline:** Applied Mathematics

## Ansar Shahzadi

M.Phil (Quaid-e-Azam University) Pakistan

**Discipline:** Statistics

## Atifa Kanwal

M.Phil (Quaid-i-Azam University) Pakistan

**Discipline:** Mathematics

## Muhammad Yousaf

M. Phil (International Islamic University) Pakistan

**Discipline:** Economics

**Specialisation:** International & Monetary Economics

## Usman Khawar

M.A (Punjab University) Pakistan

**Discipline:** English

**Specialisation:** English Language & Literature

## Komal Malik

M. Phil (International Islamic University) Pakistan

**Discipline:** Linguistics

**Specialisation:** Linguistics

## Dr Hina Munir Dutt

PhD NUST, Pakistan

**Specialisation:** Differential Equations

## Ammar Ahmed

M. Phil (International Islamic University) Pakistan

**Discipline:** Islamic Studies

**Specialisation:** Hadith & Its Sciences



# National and International Linkages

## Industry Linkages

On the domestic front, SEecs has been quite successful, as one of the pioneers, in knitting industry and academia into a meaningful partnership and working in tandem on several practical ideas for the mutual benefit. This has helped them jointly propel the dormant conditions of our technology and engineering education centers. SEecs is engaged in various industrial projects through Corporate Advisory Council (CAC). SEecs has always actively participated in CAC telecom forum. This has greatly facilitated the two sides to share valuable inputs from each other and devise improved strategies to achieve the goals of academia-industry partnership. SEecs industry linkages have recently been extended overseas and a handful of projects have already completed in collaboration with US companies. Purpose of these linkages is to expose students to practical work experience in the industry and to familiarize them with the opportunities that exist for careers in Electrical Engineering and Computer Science. Some very well renowned companies including Trgtech, TechAccess, Bentley Systems, Buraaq Integrated Solutions, BrightSpyre and Personforce offer summer projects and provide professional and outstanding environment that offers hands-on career experience.

## Industrial Collaboration & Professional Training Centers

SEecs professional credibility and its image as a catalyst to paradigm shifts in higher education, marked with an increasing emphasis on creativity and innovation has attracted to its premises some of the world class research laboratories, as the coveted gifts from leading companies. The Cisco Networking Academy Programme (CNAP) is a comprehensive e-learning programme that provides students with the Internet technology skills essential in a global economy. The Academy delivers online assessment, hands-on labs, instructor lead training and preparation for industry standard certifications. Microsoft Imagine Academy and Certiport Testing Centre provide the facility to help equip students with 21st century skills for academic and professional success.

## Students Support Facilities

### Library

NUST SEecs houses a state-of-the-art library with rich collection of books in the areas of Electrical engineering and Computer science. It has established its repute in the student community by providing excellent services and research facilities to fulfill information needs of its readers. It is equipped with the latest computers to access the digital library of more than 23,000 research journals (<http://www.digitallibrary.edu.pk>) and 130,000 online books (<http://site.ebrary.com>)

The library also subscribes three journals and twelve magazines for its readers. It has a collection of 15,000 books in the area of databases, networking, e-commerce, object-oriented programming, data communications, circuit analysis, antennas, digital signal processing, microwave engineering, wireless communications, satellite communications, fiber

optic communications, mobile communications, digital design, control systems, mathematics, physics, chemistry, management, Islam, Urdu and English fiction, etc. Virtual University lectures CDs on different subjects have been provided for students and more than 1000 thesis in printed form are available for reference purpose. A dedicated desk, with a qualified staff has been established to provide reference services from the HEC digital library for SEecs researchers

All the library services are computerized and the Online Public Access Catalogue ([library.seecs.nust.edu.pk](http://library.seecs.nust.edu.pk)) has been launched to help the faculty and students to check the library resources from anywhere

## Lab Facilities

SEecs houses well equipped laboratories facilitating training and research activities. The systems and apparatus are maintained and kept updated by highly qualified lab staff. All labs are kept opened from 9am till 9pm to facilitate/encourage maximum learning and research activities.

## Teaching and Research Facilities in Electrical Engineering

Following teaching labs have been established that play a vital role in training undergraduate students with the state-of-the-art electrical and computer design and analysis techniques

- » Digital and Embedded Systems Lab
- » Electromechanical and Power Systems Lab
- » Basic Electronics Lab
- » Control Systems Lab
- » Advanced Electronics Lab
- » Microwave Devices and Antenna Lab
- » Digital Signal Processing Lab
- » Communication Systems Lab

Besides the teaching lab following are the research labs managed by electrical engineering department

- » Centre of Excellence for FPGA/ASIC Research (CEFAR)
- » System Analysis and Verification (SAVe)
- » Wireless, Sensor and Secure Network (WISNET Lab)
- » Signal Processing & Machine Learning Lab (Sigma Lab)
- » The Core Communications and Networks Laboratory (CoNNeKT) Lab
- » Electronics Systems Design Automation (ESDA) Lab
- » Information Processing Transmission Lab
- » Electroencephalogram (EEG) Research Lab
- » GSM Lab
- » Mobile Robotics Lab

## Teaching and Research Facilities in Computing

Research facilities at Department of Computing include:

- » HPC (High Performance Scientific Computing) Lab
- » CERP (Centre for Education, Research and Practice) Lab
- » TUKL-NUST R&D Center
- » Centre for Research in Modelling, Simulation & Vision (CRIMSON) Lab

- » KTH-AIS (Applied Information Security) Lab
- » EMC (Centre of Excellence for Mobile Computing) Lab
- » KBS (Knowledge Based Systems) Lab
- » EMC Lab
- » CRIMSON Lab
- » IBM Linux Competency Center

Besides these research-oriented labs, teaching and skill labs have also been established which play a vital role in training and development of students. These include:

- » Computing Lab #1
- » Computing Lab #2
- » Computing Lab #3
- » Computing Lab #4
- » Computing Lab #5
- » Computing Lab #6
- » General Purpose Lab

Professional trainings related to IBM and Open Source technologies are conducted in the IBM Competency Center.

## Student Bodies

Being a progressive and modern university, NUST attaches considerable importance to the grooming of young entrants as the leaders and managers of tomorrow. They are offered sufficient opportunities at SE ECS to attain and polish various social and professional skills. For this purpose, following vibrant societies and clubs exist at SE ECS. These societies support students enrich their life experience and broaden their outlook on important social and professional issues by engaging them in a wide range of wholesome social, cultural and intellectual activities throughout their stay at school. In a wide range of wholesome social, cultural and intellectual activities throughout their stay at SE ECS.

- » International Association for the Exchange of Students for Technical Experience – Islamabad
- » One World Youth Project – Islamabad
- » NUST Entrepreneur Club
- » ACM Student Chapter
- » IEEE Student Branch
- » IEEE Women In Engineering
- » IEEE Robotics & Automation Society
- » Computer Society of Pakistan
- » Youth Entrepreneur Society

## Transport

The school provides transport facility to its students, faculty and staff. In the beginning of semester, the requirements for availing this facility are shared with prospective commuters and routes are determined according to the demand and the timely availability of transport is top priority of the school.

## Career Development Office

SE ECS provides students sound academic foundation, with a focus on practical applications of knowledge and research. This makes them action-oriented, with diverse interests and backgrounds to meet the demands of their prospective employers.

The objective of setting up a Career Development Office (CDO) is to facilitate placements and internships of the graduates of the Master's and Undergraduate programmes. CDO offers counseling and placement services and undertakes a wide range of activities including company presentations, on-campus jobs, open house, job fairs, workshops on resume writing and interviewing skills, job search strategies etc. This helps the students and the companies to evaluate options and make the right choice matching with their respective needs.

## NUST SE ECS Alumni



### ◀ Syed Hassaan Tauqeer (BSCS-3)

Looking back at my four years in SE ECS-NUST, I see the development of an educational institution unlike any other in Pakistan. With its roots anchored deep in research and entrepreneurship, SE ECS has a culture of nurturing ideas and promoting its inhabitants on both national and foreign forums. The university proudly and actively indulges undergraduate students in international collaborative research projects to help them grow professionally. It also encourages them to appreciate and participate in the propagation of art and culture through clubs, societies and student organized conferences and festivals. The most important part of this university, however, is the integration of the diverse flavours that are represented by the people that come here from all over Pakistan. The opportunities that I was offered at SE ECS helped me forge valuable connections from the world over and strengthened my technical capabilities while giving me the most amazing memories that I shall remember for a lifetime.

### Laraib Shakeel (BESE-4) ▶

During my stay at NUST, I got a chance to find my interests and polish my skills. Being a part of one of NUST's most prestigious schools was a great experience. The faculty and staff at SE ECS are very encouraging and helpful. They helped me grow not only in academics but also as a human being. I learnt to balance my social life and work. SE ECS taught me how to be productive under stress. It also taught me to not worry about things too much because everything happens for a reason. NUST gives you a hard time but it's all worth it in the end.



### ▶ Khurram Javed (BESE-5)

When I joined NUST, I wasn't too sure of my decision. Many of my peers were going to the top universities all over the world, and I feared that I wouldn't have as many opportunities as they do. However, with-in a short time, all my doubts were cleared. Not only was I taught by extremely passionate and talented instructors, but I was also mentored to conduct quality research. NUST, then, provided me with funded international and national internships and helped me build a solid resume. Even before graduating, I had multiple funded offers for masters and PhD from reputed international universities. To summarize, NUST is a diverse place with a plethora of opportunities, and one only has to be willing to benefit from them.

Department of Computing (DoC) is the first department established at SECS. Within a decade, DoC has become one of the leading seats of learning in Computing. Students are prepared for the industry with emphasis on conceptual learning application of knowledge. DoC collaborates with international and national institutes of repute and at the same time maintains a vibrant relationship with the industry. Internship opportunities in industry and research groups are provided so that students get opportunity to work on real-life projects. Graduates from our department have gone on to work for national and international organisations of repute such as Oracle, Microsoft, IBM, etc.

## Bachelors in Software Engineering

The BESE programme is designed to train students to become software engineers that are equipped to handle all phases of the software development process. The core courses include Software Engineering, Requirements Engineering, Software Quality Engineering, Software Project Management, etc.

### Why join this programme?

The aim of the Bachelors in Software Engineering degree is to produce well-rounded software engineers who can fulfil the demand for software researchers, academics and developers in Pakistan. While the study of software engineering has a lot in common with computer science, software engineers learn much more about creating high-quality software in a systematic, controlled, and efficient manner.

### Associated Careers

With software permeating virtually all aspects of our work, a Software Engineering graduate has the option to work in many different sectors such as software industry, telecommunication, finance, healthcare, transport, etc. Other engineering areas like aeronautical, automotive, etc. also have increasing needs for software engineering. In addition, the SE programme develops a strong background for pursuing higher education and research. Graduates from our programmes are studying and doing research at some of the best universities and institutes around the world.

### Scheme of Studies

Programme Code-S 605

#### Semester – I

Course Code	Course Title	Credits
HU-100	English	2-0
CS-114	Fundamentals of Programming	2-1
HU-107	Pakistan Studies	2-0
MATH-101	Calculus and Analytical Geometry	3-0
ME-105	Workshop Practice	0-1
PHY-102	Applied Physics	2-1
*MATH-161	Discrete Mathematics	3-0
OHS-101	Occupational Health and Safety	1-0
<b>Total</b>		<b>18</b>

#### Semester – II

Course Code	Course Title	Credits
CS-212	Object Oriented Programming (OOP)	3-1
HU-101	Islamic Studies	2-0
MATH-121	Linear Algebra and ODEs	3-0
ME-109	Engineering Drawing	0-2
HU-109	Communication Skills	2-0
EE-122	Computer Architecture and Logic Design	3-1
<b>Total</b>		<b>17</b>

#### Semester – III

Course Code	Course Title	Credits
CS-220	Database Systems	3-1
SE-200	Software Engineering	3-0
CS-250	Data Structures & Algorithms	3-1
MATH-361	Probability and Statistics	3-0
EE-353	Computer Networks	3-1
<b>Total</b>		<b>18</b>

#### Semester – IV

Course Code	Course Title	Credits
CS-330	Operating Systems	3-1
CS-251	Design & Analysis of Algorithm	3-0
MATH-232	Complex Variables and Transforms	3-0
SE-211	Software Design and Architecture	2-1
MATH-352	Numerical Methods	2-1
XXX-XXX	"Sociology Elective-I (Professional Ethics/ Engg Economics/ Professional Practices) "	2-0
<b>Total</b>		<b>18</b>

## Semester – VI

Course Code	Course Title	Credits
XX-XXX	"Management Science Elective-I (Engg Management / Project Management)"	3-0
XX-XXX	Engineering Elective-I (Web Engg)	3-1
SE-315	Cloud Computing	2-1
CS-336	MDEE-I (Embedded Systems)	2-1
HU-212	Technical & Business Writing	2-0
CS-314	Software Construction	2-1
<b>Total</b>		<b>18</b>

## Semester – V

Course Code	Course Title	Credits
SE-320	Formal Methods	3-0
SE-321	Software Quality Engineering	3-0
MGT-271	"Entrepreneurship (Management Science Elective-II)"	2-0
	"Engineering Elective-II (Distributed Computing / Information Retrieval)"	3-X
SE-430	Software Project Management	3-0
CS-261	Human Computer Interaction	2-1
<b>Total</b>		<b>17-X</b>

## Semester – VII

Course Code	Course Title	Credits
CS-484	Information Security	3-0
SE-499	Senior Project	0-3
	Engineering Elective-III	3-X
	Engineering Elective-IV	3-1
ECO-130	Sociology Elective-II (Engineering Economics)	2-0
<b>Total</b>		<b>15-X</b>

## Semester – VIII

Course Code	Course Title	Credits
SE-499	Senior Project	0-3
	Engineering Elective-V	3-1
CS-335	MDEE-II (Internet of Things)	3-0
CSL-401	Community Service	0-2
<b>Total</b>		<b>10-X</b>
<b>Grand Total</b>		<b>131-X</b>

## Notes:

1. The labs and elective courses will be offered in such a way that the total number of credit hours should remain in between 133 - 137.
2. The Elective course in particular category may not be offered, if the minimum credit hours requirement is already met.
3. The order of offering of General Education/Supporting Science core courses can be changed depending on availability of resources.
4. \* Community Service is a non-credit course.

## SE Elective Courses

**Note:** No limit on number of courses, minimum 21Credit Hours

Code	Course Title	Credits	Code	Course Title	Credits
BIO-215	Bioinformatics	3-0	CS-453	Programming Languages	3-0
BIO-317	Computational Biology	3-0	CS-471	Machine Learning	3-1
CS-213	Advanced Programming	3-1	CS-472	Natural Language Processing	3-0
CS-321	Advanced Database Systems	3-0	CS-473	Theory of Intelligent Systems	3-1
CS-322	RDBMS Using Oracle	2-1	CS-474	Computer Vision	2-1
CS-331	System Programming	2-1	CS-476	Speech and Image Processing	3-1
CS-332	Distributed Computing	3-1	CS-481	Computer Forensics	3-1
CS-334	Open Source Systems	3-1	CS-482	System Incident Handling	3-0
CS-340	Web Technologies-I	2-1	CS-490	Advanced Topics in Computing	3-0
CS-342	Mobile Computing	3-0	EE-232	Signals and Systems	3-1
CS-344	Web Engineering	3-1	EE-322	Wireless Networks	3-0
CS-352	Theory of Automata and Formal Languages	3-0	EE-330	Digital Signal Processing	3-1
CS-361	Computer Graphics	3-1	EE-350	Data Communication	3-0
CS-362	Multimedia Systems and Design	2-1	EE-430	Telecommunication Systems	3-0
CS-363	Visualization	2-1	EE-433	Digital Image Processing	3-1
CS-364	Game Programming	2-1	MATH-352	Numerical Methods	2-1
CS-380	Introduction to Computer Security	3-0	SE-301	Object Oriented Software Engineering	3-0
CS-381	Network Security	3-1	SE-313	Design Patterns	2-1
CS-414	Advanced Java with emphasis on Internet Applications	3-1	SE-422	Software Testing	3-0
CS-423	Data Warehousing and Data Mining	3-1	SE-423	Software Metrics	3-0
CS-424	Information Retrieval	3-0	SE-431	Software Engineering Economics	3-0
CS-425	Management Information Systems	3-0	SE-440	Business Process Automation	3-0
CS-433	Applied Parallel Computing	2-1	SE-490	Advanced Topics in Software Engineering	3-0
CS-441	Web Technologies-II	3-1	CS-260	Human Computer Interaction	3-0
CS-443	E-Commerce and Solutions	3-0	CS-370	Artificial Intelligence	3-1
			CS-483	Information Security Management	3-0



**General Education Electives**

CS-309	Computing and Society	3-0
EC-303	Mobile Application Development for SME's	2-1
ECO-130	Engineering Economics	2-0
FIN-100	Principles of Accounting	3-0
FIN-204	Financial Management for IT Professional	2-0
HRM-240	Organizational Behaviour	2-0
HRM-241	Organization Behavior	3-0
HRM-441	Human Resource Management	2-0
HRM-442	Human Resource Management	3-0
HU-102	Psychology	3-0
HU-103	Principles of Sociology	3-0
HU-104	English Literature	3-0
HU-223	Professional Ethics	3-0
MGT-164	Introduction to Management	2-0
MGT-175	Intellectual Property Rights	3-0
MGT-452	New Business Ventures	2-0
MKT-102	Principles of Business and Marketing	2-0

**Supporting Science Electives**

PHY-101	Applied Physics	3-1
CH-101	Applied Chemistry	2-1
CS-271	Computational Logic	3-0
CS-382	Fundamentals of Cryptography	3-0
EE-102	Basic Electrical Engineering	3-1
EE-201	Engineering Mechanics	3-0
EE-212	Basic Electronics	2-1
EE-215	Electronic Devices and Circuits	3-1
EE-414	Digital Electronics	3-1
EE-477	Analogue and Digital Communications	3-1
MATH-112	Calculus II	3-0
MATH-133	Engineering Mathematics	3-0
MATH-221	Number Theory	3-0
MATH-232	Complex Variables and Transforms	3-0
MATH-234	Multivariable Calculus	3-0
MATH-351	Numerical Methods	3-0
OTM-455	Engineering Project Management	2-0
PHY-401	Advanced Physics	2-1
SE-410	System Modeling and Simulation	3-1
CEM-300	Procurement Management	3-0

**Software Engg - Core Depth Elective Courses**

SE-403	Agent Based Software Engineering	2-1
CS-404	Big Data Analytics	2-1
CS-405	Deep Learning	3-1
CS-406	Visual Programming	2-1
SE-407	Real Time Systems	2-1
CS-408	Data Encryption and Security	2-1

**Multi-Disciplinary Engineering Electives**

CS-335	Internet of Things	3-0
CS-336	Embedded Systems	2-1

# Bachelors of Science in Computer Science

The aim of the degree programme is twofold: firstly to create well-rounded computer scientists who will fulfil the demand for computer science researchers and software developers in Pakistan, and, secondly to nurture entrepreneurship among the young computer scientists to promote innovation at a national level. The emphasis of entrepreneurship in the programme will hopefully give birth to new developments in the field of computing. The students of this programme will help in strengthening research projects in core computer science areas and bring new ideas for establishing independent businesses that shall contribute towards the economy of the country.

The programme contains mandatory courses in the areas of artificial intelligence, compiler construction, theory of automata and formal languages, scientific computing and analysis of algorithms. In addition, the CS programme will contain courses like Introduction to Management, Strategic Marketing and Management, Entrepreneurship, Intellectual Property, Accounting and New Business Ventures to encourage entrepreneurship in the students.

## Why join this programme?

The aim of the Bachelors in Computer Science degree is to produce well-rounded computer professionals who can create new technologies and ideas and devise new ways to use computers. The degree in CS is the most flexible of degrees and can open doors into the professional worlds of many other disciplines. The programme serves those students who wish to proceed as entrepreneurs or generalists in computing or who aspire to graduate study, research positions, or cross-disciplinary innovation. This Programme develops skills in students for applying the concepts, principles, and practices in Computer Science for analysing and solving real world problems to support industry, research and development. The students are provided effective personal development and team-work skills for continuing professional growth and life-long learning and awareness of their social, professional and ethical responsibilities in national and international environment.

## Associated Careers

Computer Science graduates have a world of career opportunities before them. The CS professionals can generate and implement creative solutions to difficult problems, as well as to train the next generation of computer scientists and software professionals. They not only can work as entrepreneurs but also have the option to work as software developers and analysts in many different sectors such as software industry, telecommunications, finance, healthcare etc.. In addition, the CS programme develops a strong background for pursuing higher education and research.

## Scheme of Studies

Programme Code-S642

### Semester I

Course Code	Course Title	Credits
CS-100	Fundamentals of ICT	2-1
CS-110	Fundamentals of Computer Programming	3-1
HU-101	Islamic Studies	2-0
HU-109	Communication and Interpersonal Skills	3-0
MATH-111	Calculus-I	3-0
MATH-161	Discrete Mathematics	3-0
	<b>Total</b>	<b>18</b>

### Semester II

Course Code	Course Title	Credits
CS-212	Object Oriented Programming	3-1
EE-221	Digital Logic Design	3-1
HU-107	Pakistan Studies	2-0
	CS Computing Elective-I	3-0
XX-XXX	Applied Physics	2-X or 3-X
XX-XXX	University Elective-I	2-X
	<b>Total</b>	<b>18-X</b>

### Semester III

Course Code	Course Title	Credits
CS-220	Database Systems	3-1
CS-235	Computer Organisation and Assembly Language	3-1
CS-250	Data Structures & Algorithms	3-1
HU-210	Technical Writing	3-0
MATH-222	Linear Algebra	3-0
	<b>Total</b>	<b>18</b>

### Semester IV

Course Code	Course Title	Credits
CS-251	Design and Analysis of Algorithms	3-0
CS-330	Operating Systems	3-1
	CS Computing Elective-II	3-0
MATH-361	Probability and Statistics	3-0
XX-XXX	CS Elective-I	3-X
	<b>Total</b>	<b>16-X</b>

## Semester V

Course Code	Course Title	Credits
	University Elective-II	3-X
SE-200	Software Engineering	3-0
EE-353	Computer Networks	3-1
CS-370	Artificial Intelligence	3-1
XX-xxx	CS Elective – II	3-X
<b>Total</b>		<b>17-X</b>

## Semester VII

Course Code	Course Title	Credits
CS-352	Theory of Automata and Formal Languages	3-0
CS-499	Senior Project	0-3
MGT-272	Entrepreneurship	3-0
	University Elective -III	3-X
<b>Total</b>		<b>9-3+X</b>

## Semester VI

Course Code	Course Title	Credits
HU-223	Professional Ethics	3-0
	CS Supporting Elective - III	3-X
	CS Elective – III	3-X
CS-431	Parallel and Distributed Computing	3-0
CS-484	Information Security	3-0
<b>Total</b>		<b>15-X</b>

## Semester VIII

Course Code	Course Title	Credits
	University Elective – IV	3-0
	University Elective – V	2+X-0
	CS Elective – VI	2+X-1
CS-354 XX-XXX	Compiler Construction	"3-1 2-1"
CSL-401	Community Service Learning	0-2
CS-499	Senior Project	0-3
<b>Total</b>		<b>10+X-5</b>
<b>Grand Total</b>		<b>129-X</b>



## Elective Courses

Course Code	Course Title	Credits
<b>Data and Knowledge Management System</b>		
CS-423	Data Warehousing and Data Mining	4(3-1)
CS-321	Advanced Database Systems	3(3-0)
CS-340	Web Technologies-I	3(2-1)
CS-443	E-Commerce and Solutions	3(3-0)
CS-424	Information Retrieval	3(3-0)
CS-322	RDBMS Using Oracle	3(2-1)
CS-441	Web Technologies-II	4(3-1)
CS-425	Management Information Systems	3(3-0)
CS-404	Big Data Analytics	3(2-1)
<b>Intelligent Systems</b>		
CS-471	Machine Learning	4(3-1)
CS-472	Natural Language Processing	3(3-0)
CS-473	Theory of Intelligent Systems	4(3-1)
CS-476	Speech and Image Processing	4(3-1)
CS-474	Computer Vision	3(2-1)
BIO-317	Computational Biology	3(3-0)
BIO-215	Bioinformatics	3(3-0)
CS-405	Deep Learning	4(3-1)
<b>Computer Graphics and Multimedia Systems</b>		
CS-361	Computer Graphics	4(3-1)
EE-433	Digital Image Processing	4(3-1)
CS-362	Multimedia Systems and Design	3(2-1)
CS-363	Visualization	3(2-1)
CS-364	Game Programming	3(2-1)
<b>Parallel and Distributed Systems</b>		
CS-332	Distributed Computing	4(3-1)
CS-342	Mobile Computing	3(3-0)
CS-433	Applied Parallel Computing	3(2-1)
CS-334	Open Source Systems	4(3-1)
CS-331	System Programming	3(2-1)
<b>Software Engineering</b>		
SE-440	Business Process Automation	3(3-0)
SE-313	Design Patterns	3(2-1)
SE-423	Software Metrics	3(3-0)
SE-422	Software Testing	3(3-0)
SE-431	Software Engineering Economics	3(3-0)
SE-430	Software Project Management	3(3-0)
SE-320	Formal Methods	3(3-0)
SE-301	Object-oriented Software Engineering	3(3-0)
SE-210	Software Design and Architecture	4(3-1)
SE-321	Software Quality Engineering	3(3-0)
SE-311	Software Requirements Engineering	3(3-0)
CS-335	Internet of Things	3(3-0)
CS-344	Web Engineering	4(3-1)
<b>Computer Security</b>		
CS-381	Network Security	4(3-1)

CS-380	Introduction to Computer Security	3(3-0)
CS-481	Computer Forensics	4(3-1)
CS-482	System Incident Handling	3(3-0)
EE-322	Wireless Networks	3(3-0)
<b>Miscellaneous</b>		
EE-430	Telecommunication Systems	3(3-0)
EE-232	Signals and Systems	4(3-1)
EE-330	Digital Signal Processing	4(3-1)
EE-350	Data Communication	3(3-0)
CS-213	Advanced Programming	4(3-1)
EC-303	Mobile Application Development for SME's	3(2-1)
CS-414	Advanced Java with emphasis on Internet Applications	4(3-1)
CS-453	Programming Languages	3(3-0)
CS-260	Human Computer Interaction	3(3-0)
CS-490	Advanced Topics in Computing	3(3-0)
SE-410	System Modeling and Simulation	4(3-1)
<b>University Elective</b>		
HRM-441	Human Resource Management	2(2-0)
MGT-175	Intellectual Property Rights	3(3-0)
HU-115	Principles of Sociology	3(3-0)
HU-102	Psychology	3(3-0)
HU-104	English Literature	3(3-0)
FIN-100	Principles of Accounting	3(3-0)
CS-309	Computing and Society	3(3-0)
MGT-164	Introduction to Management	2(2-0)
HRM-240	Organizational Behavior	2(2-0)
ECO-130	Engineering Economics	2(2-0)
MKT-102	Principles of Business and Marketing	2(2-0)
FIN-204	Financial Management for IT Professional	2(2-0)
MGT-452	New Business Ventures	2(2-0)
EE-212	Basic Electronics	3(2-1)
CS-271	Computational Logic	3(3-0)
CH-101	Applied Chemistry	3(2-1)
PHY-401	Advanced Physics	3(2-1)
MATH-232	Complex Variables and Transforms	3(3-0)
OTM-455	Engineering Project Management	2(2-0)
CEM-300	Procurement Management	3(3-0)

# MS/PhD in Computer Science

The aim of this degree programme is to create well-rounded computer scientists who can fulfil the demand for computer science researchers, academics, and practitioners in Pakistan. Furthermore, this programme tends to target system-level approach for the design of computing applications, so only highly-specialised, theoretically-sound, and practically-important courses will be offered. The main objective of the MSCS degree programme is to give its students a strong background in advanced topics of computer science which will then be complimented with specialised postgraduate courses in areas of immense research and commercial potential. This programme has been designed to produce highly-skilled professionals who would be trained computer science areas, namely Algorithms and Complexity, Architecture and Organisation, Operating Systems, Intelligent Information Management, Graphics and Visual Computing, Human-Computer Interaction, Web Technologies, and Software Engineering.

## Why join this programme?

The Masters of Computer Science programme will provide a theoretical and in-depth perspective of the principles and practice of emerging and classical software systems with an emphasis on hard core computer science aspects of these systems. The coursework is structured in a way that will ensure that the students are equally capable of applying their knowledge and skills to particular specialisation areas such as High Performance Computing, Data Management and Intelligent Software Systems. Based on their learning and research interactions, MSCS students at Department of Computing get a unique exposure by visiting world-class research labs, both for short and long-term projects.

## Associated Careers

In this programme, highly-specialised, theoretically-sound, and practically-important courses will be offered. Graduates of this programme can subsequently utilise their knowledge to pursue a PhD, get employment in relevant national and multinational companies/ industries, become entrepreneurs or research scientists.

## MS Coursework

### Semester-I

Course Code	Course Name	Credits
CS-813	Mathematical Methods for Computing	3
CS-837	Advanced Operating Systems	3
CS-850	Advanced Theory of Computation	3
CS-854	Advanced Algorithm Analysis	3

### Elective Courses

#### Parallel and Distributed Computing (PDC)

Course Code	Course Title	Credits
CS-821	Distributed Databases	3
CS-830	Advanced Computer Architecture	3
CS-832	Parallel Computing	3
CS-833	Cloud Computing	3
CS-834	Scientific Computing	3
CS-836	Advanced Distributed Computing	3
CS-839	Parallel and Distributed Simulation	3
CS-865	Ubiquitous and Autonomic Computing	3
IS-838	Advanced Simulation & Modeling	3
CS-897	Advanced Topics in Computing	3

#### Graphics and Visual Computing (GVC)

CS-861	Advanced Computer Graphics	3
CS-862	Advanced Image Processing	3
CS-864	Scientific Visualization	3

## Programme Code-S742/S842

CS-866	Information Visualization	3
CS-867	Computer Vision	3
CS-869	Game Design	3
CS-876	Augmented and Virtual Reality	3
CS-893	Advanced Computer Vision	3
CS-897	Advanced Topics in Computing	3
<b>Intelligent Information Systems (IIS)</b>		
CS-863	Applied Artificial Intelligence	3
CS-871	Machine Learning	3
CS-875	Natural Language Processing	3
CS-878	Deep Learning	3
CS-879	Advanced Machine Learning	3
CS-890	Advanced Data Science	3
CS-891	Multi Agent Systems	3
CS-895	Big Data Analytics	3
CS-897	Advanced Topics in Computing	3
<b>Software Design and Management (SDM)</b>		
CS-810	Advanced Requirements Engineering	3
CS-811	Component-based Software Engineering	3
CS-812	Object Oriented Analysis & Design	3
CS-840	Software Verification	3
CS-841	Software Quality Engineering	3
CS-842	Rich Internet Applications	3
CS-853	Formal Methods	3

CS-860	Advanced Software Engineering	3
CS-869	Model Driven Software Engineering	3
CS-897	Advanced Topics in Computing	3
<b>Computer &amp; Wireless Networks (C&amp;WN)</b>		
IT-877	Advance Computer Networks	3
IT-872	Wireless Networks	3
IT-874	Wireless Sensor Networks	3
IT-875	QOS for Networks	3
IS-852	Data Communication Networks & Security	3
CSE-879	Network Performance Analysis	3

EE-981	Network Switching and Routing	3
CS-897	Advanced Topics in Computing	3
IS-821	Advanced Network / Web Security	3
<b>Research / Thesis</b>		
CS-899	MS Thesis	6
CS-999	PhD Thesis	30
<b>Additional Courses</b>		
RM-898	Research Methodology	2
SEM/WKSP-897	Seminar / Workshop	1
SEM/WKSP-997	Seminar / Workshop	1

## PhD Course Curriculum

The PhD candidates can take any course of 800/900 level with consultation with their supervisor and GEC. The GEC may specify additional subjects to be taken by the PhD student, if considered essential. After successful completion of 800/900 level courses with a minimum CGPA 3.5 out of 4.0, the student take the qualifying examination. The examination is conducted into parts, Part-A is written comprehensive test and Part-B is Oral examination.

## PhD Coursework

PhD candidates can take any of the following courses during their coursework.

Course Code	Course Title	Credits	Course Code	Course Title	Credits
CS-813	Mathematical Methods for Computing	3	CS-879	Advanced Machine Learning	3
CS-837	Advanced Operating Systems	3	CS-890	Advanced Data Science	3
CS-850	Advanced Theory of Computation	3	CS-891	Multi Agent Systems	3
CS-854	Advanced Algorithm Analysis	3	CS-895	Big Data Analytics	3
CS-821	Distributed Databases	3	CS-897	Advanced Topics in Computing	3
CS-830	Advanced Computer Architecture	3	CS-810	Advanced Requirements Engineering	3
CS-832	Parallel Computing	3	CS-811	Component-based Software Engineering	3
CS-833	Cloud Computing	3	CS-812	Object Oriented Analysis & Design	3
CS-834	Scientific Computing	3	CS-840	Software Verification	3
CS-836	Advanced Distributed Computing	3	CS-841	Software Quality Engineering	3
CS-839	Parallel and Distributed Simulation	3	CS-842	Rich Internet Applications	3
CS-865	Ubiquitous and Autonomic Computing	3	CS-853	Formal Methods	3
IS-838	Advanced Simulation & Modeling	3	CS-860	Advanced Software Engineering	3
CS-897	Advanced Topics in Computing	3	CS-869	Model Driven Software Engineering	3
CS-861	Advanced Computer Graphics	3	CS-897	Advanced Topics in Computing	3
CS-862	Advanced Image Processing	3	IT-877	Advance Computer Networks	3
CS-864	Scientific Visualization	3	IT-872	Wireless Networks	3
CS-866	Information Visualization	3	IT-874	Wireless Sensor Networks	3
CS-867	Computer Vision	3	IT-875	QOS for Networks	3
CS-869	Game Design	3	IS-852	Data Communication Networks & Security	3
CS-876	Augmented and Virtual Reality	3	CSE-879	Network Performance Analysis	3
CS-893	Advanced Computer Vision	3	EE-981	Network Switching and Routing	3
CS-897	Advanced Topics in Computing	3	CS-897	Advanced Topics in Computing	3
CS-863	Applied Artificial Intelligence	3	IS-821	Advanced Network / Web Security	3
CS-871	Machine Learning	3	CS-999	PhD Thesis	30
CS-875	Natural Language Processing	3			
CS-878	Deep Learning	3			

# MS/PhD in Information Technology

The MS (IT) degree aims to equip graduates with a range of technical, business and behavioral skills needed for the successful implementation and management of Information Technology in today's business environment. Graduates of the programme take IT professional positions in industry and organizations, or pursue higher education and research in related disciplines.

## Why join this programme?

The Masters of Information Technology curriculum inculcates advanced knowledge of information and communication technology. It is an ideal choice for a student who wishes to enhance his/her expertise with specialist IT knowledge. Based on their learning and research interactions, MSIT students at Department of Computing get a unique exposure by visiting world-class research labs, both for short and long-term projects.

## Associated Careers

The graduates of MSIT programme have gone on to achieve success in both industry and research in Information Technology and Computing. They attribute their success to the high quality of teaching and emphasis on research activities. The graduates are working in various national and multinational IT firms as research scientists, managers, business analysts, network system analysts, and a few of them are successful technology entrepreneurs.

## Scheme of Studies

### Semester – I

Course Code	Course Title	Credits
CS-820	Advance Database Concepts	3
CS-812	Object-oriented Analysis & Design	3
EE-981	Network Switching and Routing	3
IT-852	Mathematical Methods of IT	3

### Elective Courses

#### Mobile and Cloud Technologies (MCT)

CS-831	Parallel Computing	3
CS-833	Cloud Computing	3
CS-836	Advance Distributed Computing	3
CS-865	Ubiquitous and Autonomic Computing	3
SE-816	Advanced OO Design and Implementation	3
IT-817	Enterprise OO Technologies	3
IT-861	Applied Cloud Computing	3
IT-862	Mobile Application Development	3
CS-897	Advanced Topics in Computing	3

#### Network Technologies (NWT)

IT-853	Advanced Network Security	3
IT-860	Advanced Data Communication	3
IT-872	Wireless Networks	3
IT-874	Wireless Sensor Networks	3
IT-875	QOS for Networks	3
IT-876	Network Design & Management	3

## Programme Code S717/S817

IT-877	Advance Computer Networks	3
EE-884	Photonic Networks	3
CSE-844	Performance Analysis of Networks	3
IT-863	Internet of Things	3
IT-864	Software Defined Networking	3
CS-897	Advanced Topics in Computing	3

#### Database Technologies (DBT)

CS-821	Distributed Databases	3
CS-822	Data Mining	3
CS-823	Advanced Topics in Database	3
CS-824	Web-based Databases	3
CS-825	Information Retrieval	3
CS-826	Object-Oriented Databases	3
CS-866	Information Visualization	3
CS-871	Machine Learning	3
CS-885	Data Security & Privacy	3
CS-897	Advanced Topics in Computing	3

#### E-Commerce Technologies (ECT)

IT-800	Strategic Information Management	3
IT-801	E-commerce Engineering	3
IT-802	Planning and Designing E-commerce Projects	3
CS-803	Internet Marketing	3
CS-804	E-commerce Laws and Regulations	3
CS-842	Rich Internet Applications	3
CS-897	Advanced Topics in Computing	3

### Additional Elective Courses

IT-807	Cryptography and Security Mechanisms	3
IT-815	Graph Theory & Algorithm	3
IT-855	Logical & Formal Methods	3
CS-810	Advanced Requirements Engineering	3
CS-811	Component-based Software Engineering	3
CS-832	Distributed Computing	3
CS-834	Scientific Computing	3
CS-840	Software Verification	3
CS-841	Software Testing & Quality Engineering	3
CS-853	Formal Methods	3
CS-861	Advanced Computer Graphics	3
CS-862	Advanced Image Processing	3
CS-864	Scientific Visualization	3
CS-872	Ontology Engineering	3
CS-873	Semantic Web	3
CS-877	Artificial Intelligence & Machine Learning	3
CS-880	Information Assurance	3
CS-882	Advanced Information Security	3
CS-881	Computer Security Architecture	3
SE-860	Advanced Software Engineering	3
SE-869	Model Driven Software Engineering	3
IS-838	Advanced Simulation & Modeling	3

### Research / Thesis

CS-899	MS Thesis	6
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### Additional Courses

RM-898	Research Methodology	2
SEM/WKSP-897	Seminar / Workshop	1



## PhD Course Curriculum

The PhD candidates can take any course of 800/900 level with consultation with their supervisor and GEC. The GEC may specify additional subjects to be taken by the PhD student, if considered essential. After successful completion of 800/900 level courses with a minimum CGPA 3.5 out of 4.0, the student take the qualifying examination. The examination is conducted into parts, Part-A is written comprehensive test and Part-B is Oral examination.

### PhD Coursework

PhD candidates can take any of the following courses during their coursework.

Course Code	Course Title	Credits	Course Code	Course Title	Credits
CS-820	Advance Database Concepts	3	CS-897	Advanced Topics in Computing	3
CS-812	Object-oriented Analysis & Design	3	IT-800	Strategic Information Management	3
EE-981	Network Switching and Routing	3	IT-801	E-commerce Engineering	3
IT-852	Mathematical Methods of IT	3	IT-802	Planning and Designing E-commerce Projects	3
CS-831	Parallel Computing	3	CS-803	Internet Marketing	3
CS-833	Cloud Computing	3	CS-804	E-commerce Laws and Regulations	3
CS-836	Advance Distributed Computing	3	CS-842	Rich Internet Applications	3
CS-865	Ubiquitous and Autonomic Computing	3	CS-897	Advanced Topics in Computing	3
SE-816	Advanced OO Design and Implementation	3	IT-807	Cryptography and Security Mechanisms	3
IT-817	Enterprise OO Technologies	3	IT-815	Graph Theory & Algorithm	3
IT-861	Applied Cloud Computing	3	IT-855	Logical & Formal Methods	3
IT-862	Mobile Application Development	3	CS-810	Advanced Requirements Engineering	3
CS-897	Advanced Topics in Computing	3	CS-811	Component-based Software Engineering	3
IT-853	Advanced Network Security	3	CS-832	Distributed Computing	3
IT-860	Advanced Data Communication	3	CS-834	Scientific Computing	3
IT-872	Wireless Networks	3	CS-840	Software Verification	3
IT-874	Wireless Sensor Networks	3	CS-841	Software Testing & Quality Engineering	3
IT-875	QOS for Networks	3	CS-853	Formal Methods	3
IT-876	Network Design & Management	3	CS-861	Advanced Computer Graphics	3
IT-877	Advance Computer Networks	3	CS-862	Advanced Image Processing	3
EE-884	Photonic Networks	3	CS-864	Scientific Visualization	3
CSE-844	Performance Analysis of Networks	3	CS-872	Ontology Engineering	3
IT-863	Internet of Things	3	CS-873	Semantic Web	3
IT-864	Software Defined Networking	3	CS-877	Artificial Intelligence & Machine Learning	3
CS-897	Advanced Topics in Computing	3	CS-880	Information Assurance	3
CS-821	Distributed Databases	3	CS-882	Advanced Information Security	3
CS-822	Data Mining	3	CS-881	Computer Security Architecture	3
CS-823	Advanced Topics in Database	3	SE-860	Advanced Software Engineering	3
CS-824	Web-based Databases	3	SE-869	Model Driven Software Engineering	3
CS-825	Information Retrieval	3	IS-838	Advanced Simulation & Modeling	3
CS-826	Object-Oriented Databases	3	<b>Research / Thesis</b>		
CS-866	Information Visualization	3	CS-999	PhD Thesis	30
CS-871	Machine Learning	3	<b>Additional Courses</b>		
CS-885	Data Security & Privacy	3	SEM/WKSP-997	Seminar / Workshop	1

# MS/PhD in Information Security

The Masters in Information Security (MS-IS) programme aims to produce highly-skilled professionals who are trained in three important areas of information security, namely Network Security, Computer Security, and Data Security. In addition to the focus on information security management and technical principles, another distinguishing aspect of the MS-IS programme is the application of information security to research and development in advanced computer and communication systems. The coursework of the MS-IS programme has been designed with a special emphasis on preparing research-ready students that can undertake significant postgraduate research work, as well as equipping them with practical knowledge needed to pursue a career in information security engineering.

## Why join this programme?

Information security is one of the most essential requirements for an information-based economy of the future. Organisations and people that use and depend on information technology must ensure that their systems are not compromised and exploited by attackers. This programme will expose the students to the advanced technologies in attacking computer and communication systems as well as preventing attacks. Students will have a solid foundation to conduct research and development in new security technologies which will give them a competitive advantage in the industry. It should be noted that this degree is intellectually challenging and students with a passion for problem solving using mathematics and/or computer Programming will find this course very interesting and rewarding.

## Associated Careers

The MS-IS degree can create opportunities for employment as security consultants in major public service sectors, such as telecommunications and banking, as well as employment within specialist information security research and development companies (both local and foreign).

## Scheme of Studies

Programme Code-S714/814

### Core Courses

Course Code	Course Title	Credits
IS-820	Computer Security	3
IS-821	Network Security	3
IS-842	Advanced Cryptography – I	3
IS-830	Information Security Management	3
IS-899	MS Thesis	6

### Elective Courses

Course Code	Course Title	Credits
<b>Cryptology</b>		
IS-843	Advanced Cryptography – II	3
IS-844	Cryptanalysis	3
IS-845	Quantum Cryptography	3
IS-846	Formal Methods for Information Security	3
IS-891	Advanced Topics in Cryptology	3

### Systems / Network Security

IS-822	Wireless Network Security	3
IS-825	Vulnerability Exploitation and Defense	3
IS-827	Electronic Warfare – Principles and Techniques	3
IS-851	Secure Communications	3
IS-852	Data Communication Networks & Security	3
IS-853	Cloud Computing Security	3

IS-854	Advanced Web Security	3
IS-861	Secure Electronic Commerce	3
IS-863	Cellular and Mobile Network Security	3
IS-859	Information Security Engineering	3
IS-893	Advanced Topics in Systems Security	3

### Information Security Management

IS-831	Information Security Project Management	3
IS-833	IT Security Evaluation & Auditing	3
IS-832	Legal Aspects of Information Security	3
IS-834	Security Planning and Incident Management	3
IS-835	Security Risk Analysis and Management	3
IS-836	Auditing Networks, Perimeters and Systems	3
IS-837	Security and Privacy of Information and Information Systems	3

IS-894	Advanced Topics in Information Security Management	3
<b>Digital Forensics and Incident Response</b>		
IS-823	Computer Forensics	3
IS-839	Critical Infrastructure Protection and Incident Management	3
IS-855	Information Hiding	3
IS-870	Network Forensics	3
IS-871	OS & File System Forensics	3
IS-872	Forensics Incident Response	3
IS-873	Malware Analysis and Reverse Engineering	3
IS-874	Intrusion Detection	3
IS-895	Advanced Topics in Digital Forensics and Incident Response	3
<b>General</b>		
IS-810	Secure Coding	3

IS-824	Biometrics	3
IS-826	Cyber Warfare	3
IS-856	Access Control and Database Security	3
IS-890	Advanced Topics in Information Security	3
IS-838	Advanced Simulation and Modeling	3
CE-838	Analysis of Stochastic Systems	3
SE-802	Pattern Recognition	3
SE-805	Advance Artificial Intelligence	3
IS-999	PhD Thesis	30

### Additional Courses

RM-898	Research Methodology	2
SEM/WKSP-897	Seminar / Workshop	1
SEM/WKSP-997	Seminar / Workshop	1

## PhD Course Curriculum

The PhD candidates can take any course of 800/900 level with consultation with their supervisor and GEC. The GEC may specify additional subjects to be taken by the PhD student, if considered essential. After successful completion of 800/900 level courses with a minimum CGPA 3.5 out of 4.0, the student take the qualifying examination. The examination is conducted into parts, Part-A is written comprehensive test and Part-B is Oral examination.

### PhD Coursework

**PhD candidates can take any of the following courses during their course work.**

Course Code	Course Title	Credits
IS-830	Information Security Management	3
IS-843	Advanced Cryptography	3
IS-851	Secure Communications	3
IS-852	Data Communication Networks & Security	3
IS-844	Cryptanalysis	3
IS-810	Secure Coding	3
IS-822	Wireless Network Security	3
IS-823	Computer Forensics	3
IS-825	Vulnerability Exploitation & Defense	3
IS-833	IT Security Evaluation & Auditing	3
IS-824	Biometrics	3

IS-831	Information Security Project Management	3
IS-826	Cyber Warfare	3
IS-856	Access Control and Database Security	3
IS-855	Information Hiding	3
IS-854	Advanced Web Security	3
IS-853	Cloud Computing Security	3
IS-842	Applied Cryptography	3
EE-852	Information and Coding Theory	3
CE-838	Analysis of Stochastic Systems	3
IS-820	Computer Security	3
IS-821	Network Security	3

## Department of Electrical Engineering

The Electrical Engineering (EE) Department at SECS currently offers an undergraduate degree in Electrical Engineering with various specialisations and a strong postgraduate programme leading to PhD in Electrical Engineering. The EE department offers a broad range of EE courses, both elementary and advanced, spanning the whole gamut of EE disciplines including areas such as electronics, electrical machines, power engineering, control systems, communication systems and networks.

The EE department aims to achieve academic and research leadership in its subject areas through its well-designed curriculum (that emphasises conceptual understanding and fosters creativity) coupled with its strong focus on research, innovation, and industry-liaison. The school also strongly emphasizes on imbuing the graduates with strong professional ethics.

### Bachelors in Electrical Engineering

Electrical Engineering encompasses a broad spectrum of knowledge areas including electronics (Digital and Analogue), Signal Processing and Communication Systems, Control Systems and Robotics, Electromagnetics and Electro-optics, Electrical Energy Generation and Distribution.

The Electrical Engineering department at SECS prepares the students to become professional electrical engineers who are proficient in applying the knowledge acquired at school in core electrical engineering disciplines to solve practical engineering problems.

### Why join this programme?

In the contemporary world, applications of electronics and electrical engineering are both diverse and pervasive. By joining the Electrical Engineering programme you take the first step in becoming a member of an elite group of specialists who will always have a niche area of knowledge which shall never get redundant. The programme is especially prominent for the following reasons:

- » Strong focus on teaching excellence
- » Strong focus on incorporating practical skills in lab work and on fostering research and innovation
- » Increased job opportunities due to greater market acceptance

### Associated Careers

Electrical and electronic engineering graduates are in demand in a number of industries-broadcast communications, mobile communications, optical communications, integrated circuit design, instrumentation, medical engineering, avionics, consumer electronics and computer networking, to name but a few. Graduates can also pursue research, as PhD students, or join industrial laboratories.



## Semester-I

## Semester-II

Course Code	Course Title	Credits	Course Code	Course Title	Credits
HU-100	English	2-0	HU-107	Pakistan Studies	2-0
CS-114	Fundamentals of Programming	2-1	MATH-121	Linear Algebra and ODEs	3-0
HU-101	Islamic Studies	2-0	ME-109	Engineering Drawing	0-2
MATH-101	Calculus and Analytical Geometry	3-0	HU-109	Communication Skills	2-0
ME-105	Workshop Practice	0-1	*ME-100	Engineering Mechanics	3-0
PHY-102	Applied Physics	2-1	*EE-211	Electrical Network Analysis	3-1
*EE-111	Linear Circuit Analysis	3-1			
	<b>Total</b>	<b>14-4</b>		<b>Total</b>	<b>13-3</b>

## Semester-III

## Semester-IV

Course Code	Course Title	Credits	Course Code	Course Title	Credits
*CS- 212	Object Oriented Programming (OOP)	3-1	EE-215	Electronic Devices and Circuits	3-1
ME-102	Thermodynamics	2-0	EE-241	Electromagnetic Field Theory	3-0
EE-221	Digital Logic Design	3-1	EE-222	Microprocessor Systems	3-1
HU-212	Technical & Business Writing	2-0	MATH-232	Complex Variable and Transforms	3-0
MATH-243	Vector Calculus	3-0	ECO-130	Engineering Economics	2-0
	<b>Total CHs</b>	<b>13-2</b>		<b>Total CHs</b>	<b>14-2</b>

Note: Transfer students will take one additional course EE-111 Linear Circuit Analysis (3-1) in 3<sup>rd</sup> Semester

Note: Transfer students will take one additional course (EE-211 Electrical Network Analysis (3-1) or ME-100 Engineering Mechanics (3-0)) in 4th Semester. 1x left over will be taken in next Summer.

## Semester – V

## Semester – VI

Course Code	Course Title	Credits	Course Code	Course Title	Credits
EE-383	Instrumentation and Measurements	3-1	EE-351	Communication Systems	3-1
EE-260	Electrical Machines	3-1	EE-371	Linear Control Systems	3-1
EE-313	Electronic Circuit Design	3-1	EE-330	Digital Signal Processing	3-1
EE-232	Signals and Systems	3-1	MATH-351	Numerical Methods	3-0
MATH-361	Probability & Statistics	3-0	EC/EE- XXX	Elective-I	3-X
	<b>Total</b>	<b>15-4</b>		<b>Total</b>	<b>15-(3+X)</b>

## Semester – VII

## Semester – VIII

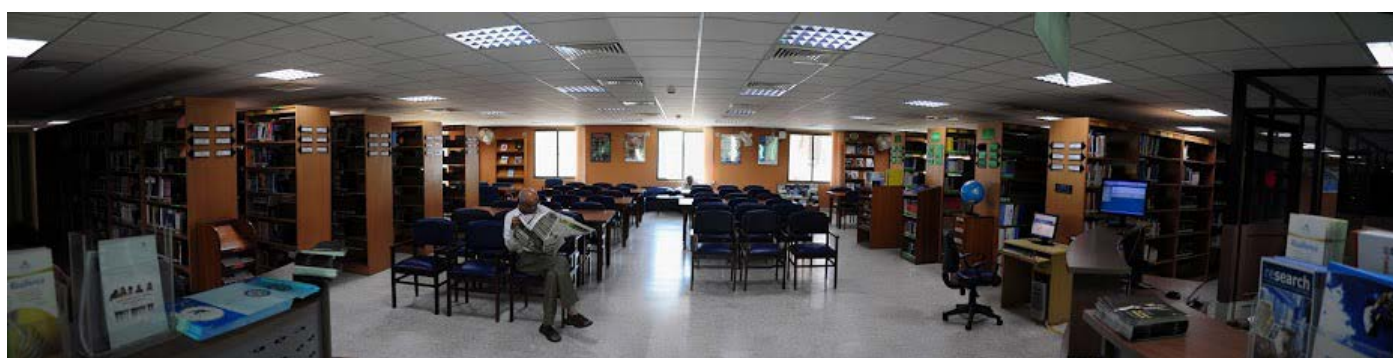
Course Code	Course Title	Credits	Course Code	Course Title	Credits
OTM-455	Engineering Project Management	2-0	HU-222	Professional Ethics	2-0
EE-498	Senior Design Project-I	0-2	MGT-271	Entrepreneurship	2-0
EC/EE-XXX	Elective-II (Tfr from sem VI)	3-X	XX-XXX	University Elective	3-X
EC/EE-XXX	Elective-III	3-X	EC/EE-XXX	Elective-V	3-X
EC/EE-XXX	Elective-IV	3-X	EE-499	Senior Design Project-II	0-4
EE-XXX CS-XXX	Elective-IV	3-X		<b>Total CHs</b>	<b>10-(4+X)</b>
	<b>Total</b>	<b>11-(2+X)</b>		<b>Grand Total</b>	<b>105+24+X (129+X)</b>

## Elective Courses

At the end of first year, the sequence of elective courses for different streams may be announced. The students may choose one of the offered streams. The finalized streams will be decided by the department depending upon the number of students in each stream.

## Elective Courses for BE in Electrical Engineering (BEE)

Course Code	Course Title	Credits	EE-384	Digital Instrumentation	3-1
CE-185	Basic Civil Engineering	3-1	EE-385	Industrial Electronics	3-1
CS-220	Database Systems	3-1	EE-411	CMOS Analog Circuits Design	3-0
CS-251	Design & Analysis of Algorithms	3-0	EE-412	VLSI Circuit Design	3-0
CS-435	Parallel & Distributed Processing	3-1	EE-414	Digital Electronics	3-1
CS-470	Machine Learning	3-0	EE-415	Opto-Electronics	3-1
CS-474	Computer Vision	2-1	EE-421	Digital System Design	3-1
CS-475	Computer Vision	3-0	EE-423	Embedded System Design	3-1
EE-316	Operational Amplifier Applications	3-1	EE-428	Industrial Process Control	3-1
EE-317	Integrated Circuits	3-0	EE-441	Microwave ICs Design	3-0
EE-318	Solid State Electronics	3-0	EE-442	Microwave Devices	3-1
EE-332	Linear Systems and Signal Processing	3-0	EE-443	Electromagnetic Compatibility	3-0
EE-333	Digital Image Processing	3-0	EE-463	Fundamentals of High Voltage Engineering	3-0
EE-341	Transmission Lines, Antennas and Wave Propagation	3-1	EE-464	Power Systems Protection	3-0
EE-342	Microwave Engineering	3-1	EE-465	Power Economics and Management	3-0
EE-343	Transmission Lines, Waveguides	3-1	EE-466	Advanced Electrical Machines	3-1
EE-344	Wave Propagation and Antennas	3-1	EE-472	Industrial Control and Automation	3-0
EE-356	Wireless Communication	3-0	EE-474	Advanced Control Systems	3-0
EE-357	Computer and Communication Networks	3-1	EE-475	Power System Operation and Control	3-0
EE-361	Analysis and Design of Electric Machines	3-0	EE-476	System Identification	3-0
EE-363	Power Transmission	3-0	EE-481	Robotics-II	3-0
EE-364	Power Distribution and Utilization	3-0	EE-482	Electric Drives	3-0
EE-365	Renewable Energy Systems	3-0	EE-491	Radar Systems	3-1
EE-366	Power Engineering	3-0	EE-493	Applied Control & Navigation Systems	3-0
EE-367	Electrical Power Transmission & Distribution	3-1	EE-497	Power Engineering Lab	0-1
EE-368	Power Electronics	3-1	SE-200	Software Engineering	3-0
EE-369	Power Electronics	3-0	CS-330	Operating Systems	3-1
EE-372	Digital Control Systems	3-1	EE-321	Computer Architecture & Organisation	3-1
EE-374	Optimal Control	3-0	EE-444	Antenna Design	3-0
EE-375	Introduction to Adaptive Control	3-1	EE-451	Mobile Communication Systems	3-0
EE-376	Stochastic Control	3-1	EE-452	Satellite Communication Systems	3-0
EE-377	Multivariable Control	3-1	EE-455	Optical Fibre Communication	3-0
EE-378	Introduction to Non-linear Control	3-0	EE-458	Broadband Technologies	3-0
EE-381	Robotics-I	3-1	EE-461	Power System Analysis and Design	3-0



# MS/PhD in Electrical Engineering

The Department of Electrical Engineering offers programmes leading to the Master of Science and Doctor of Philosophy degrees. Graduate study in the department is organized into following streams:

- » Control Systems
- » Signal Processing
- » Telecommunication / Communication Systems
- » Digital Systems
- » Artificial Intelligence and Autonomous Systems
- » Solid State Electronics and Circuits

## MS Electrical Engineering Degree Requirements:

The student must complete a total of 30 credits and meet the requirements specified below:

- » MS students are required to take at least 3 core courses (9 Cr Hrs) out of the pool of core courses. Selection of core courses will be based on their relevance to the stream the student has been admitted to and will be subject to prior approval of concerned Head of Department.
- » In addition to the core courses an MS Student must complete a minimum of 3 courses (9 Cr Hrs) from the list of approved EE courses, of the approved streams.
- » Furthermore, a Student will be allowed to take a maximum of 2 courses (6 Cr Hrs) from all the approved courses of other engineering and basic sciences disciplines of NUST Schools / Institutes / Colleges with prior approval of HOD.
- » However a student may, in addition to completing 6 courses (18 Cr Hrs), to fulfill the requirements specified in para (a) and (b) above, and in lieu of courses defined in para (c) above, may choose to complete the remaining 2 courses (6 Cr Hrs), by studying approved EE courses from any of the streams.



## Core Courses

Course Code	Course Title	Credits
EE 849	Electromagnetic Field Analysis	3
EE 847	Microwave Networks and Passive Components	3
EE 831	Advanced Digital Signal Processing	3
CE 866		
EE 891	Stochastic Systems	3
EE 851	Advanced Digital Communication Systems	3
EE 852	Information and Coding Theory	3
EE 871	Linear Control Systems	3
EE 801	Semiconductor Device Physics	3
EE 802	Quantum Mechanics	3
EE 803	Physical Electronics	3
EE 823	Advanced Digital System Design	3
CE 825		
EE 826	Advanced VLSI Design	3
EE 863	Power Systems Analysis	3
EE 862	Power System Operation and Control OR	3
EEE 800	Power System Operation, Control and Optimization	3
EEE 801	Clean Energy Generation, Integration and Storage	3
EEE 802	Advanced Power System Stability and Transient Studies	3
EE 877	Mobile Robotics	3
SE 807	Machine Learning	3
EE 808	Digital Integrated Circuit Design	3
EE 809	Analog Integrated Circuit Design	3
<b>Solid State Electronics and Circuits</b>		
EE 804	Photonic Devices	3
EE 805	Semiconductor Processing	3
EE 806	Thin Film Processing	3
EE 807	Thin Film Characterization	3
EE 808	Digital Integrated Circuit Design	3
EE 809	Analog Integrated Circuit Design	3
EE 900	Optoelectronic Devices & Materials	3
EE 901	Power Electronics & Electric Drives	3
EE 902	Nano-Electronics	3
EE 903	Advanced Semiconductor Device Theory	3

EE 904	Microchip Fabrication Technology	3
EE 905	Advanced Power Electronics	3
EE 906	Solid State Electronics	3
EE 907	Micro & Nano Fabrication	3
EE 908	Ultra High Speed Nanoelectronic Devices	3
EE 909	Selected Topics in Electronics	3
EE 898	Nanotechnology	3
EE 818	Micro-Electro-Mechanical Systems	3
EE 893	Data Acquisition & Mixed Signal Design	3
<b>Signal Processing</b>		
EE 832	Pattern Recognition	3
EE 833	DSP Hardware System Design	3
EE 834	Applied Signal Processing	3
EE 835	Multirate Systems & Filter Banks	3
EE 836	Advanced Digital Image Processing	3
EE 837	Advanced Topics in Computer Vision & Image Processing	3
EE 838	Filtering & Tracking	3
EE 839	Adaptive Filters	3
EE 930	Spatial Array Processing	3
EE 931	DSP Software System Design	3
EE 932	Speech Processing	3
EE 933	Time Frequency Analysis	3
EE 939	Selected Topics in Signal Processing	3
CS 867	Computer Vision	3
CE 803		
<b>Telecommunication/Communication Systems</b>		
EE 853	Advanced Wireless Communication	3
EE 854	Optical Communication Systems	3
EE 855	Error Control Coding	3
EE 856	Software Defined Radio	3
EE 857	Advanced Satellite Communication Systems	3
EE 858	Communication Project Management	3
EE 859	Performance Analysis of Communication Networks	3
EE 950	Advanced Data Communication Systems	3
EE 951	Radar Systems	3
EE 959	Selected Topics in Communication Systems	3



EE	897	Detection & Estimation	3
CSE	812	RF Communication System Design	3
EE	881	Advanced Communication Networks	3
EE	882	Cognitive Radio Networks	3
EE	883	Wireless Sensor & Mesh Networks	3
EE	884	Photonic Networks	3
EE	885	Broadband Networks	3
EE	886	Advanced Wireless Networks	3
EE	887	Network Switching & Routing	3
EE	888	Advanced Computer Network Design & System Security	3
EE	889	Network and Service Management and Control	3
EE	989	Selected Topics in Networks	3
CSE	820	Advanced Computer Networks	3
CSE	879	Network Performance Analysis	3
<b>Control Systems</b>			
EE	872	Optimal Control	3
EE	873	Fuzzy Control	3
EE	874	Adaptive Control	3
EE	875	Discrete Time Control Systems	3
EE	876	Probabilistic Robotics	3
EE	877	Mobile Robotics	3
EE	878	System Identification	3
EE	879	Robust Control	3
EE	970	Advanced Robotics	3
EE	971	Modeling & Simulation of Dynamic Systems	3
EE	972	Advanced Digital Control Systems	3
EE	973	Control System Optimization	3
EE	974	Networked & Embedded Control Systems	3
EE	975	Robust & Multivariable Control	3
EE	976	Optimal & Multivariable Control	3
EE	977	Nonlinear Control Systems	3
EE	978	Convex Optimization	
EE	979	Selected Topics in Control Systems	3
EE	894	Cognitive Robotics	3
EE	892	Instrumentation & Systems	3
EM	800	Robotics - 1	3
EM	805	Robotics - 2	3

MTS	800	Advanced Robotics I	3
MTS	801	Advanced Robotics II	3
MTS	840	Data Acquisition and Control	3
ME	837	Nonlinear Dynamics	3

**Artificial Intelligence and Autonomous Systems**

EE	836	Advanced Digital Image Processing	3
EE	876	Probabilistic Robotics	3
EE	837	Advanced Topics in Computer Vision & Image Processing	3
EE	897	Detection & Estimation	3
EE	970	Advanced Robotics	3
EE	839	Adaptive Filters	3
EE	832	Pattern Recognition	3
EE	871	Linear Control Systems	3
EE	821	Advanced Embedded System Design	3
EE	878	System Identification	3
SE	801	Artificial Neural Networks	3
CS	867	Computer Vision	3
SYSE	804	Modeling, Simulation & Optimization	3
MATH	816	Applied Linear Algebra	3

**Digital Systems**

MATH	816	Applied Linear Algebra	3
EE	821	Advanced Embedded System Design	3
EE	822	ASIC Design Methodology	3
EE	824	Real Time Systems	3
EE	825	System Level Packaging	3
EE	827	Mixed Signal IC Design	3
EE	828	Computerized Tomography Systems	3
EE	829	Digital Data Acquisition & Control	3
EE	920	System Validation	3
EE	921	System on Chip Architecture	3
EE	922	Design of Fault-Tolerant Systems	3
EE	929	Selected Topics in Digital Systems	3
CSE	811	Advanced Computer Architecture	3

**Thesis / Research**

EE	899	MS Thesis	6
EE	999	PhD Thesis	30
RM	898	Research Methodology	2
SEM/ WKSP	897	Seminar / Workshop	1

SEM/ WKSP	997	Seminar / Workshop	1
Courses of other Departments (Information / Systems / Computational & Software Engineering) approved for MS/ PhD Electrical Engineering			
MATH	812	Advanced Engineering Mathematics	3
MATH	850	Advanced Numerical Analysis	3
IS	820	Computer Security	3
IS	822	Wireless Network Security	3
IS	827	Electronic Warfare – Principles and Techniques	3
IS	851	Secure Communications	3
IS	852	Data Communication Networks & Security	3
IS	855	Information Hiding	3
IS	863	Cellular and Mobile Network Security	3
IS	893	Micro & Nano Fabrication	3
SYSE	804	Modeling, Simulation & Optimization	3
SYSE	844	Communication System Engineering	3
SYSE	845	Advanced Communication System and Network Security	3
SYSE	861	Introduction to C4I2SR System Engineering	3
SYSE	862	Architecting C4I System of Systems	3

CSE	812	Distributed Systems and Resource Optimization	3
CSE	842	Communication Systems & Networks	3
CSE	843	Performance Analysis of Communication Systems	3
CSE	844	Performance Analysis of Networks	3
SE	801	Artificial Neural Networks	3
SE	807	Machine Learning	3
SE	808	Bio Informatics Systems	3
SE	826	Advanced Computer Network Design and System Security	3
SE	828	Network Security	3
SE	851	Wavelet Compression	3
SE	865	Human computer Interface	3
SE	898	Research Methodologies	3

**Note:**

Offering of Elective Courses in all the specialisation streams is subject to the availability of faculty and class strength



## PhD Electrical Engineering

PhD candidates have to complete minimum of 18 credits of 800/900 level courses or equivalent. These 18 credit hours are in addition to the pre-requisites specified by the PhD Evaluation Acceptance Committee (PEAC). Minimum GPA of 3.5/4.0 is required in the course work. After the successful completion of course work, the student can take the qualifying examination consisting of Part-A (Written Comprehensive Examination) and Part-B (Oral Examination). In addition to the coursework, all doctoral students must register for at least 30 credits of doctoral research. PhD candidates may take any of the courses mentioned above or other graduate courses relevant to their area of research.



# MS Innovative Technologies in Learning

This newly started graduate programme will provide a design space for mixing and matching of diverse disciplines and research areas thus creating disruptive technologies at the innovative edge of psychology, information technology, graphic design, storytelling and drama.

It will provide a practical forum to look beyond the obvious, to ask questions not yet asked and to provide innovative solutions that could dramatically improve the way people learn - not only for those who go to a school but also those who cannot attend a conventional school.

Educational innovation, driven by a need for continuing education in the labor force, is transforming the global industrial landscape. Moreover, this need has also put a lot of stress on producing dynamic and diverse educational entrepreneurs as well as researchers who can steer the next revolution in education. This is the first programme in Pakistan that will address the deficiency of such individuals and aim to create graduates with the ability to "Learn, Think, Apply, Innovate and Educate".

## Why join this programme?

We have about 5 million adults in Punjab who go to high school, but there are more than 8 million adults who dropout before entering high school. This inequality is becoming more pronounced as times passes. Inequality in education, in opportunities and in financial status of families is linked to disturbing indicators in a society. This is like a time bomb which is ticking not only for the poor but also for the neighboring rich. The planners have never thought that the poor will never be able to send their children to high school - the school should reach out to their children (at different times) whenever they needed it. Not only the school should reach out, it should provide free textbooks, the required stationery, and more importantly a personalized pedagogy for each learner; fast learners can move swiftly while slow learners are provided additional tools to support their learning. Moreover, we should not forget that the school should only deliver the content needed by the children. The lo-

## Scheme of studies

### Semester-I

Course Code	Course Title	Credits
ITE-801	Learning Through Pedagogy and Technology	3
ITE-802	Universal Design for Learning	3
ITE-812	Design of Learning Interfaces	3
PSY-811	Psychology of Learning and Cognition	3

### Semester-II

Course Code	Course Title	Credits
ITE-811	Role of Technology in Education	3
XX-XXX	Elective-I	3
XX-XXX	Elective-II	3
XX-XXX	Elective-III	3
RM-898	Research Methodology	2

cal software industry is swiftly moving towards design of mobile educational applications and games. Currently, there is no pedagogical grounding which can provide a framework for designing interactive applications. The proposed MS programme will enable our graduates to take advantage of the billion dollar emerging industry dealing with edutainment.

## Objectives

- To develop entrepreneurial innovations in educational practice.
- To evaluate technology's impact on learning and development.
- To excel in designing interactive media content and learning applications.

## Associated Careers

The objectives of proposed MS in ITL are to develop entrepreneurial innovations in educational practice, to evaluate technology's impact on learning and development and to excel in designing interactive media content and learning applications. The graduates of this MS programme will be suitable and sought after in the following industry:

- Interactive text book design
- Schools
- Games and interactive media
- Online education companies
- Instructional designer, online training
- Animation development, children's and adults educational television network
- Educational start-ups
- War games design and development

Programme Code-S758

### Semester-III

Course Code	Course Title	Credits
ITE-899	MS Thesis	6

### Elective Courses

Course Code	Course Title	Credits
ITE-803	Pedagogy of the Oppressed: Critical Thinking	3
ITE-813	Design of Games for Learning	3
ITE-821	Innovative Entrepreneurship in Education	3
ITE-831	Advanced Topics in Education (Seminar Course)	3
ITE-832	Navigating Pakistan's Educational Landscape	3
CS-822	Data Mining	3
CS-861	Advanced Computer Graphics	3

The domain of data science is emerging as one of the hottest new professions and academic disciplines in the 21st century, both in Pakistan and in the rest of the world. The demand for data scientists is racing ahead of supply, and this will accelerate further. People with the necessary skills are scarce, primarily because the discipline is so new. Considering this dire need of the knowledge of data science, NUST-SECS has started the MS programme in data science i.e. MS Data Science (DS). The aim is to produce data scientists and professionals capable of business decision making based on the insightful analyses they would be able to perform through the data science skills that they would have developed under this graduate programme.

## Why to join this programme?

The curriculum of MS Data Science (DS) programme at NUST-SECS is tailored to meet the indigenous needs of the ailing software industry of the country and of the world. The qualified graduates will also be able to cater the emerging demands of the industry. It will equip the students with advanced and contemporary technical knowledge of Data Science and will enable them to better manage and govern the big-data and retrieve the necessary information.

During the study students will carry out advanced research in diversified topics related to data science such as, big data analytics, image processing, information visualization, information retrieval, information extraction, text mining, semantic web and cloud computing. This research along with the coursework will produce qualified human resources in the field of data science.

## Objectives

The key objectives of this programme are:

- To equip students to transform bigdata into actionable insights to make complex business decisions.
- To enable students, understand and analyze a problem and arrive at computable solutions for big-data processing.
- To expose students to the set of big-data technologies that matches those solutions.
- To gain hands-on experience on data-centric tools for statistical analysis, visualization and big-data applications at the same rigorous scale as in a practical data science project.
- To understand the implications of handling bigdata in terms of data security and business ethics.

## Associated Careers

The students will have hands-on experience on different tools and techniques of data science that will enhance their chances of absorption in the data science sector both in local and international industry, such as TeraData, IBM, Telecom industry, banks, hospitals, insurance institutions and government organizations.

## Scheme of studies

Programme Code S773-

### Semester-I

Course Code	Course Title	Credits
CS-871	Machine Learning	3+0
CS-807	Statistical and Mathematical Methods for Data Science	3+0
CS-808	Tools and Techniques for Data Science	3+0

### Semester-II

Course Code	Course Title	Credits
XX-xxx	Specialisation Elective-I	3+0
XX-xxx	Elective-I	3+0
XX-xxx	Elective-II	3+0

### Semester-III

Course Code	Course Title	Credits
XX-xxx	Specialisation Elective-II	3+0
XX-xxx	Elective-III	3+0

### Semester-III

Course Code	Course Title	Credits
XX-xxx	Specialisation Elective-II	3+0
XX-xxx	Elective-III	3+0

### Semester-IV

Course Code	Course Title	Credits
CS-899	Thesis	0+6

### Specialized Electives

Course Code	Course Title	Credits
CS-825	Information Retrieval	3+0
CS-836	Advance Distributed Computing	3+0
CS-866	Information Visualization	3+0
CS-878	Deep Learning	3+0
CS-875	Natural Language Processing	3+0
CS-895	Big Data Analytics	3+0

## Electives

Course Code	Course Title	Credits
CS-820	Advanced Database Concepts	3+0
CS-821	Distributed Databases	3+0
CS-822	Data Mining	3+0
CS-823	Advance Topics in Databases	3+0
CS-831	Parallel Computing	3+0
CS-833	Cloud Computing	3+0
CS-834	Scientific Computing	3+0
CS-853	Formal Methods	3+0
CS-861	Advanced Computer Graphics	3+0
CS-820	Advanced Database Concepts	3+0
CS-821	Distributed Databases	3+0
CS-822	Data Mining	3+0
CS-823	Advance Topics in Databases	3+0
CS-831	Parallel Computing	3+0
CS-833	Cloud Computing	3+0
CS-834	Scientific Computing	3+0

CS-853	Formal Methods	3+0
CS-861	Advanced Computer Graphics	3+0
CS-862	Advanced Image Processing	3+0
CS-863	Artificial Intelligence with Applications	3+0
CS-864	Scientific Visualization	3+0
CS-867	Computer Vision	3+0
CS-872	Ontology Engineering	3+0
CS-882	Advanced Information Security	3+0
CS-885	Data Security & Privacy	3+0
CS-890	Advanced Data Science	3+0
CS-897	Advanced Topics in Computing	3+0
CS-839	Parallel and Distributed Simulation	3+0
CS-870	Social Web Mining	3+0
CS-873	Semantic Web	3+0
CS-879	Advanced Machine Learning	3+0
<b>Additional Courses</b>		
RM-898	Research Methodology	2+0
SEM/WKSP-897	Seminar / Workshop	1+0

## MS Artificial Intelligence

In the 20th century, Alan Turing was probably the first person who subjectively and objectively formalized the idea and gave new meaning to the word Artificial Intelligence (AI), where he described it as a response to a stimulus whereby it was difficult to tell if it was done by a human or a machine. With the advent of computer technology and easy availability of desktop systems training in Computer Science, AI got a boost and the world has never looked back. We are now at the cusp of the fourth industrial revolution as computing power has become much more pervasive and powerful. Given the beginnings of the fourth industrial revolution, with AI at its core, it is imperative to imbue students with a right bent of mind and necessary skills and knowledge to further enhance their understanding of this emerging area so that they can contribute to the society in a more productive way. From its very genesis, Artificial Intelligence has taken cues from multiple disciplines, and has only recently been recognized as an area worth specializing in. It is built on fields such as Mathematics, Statistics, and Computer Science. It finds wide applications in almost all areas of human endeavor, where decision making needs to be left to the machines by taking human agency out of it. Such is the nature of this field, that students equipped with AI skills will find employment in almost every other field. Considering the tremendous demand of AI in every domain, NUST-SECS is offering MS programme in Artificial Intelligence i.e. MS Artificial Intelligence (AI).

### Why to join this programme?

The programme would interest students working in diverse areas, as different labs are established under its umbrella where they will be working on different application areas, such as medical image processing, robotics, and smart city. The coursework covers both the depth and the breadth of the core areas. Students will have the liberty to specialize in any of the areas in which research is being carried out under National Center for Artificial Intelligence (NCAI) and they will also have the freedom to choose courses offered at different center labs at six different universities. It is ideal for students who want to pursue further academic qualifications such as PhD in AI and/or want to build a career in the AI industry both in Pakistan and abroad. It will provide specialisation in the broader areas of deep learning, robotics, computer vision, and natural language processing. It will also provide grounding in basic mathematics and statistics behind AI based systems.

### Objectives

The key objectives of this programme are:

- Students should have a strong competence in AI, resulting in successful careers.
- Students should be able to pursue research and innovation and be able to provide modern solutions to technical problems.
- Students should be able to apply as well as create AI-based knowledge at par with the developments at both national and international levels.

### Associated Careers

The students will have hands-on experience on the latest tools and techniques in the domain of AI that will enhance their chances of absorption in the variety of sectors both in local and international industry, such as TeraData, IBM, Telecom industry, banks, hospitals, insurance institutions and government organizations.

## Semester-I

Course Code	Course Title	Credits
CS-863/CSE 860	Artificial Intelligence	3+0
CS-871/ RIME 832	Machine Learning	3+0
MATH 803	Mathematical Methods for Artificial Intelligence	3+0

## Semester-II

Course Code	Course Title	Credits
XX-xxx	Elective-I	3+0
XX-xxx	Elective-II	3+0
XX-xxx	Elective-III	3+0

## Semester-III

Course Code	Course Title	Credits
XX-xxx	Elective-IV	3+0
XX-xxx	Elective-V	3+0

## Semester-IV

Course Code	Course Title	Credits
AI-899	Thesis	0+6

## Electives

Course Code	Course Title	Credits
CS-822	Data Mining	3+0
CS-825	Information Retrieval	3+0
CS-862	Advanced Image Processing	3+0
CS-867	Computer Vision	3+0
EE-932	Speech Processing	3+0
EM-840	Data Acquisition And Control	3+0
EM-890	Modelling And Simulation	3+0
RIME-914	Robot Motion Planning	3+0
SE-802	Pattern Recognition	3+0
RIME-814	Rehabilitation and Assistive Robotics	3+0
CS-878	Deep Learning	3+0
CS-891	Multiagent Systems	3+0
CS-875	Natural Language Processing	3+0

CS-873	Semantic Web	3+0
RIME-817	Bio Robotics	3+0
AI-812	Probabilistic Graphical Models	3+0
AI-814	Knowledge Representation and Reasoning	3+0
SE-801	Neural Networks	3+0
RIME-836	Probabilistic Robotics	3+0
RIME-843	Sensors and Sensing	3+0
RIME-835	Human Robot Interaction	3+0
RIME-837	Simultaneous Localization and Mapping	3+0
AI-831	Intelligent Systems	3+0
AI-832	Reinforcement Learning	3+0
RIME-813	Robotic Grasping and Fixturing	3+0
EE-831	Advanced Signal Processing	3+0
SE-838	Modelling and Simulation	3+0
AI-853	Advanced Programming in Python	3+0
AI-854	Data Analysis and Visualization	3+0
AI-855	Cyber Security	3+0
IT-863	Internet of Things	3+0
AI-828	Complex Adaptive Systems	3+0
AI-819	Text Analytics	3+0
AI-846	Computational Creativity	3+0
AI-837	Intelligent Transportation Systems	3+0
AI-829	Social Simulations	3+0
AI-838	Serious Games	3+0
AI-856	Ethical Machines	3+0
AI-917	Evolutionary Algorithms	3+0
CS-893	Big Data Analytics	3+0
SE-805	Advanced Artificial Intelligence	3+0

## Additional Courses

RM-898	Research Methodology	2+0
SEM/WKSP-897	Seminar / Workshop	1+0

## Funded Projects

### Investigating the Impact of Game Based Learning Using Tablets in learning Mathematics for Primary School Students.

The study is mainly focused on children belonging to Out-of-School Children Schools in Islamabad that cater to the needs of street kids and those who have missed out their years of admitting into regular mainstream school. The aims and objectives of this research are:

- To create a knowledge base and stimulate debate at national and international level.
- To address the issues of equity, quality and efficiency at primary education level using game-based learning delivered through tablets technology.
- To demonstrate interactive, individualized and customized learning for each learner of both the genders belonging to various socio-economic backgrounds.

The research seeks to evaluate the effectiveness of a game-based tablet application on the topic of Primary School Mathematics, with focus on measurements, when compared with traditional classroom instructional system. The study is utilizing a quasi-experimental approach, where an experiment and a control group comprised of Grade-I Math students are studied to determine differences in their engagement and motivation levels.

This research would provide a better appreciation of the potential impact of digital game-based learning for school-aged learners, while emphasizing a number of research questions as below:

- Does Game-based learning using tablet result in increased engagement, motivation and academic achievement and better learning beliefs for primary school students of different genders and socio-economic background in learning mathematics?
- To what extent is it possible to practice self based learning in mathematics through a tablet based app without the need of an instructor for the student?
- Do teachers find game based learning using tablets an acceptable treatment for use in the classroom compared to traditional techniques for learning mathematics?

### Principal Investigators

Principal Investigator 1	Dr Muddassir Malik	SEECs	muddassir.malik@seecs.edu.pk farzana.
Principal Investigator 2	Farzana Ahmad	SEECs	ahmad@seecs.edu.pk salma.
Principal Investigator 3	Dr Salma Siddiqui	S3H	siddiqui@s3h.edu.pk

### Funding Agency

The Foundation for Information Technology Education and Development (FIT-ED) of the Philippines, as part of the Information Networks in Asia and Sub-Saharan Africa (INASSA) programme funded jointly by the International Development Research Centre (IDRC) of Canada and the Department for International

Development (DFID) of the United Kingdom, announced this open call for full proposals on Digital Learning for Development (DL4D).

### Funding

Total Funding Received: PKR. 4,121,552.21.

### The Game Developed for Intervention

#### Measure Land – A fun way to learn measurements

The game “Measure land” is a learning game developed for grade 1 to grade 5 students with a concept of self-paced fast track or “speed literacy” learning, in and out of schools using low cost tablets technology. This game covers learning outcomes of the topic of “Measurements” from the National Curriculum. Through guided narration and bilingual instructions, students are explained the concepts of measurements and are involved in a series of interactive activities based on Bloom’ Taxonomy to master the content. Positive reinforcement is provided throughout in the form of constructive feedback and rewards. At the end of each level, students are shown the ‘brain Power’ achieved which further encourages young learners to learn Mathematics with more enthusiasm. Through this game, students acquire skills to develop deep strategies of learning Mathematics and apply learning in real world scenarios, thus resulting in becoming more informed, analytical and confident learners.

#### Prominent Features:

- Supports Android 4.0 and above
- Self paced fast track learning from Grade 1 to Grade 5 on the topic of Measurements
- Learning outcomes mapped to the National Curriculum of Mathematics.
- Step by step bilingual instructions (English and Urdu) to enhance students understanding of the concepts.
- Interactive activities for students’ cognitive development.
- Caters to the needs of auditory, visual and kinaesthetic learners
- Embedded Assessments, rewards and feedback
- Easy game mechanics
- Vibrant graphics based on every day themes and scenarios to support meaningful learning.

### Research Labs

The following new dedicated labs for Artificial Intelligence are being established under the umbrella of National Center of Artificial Intelligence (NCAI) at NUST.

- Deep Learning Lab
- Intelligent Robotics Lab

In addition, the following relevant labs are also there at NUST-SEECs:

- Machine Vision and Intelligent Systems Lab <http://vision.seecs.edu.pk/>
- TUKL-NUST R&D Lab in collaboration with German Research Center for Artificial Intelligence (<https://tukl.seecs.nust.edu.pk/>)
- Knowledge-Based Systems lab





# Events

ANUST-SEECs has organized a two days virtual conference “International Conference on Digital Futures and Transformative Technologies” (ICoDT2) on 20-21 May 2021 aimed to provide a superior international forum for sharing knowledge and results in theory, methodology and applications of Intelligence Systems. The Conference was hosted to look at significant contributions to all major fields of the Intelligence Systems in theoretical and practical aspects. The aim of ICoDT2 was to provide a platform to the researchers and practitioners from both academia as well as industry to meet and share cutting-edge development in the field. The research theme was areas of artificial intelligence and allied areas including the applications of AI and ML advances in the theory, design, implementation, analysis, empirical evaluation, case studies of intelligent systems.

The conference proudly conducted 9 invited talks, 3 industrial sessions along with 47 paper presentations following 23 poster presentations and 6 workshops with 800+ participants in total.

The conference was proudly hosted by National University of Sciences and Technology (NUST), Pakistan. The event was technically sponsored by the IEEE and supported by the IEEE Robotics and Automation Society.

In the closing address of the conference, Principal-SEECs Dr. Osman Hasan provided the summary of this successful online event and emphasized on the power of innovation for our nation.



Via CiscoWebex

### Immersive content – Virtual – Augmented

**ZONG 4G**

As the **appetite** and expectation for AR, VR and other forms of richer immersive content grows, the impact on networks, event venues and overall consumer engagement will grow. Immersive Content Includes **Advanced Telemedicine, Industrial Automation/Robotics, Remote Complex Operations, Augmented Online Education.**

CATAPULT Digital





# RIMMS

Research Institute for Microwave  
and Millimeter-Wave Studies,  
Islamabad

# Research Institute for Microwave and Millimeter-Wave Studies (RIMMS), Islamabad

## About the Institute

The Research Institute for Microwave and Millimeter-Wave Studies (RIMMS) is a unique postgraduate institute at NUST, offering MS and PhD in Electrical Engineering with special focus on RF and Microwave domain since 2010. The institute works closely with industrial partners on joint R&D and consultancy projects, providing students practical experience during their studies. With an aim to become a Center of Excellence for research and consultancy in the RF and Microwave domain, this institute holds state-of-the-art microwave measurement capabilities such as Anechoic Chamber for antenna testing, EMC/EMI Lab for electromagnetic compatibility and immunity measurements and microwave lab for passive and active components testing.

**Vision:** To achieve national prominence and international recognition in the field of RF and Microwave. This is envisaged through a prolific team of faculty members, a strong research oriented graduate programme, well equipped laboratory facilities and strong industrial collaboration.

**Mission:** To become a Center of Excellence for teaching, research and consultancy in the RF and Microwave domain.

## Academics

RIMMS has been offering MS and PhD programme focused on RF & Microwave since 2010 and is well known for its high quality teaching standards. The course work broadly covers electromagnetics, passive and active microwave components, antenna design and EMC/EMI. The theoretical knowledge is supported by simulations in latest 3-D electromagnetic software such as CST Microwave Studio as well as hands-on experience using state-of-the-art measurement equipment in the associated laboratories.

## Research Environment

RIMMS offers a conducive environment for conducting top level research to its students. This includes research related to latest technologies such as antennas for LTE and 5G communications, inkjet printed antennas and sensors, on-chip antennas, MIMO antennas, MEMS based antennas etc. In addition, applied research projects from public sector R&D organizations also become topic of MS theses. A prolific team of faculty members guide the students throughout their research work. These research facilities and active collaborations drive students and researchers to work on problems of national and international significance.

## Faculty Profile

### **Dr Hammad M. Cheema, Principal**

PhD (Eindhoven University of Technology), The Netherlands

**Discipline:** Electrical Engineering

**Specialisation:** Analog and RF Integrated Circuit Design

### **Dr M. Umar Khan, Head of Department**

PhD (KFUPM), Saudi Arabia

**Discipline:** Electrical Engineering

**Specialisation:** Applied Electromagnetics

### **Dr Farooq Ahmad Tahir**

PhD (University of Toulouse), France

**Discipline:** Electrical Engineering

**Specialisation:** Microwave, Electromagnetism and Optoelectronics

### **Dr Noshawan Shoaib**

PhD (Politecnico Di Torino), Italy

**Discipline:** Electrical Engineering

**Specialisation:** RF and Microwave

### **Dr Fahimullah Khan**

PhD (Griffith University), Australia

**Discipline:** Electrical Engineering

**Specialisation:** MEMS, Microsystems

### **Dr Tahseen Mustafa**

PhD (Concordia University), Canada

**Discipline:** Electromagnetics & Antennas

### **Engr Maira Islam**

MS (NUST), Pakistan

**Discipline:** Electrical Engineering

**Specialisation:** RF and Microwave

# National and International Linkages

## Academic Linkages

RIMMS takes pride for its national and international academic linkages that have resulted in joint journal and conference publications, exchange visits and joint seminars/workshops. Some of the current foreign collaborators include King Abdullah University of Science & Technology (KAUST), Masdar Institute, UAE University, Fredrick University Cyprus, University of Saskatchewan and Macquarie University. In addition, RIMMS is actively engaged in joint research with ITU, UET Taxila, SCME-NUST and CIIT in Pakistan. This includes joint MS and PhD theses for graduate students providing fruitful learning experience.

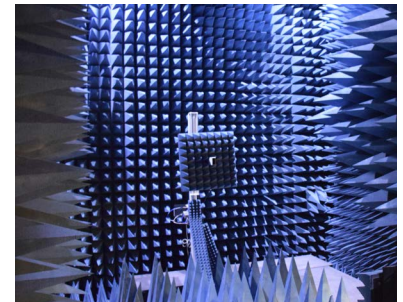
## Industry Linkages

One of the cornerstone of RIMMS vision is to forge strong and long lasting collaborations with our industry partners. These partners provide valuable input for our graduate programme so that it addresses the current industry requirements. Furthermore, RIMMS provides testing and consultancy services to the industry partners. Graduate students are involved in the practical hands-on industrial tasks in the research labs which helps them immensely in their careers after graduation.

## Lab Facilities

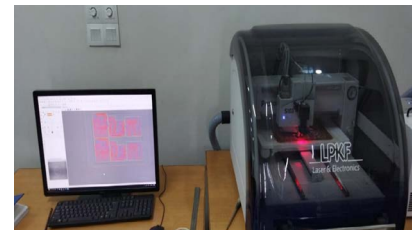
### Anechoic Chamber

This facility is used to characterize antennas in the frequency range from 0.8GHz to 40GHz. The anechoic chamber is equipped with the near-field planner scanner, and far-field tower to measure the radiation pattern of a given antenna under test (AUT). The measurement software has the capability to transform the near-field data to far-field data for plotting antenna radiation patterns in 3D. In addition, antenna arrays, RCS measurements of RFID tags and other applications where isolated environment is required can be supported by the anechoic chamber.



### Microwave Design Lab

The lab is established at NUST Interdisciplinary Cluster for Higher Education (NICHE) with an aim to carry out inter-disciplinary research in areas related to Radar systems, direction finding applications and high-power microwaves. The lab is also equipped with PCB rapid prototyping and component assembly facilities.



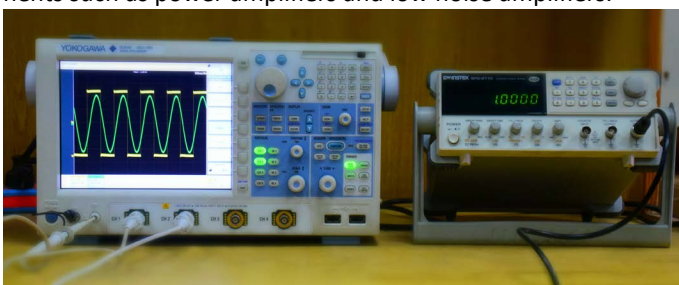
### EMC/EMI Lab

This lab aims at imparting EMC/EMI knowledge to students and researchers both from NUST and other universities and organizations. In addition, the facility is utilized to provide EMC/EMI pre-compliance testing of commercial products. Presently, the lab has the capability to perform testing as per European standards including Conducted Emissions, Radiated Emission, Radiated Immunity, Harmonic and Flicker, Electrostatic Discharge and Surge, Burst and Power Fail test.



### Microwave Research Lab

The Microwave Research Lab houses the equipment required for impedance, s-parameter and spectrum measurements both for passive components such as antennas and active components such as power amplifiers and low noise amplifiers.



- RF & Microwave MS & PhD programme since 2010.
- Specialized equipment and lab facilities.
- More than 40 students have already graduated.
- High publishing rate in journals and conferences.
- High recruitment rate in academia and industry as well as PhD opportunities abroad.
- Active industrial collaborations.
- "In 2020, RIMMS has published 27 publications in research journals and 19 conference papers in proceedings of international conferences"



I am Abdul Jabbar and I joined RIMMS in Spring 2017. I am honored to say that joining RIMMS for pursuing MS in RF & MW was one of the best decisions of my life. RIMMS is way more than just an institution. RIMMS gives you a strong sense of belonging and you feel here as a family. The talented, humble and friendly faculty, state-of-the-art RF and MW equipment, dynamic research environment, and strong industrial and academic linkages are some of the prime features of RIMMS. This is the place where students with different academic calibers arrive, and by the time they graduate, they become way more prolific and competitive in academia with enhanced interpersonal skills. For myself, RIMMS polished my skills manifold and paved the way for me to obtain multiple job opportunities and academic positions. After graduating from RIMMS, I served in multiple positions such as a Research Associate, a Design Engineer, as well as a Lecturer at a Public Sector Engineering University. Ultimately, I was selected in a highly competitive fully funded international scholarship for PhD at the University of Glasgow, UK in 2020. Finally, I would say that in the serene and prolific environment of RIMMS, MS and PhD researchers can achieve their goals in a committed way without distractions. RIMMS is undeniably a platform where students are facilitated via capabilities and experience needed to create the next generation of enabling technologies from concept to prototype.

**ABDUL JABBAR**

I am Muhammad Ayaz Zakir and I joined RIMMS in Masters programme in 2013. I was already working in RF/Microwave domain and had knowledge of basic concepts of the subject but wanted to go one step further for in-depth understanding of concepts. Also, the availability of high-end and latest testing equipment was intriguing to explore newer ideas and research. The teachers and course work had a great impact in polishing my skills that later were also implemented in design and development of projects. The environment is also friendly and especially the international level trainings helped in understanding and learning new tools and skills. The support of teachers and their keen eye towards making the student learn the subject is highly appreciable and regarded. May the Institute keep on working this way and achieve further heights (Ameen).



**MUHAMMAD AYAZ ZAKIR**



I am Yumna Gillani and I joined RIMMS in 2017 as a postgraduate student. It was one of the best decisions of my life, as it helped me become the person I am today. RIMMS has a very good learning environment and an extremely talented faculty, which is why I find myself to be very lucky when I got an opportunity to work here as an intern, for nine months, after my first semester. It gave me enough confidence and passion to pursue the job in the field. The research helped me to enhance my skills and learning capability. It broadened my horizon to boost my professional and research career. After graduating, I have joined RIMMS again as RF design engineer, because it is a place, committed to high standard research with an excellent support structure. I am proud to be a part of a university as prestigious as NUST.

**YUMNA GILLANI**

I am Iqra Aitbar and I joined RIMMS as a MS student in 2017. My academic journey at RIMMS was amazing owing to the world class lab facilities and highly competent faculty. The Institute has multiple funded projects and aids in industrial placement as well. The faculty members give their best to guide and steer the students according to their talent. Along with this, it has very exclusive RF measurement facilities such as anechoic chamber, EMC/EMI and microwave research labs. RIMMS is indeed Pakistan's best RF academic institute.

**IQRA AITBAR**



I am Tayyaba Farooqi and I graduated from RIMMS in 2019. My initial skepticism about RIMMS was ruled out by its highly competent and devoted faculty. The lab facilities available at RIMMS along with guidance of teachers made my research journey smooth and kept me motivated throughout. RIMMS has equipped me with all the necessary tools to navigate my path in the RF world. It has opened new avenues for me for which I will always be grateful. It's safe to say that it's the only specialized place to study RF and microwave in Pakistan.

# Postgraduate and Doctoral Programme at RIMMS

The Electrical Engineering postgraduate programme at RIMMS provides students, an opportunity to expand their knowledge and acquire skills in analysis, design, fabrication and measurements related to RF & Microwave components and systems.

RIMMS takes two intakes per year, one in the Fall semester and second in the Spring semester. The duration of Master's programme is two years out of which 1st year is focused on completing the course work and the 2nd year is dedicated to the research thesis along with a research methodology course. MS students are required to take at least 3 core courses out of the pool of core courses. In addition to the core courses, an MS Student must complete 5 elective courses relevant to the specialized stream. Among these electives, two courses may be taken from other engineering and basic sciences disciplines of NUST Schools / Institutes / Colleges with prior approval.

## Why join this programme

By joining the postgraduate programme you become a part of a dynamic research community that is actively engaged in the fields of microwaves, applied electromagnetics, analog and RF integrated circuit design, antenna design and MEMS microsystems. The postgraduate programme at RIMMS is especially prominent for the following reasons:

- » Research environment that encourages excellence.
- » State-of-the-art design software, laboratories and equipment.
- » Training of students to develop end-to-end microwave systems.
- » Participation in industry funded projects and consultancies.
- » High job prospects after graduation.

## MS Electrical Engineering (Evening): Specialisation: RF and Microwave

Programme Code: F703/803

### Scheme of Studies

Semester-I		
Course Code	Course Title	Credits
EE-849	Electromagnetic Field Analysis (Core-I)	3
EE-847	Microwave Networks & Passive Components (Core-II)	3
XX-XXX	Core-III	3
XX-XXX	Elective-II	3
	<b>Total</b>	<b>12</b>

Semester-II		
Course Code	Course Title	Credits
XX-XXX	Elective-II	3
XX-XXX	Elective-III	3
XX-XXX	Elective-IV	3
XX-XXX	Elective-V	3
	<b>Total</b>	<b>12</b>

Semester-III		
Course Code	Course Title	Credits
RM-898	Research Methodology*	2
XX-XXX	MS Thesis	6
	<b>Total</b>	<b>8</b>

Semester-IV		
Course Code	Course Title	Credits
EE-899	MS Thesis	3
	<b>Total</b>	<b>6</b>

\*This is a Pass/Fail Course that does not count towards the CGPA calculation. It can be taken in any of the three semesters and a Pass grade is required.

### List of Core-III (Only one to be taken)

Course Code	Course Title	Credits
EE – 831	Advanced Digital Signal Processing	3
EE - 851	Advanced Digital Communication Systems	3

## List of Elective Courses (Minimum five to be Taken)

Course Code	Course Title	Credits
EE 840	RF MEMS: Theory and Applications	3
EE 841	Electromagnetic Theory	3
EE 842	Microwave Communication System Design	3
EE 843	Microwave Transmission Lines & Waveguides	3
EE 844	Antennas & Wave Propagation	3
EE 845	EMC/EMI	3
EE 846	Microwave Photonics	3
EE 848	Radiating Systems & Antennas	3
EE 940	Advanced RF Measurements	3
EE 941	RF Transceiver Design	3
EE 942	Microwave Integrated Circuit Design	3
EE 943	Microwave Devices I	3
EE 944	Microwave Devices II	3
EE 945	Computational Electromagnetics	3
EE 946	Advanced Antenna Theory and Design	3
EE 947	Microwave Devices & Systems	3
EE 948	Advance Electromagnetic Fields	3
EE 949	Selected Topics in Microwave Engineering	3
EE 809	Analog Integrated Circuit Design	3
EE 951	Radar Systems	3

## MS Electrical Engineering (Evening): Specialisation: Integrated Circuits and Systems

### Semester-I

Course Code	Course Title	Credits
EE - 808	Digital Integrated Circuit Design (Core-I)	3+0
EE - 809	Analog Integrated Circuit Design (Core-II)	3+0
XX-XXX	Core-III	3+0
XX-XXX	Elective - I	3+0
	Total	12

### Semester-III

Course Code	Course Title	Credits
XX-XXX	Research Methodology*	2+0
EE - 899	MS Thesis	6+0
	Total	8

\* This is a Pass/Fail Course that does not count towards the CGPA calculation. It can be taken in any of the three semesters and a Pass grade is required.

### List of Core-III (Only one to be taken)

Course Code	Course Title	Credits
EE – 823	Advanced Digital System Design	3
EE - 826	Advanced VLSI Design	3

### Semester-II

Course Code	Course Title	Credits
XX-XXX	Elective-II	3+0
XX-XXX	Elective - III	3+0
XX-XXX	Elective – IV	3+0
XX-XXX	Elective-V	3+0
	Total	12

### Semester-IV

Course Code	Course Title	Credits
EE - 899	MS Thesis	6+0
	Total	6

## List of Elective Courses (Minimum five to be Taken)

Course Code	Course Title	Credits
EE-903	Advanced Semiconductor Device Theory	3+0
EE-904	Microchip Fabrication Technology	3+0
EE-822	ASIC Design Methodology	3+0
EE-827	Mixed Signal IC Design	3+0
EE-921	System on Chip Architecture	3+0
EE-821 CSE-811	Advanced Embedded System Design	3+0

CE-820	Advanced Computer Architecture	3+0
CS-853	Formal Methods	3+0
EE-920	System Validation	3+0
EE-941	RF Transceiver Design	3+0
EE-940	Advanced RF Measurements	3+0
EE-840	RF MEMS: Theory and Applications	3+0
EE-818	Micro-Electro-Mechanical Systems	3+0
CSE-812	RF Communication System Design	3+0
EE-847	Microwave Networks & Passive Components	3+0
EE-942	Microwave Integrated Circuit Design	3+0
EE-825	System Level Packaging	3+0
EE-947	Microwave Devices & Systems	3+0
EE-XXX	Advanced Analog IC Design	3+0
EE-XXX	Radio Frequency Integrated Circuit Design	3+0
EE-XXX	mm-Wave and Terahertz Integrated Circuit Design	3+0
EE-XXX	Photonic Integrated Circuits	3+0
EE-XXX	Integrated Circuits Packaging	3+0
EE-XXX	Signal Integrity in High-Speed Designs	3+0
EE-XXX	Integrated Circuit Design-for-Test	3+0
EE-XXX	Hardware Security	3+0
EE-XXX	Special Topics in Integrated Circuits and Systems	3+0

## PhD Electrical Engineering (RF & Microwave)

PhD candidates have to complete minimum of 18 credits of 800/900 level courses or equivalent. These 18 credit hours are in addition to the pre-requisites specified by the PhD Evaluation Acceptance Committee (PEAC). Minimum GPA of 3.5/4.0 is required in the course work. After the successful completion of course work, the student can take the qualifying examination consisting of Part-A (Written Comprehensive Examination) and Part-B (Oral Examination). In addition to the coursework, all doctoral students must register for at least 30 credits of doctoral research. PhD candidates may take any of the courses mentioned above or other graduate courses relevant to their area of research.





**SCME**

School of Chemical and Materials  
Engineering, Islamabad

# School of Chemical and Materials Engineering

School of Chemical and Materials Engineering (SCME) commenced its programmes in 2006, and currently offering undergraduate and postgraduate degree programmes in the twin disciplines of Chemical Engineering and Materials Engineering. In line with the futuristic vision of NUST imparting quality education, maiden undergraduate programmes in the fields of Chemical and Materials Engineering were launched in the year 2008. In 2016 the curriculum of Materials Engineering for undergraduate programme was revised and the degree title has been changed from 'Materials Engineering' to 'Metallurgy and Materials Engineering', keeping in view the national and international demand for quality engineering. Presently, the school has 641 students of which more than 237 are pursuing degrees at the MS and PhD levels.

The mission of SCME is to provide students with a broad and through understanding in engineering fundamentals, applications, and design that prepares them to practice engineering at the professional level with confidence and skills necessary to meet the technical and social challenges of the future. Graduate will attain the skills for entry level engineering portions leading to their development into advanced engineering professionals inculcating innovative thinking and entrepreneurship.

The School enjoys reciprocal ties with universities in Europe, China and the ASEAN countries, and continues to forge stronger links with the academia and research communities across the world. In this regard, an MoU has been signed with China (Tsinghua University), Korea (Chungnam National University), Turkey (Marmara University), INPT Toulouse, France, a leading university in the field of Simulation and Modeling of Fluid Dynamics. Our Materials Engineering Department is also collaborating in terms of students and teachers' exchange with Institute of Materials (IMN) Nantes University, France. Several significant industrial projects are at hand, involving private and strategic partners. This is envisioned to provide a framework for present and future collaboration between academia and the industry and to make an important contribution towards revitalizing the industry's capability. It is due to this conviction that university-industry linkage is being forged at SCME in line with prevalent higher education policy.

SCME has a strong tradition of holding seminars and talks on contemporary topics of interest; both in the specific fields of study pursued at the School and areas of wider significance. Internationally recognized faculty involved in cutting-edge contemporary research together with well-equipped, state-of-the-art labs and learning resources provide an ideal setting for professional growth. We encourage, support and celebrate exceptional approaches to teaching that excite and inspire engineering students in a supportive and challenging environment.

## Research and Development

SCME has attracted world-class faculty due to its conducive research environment, including graduates from the world's leading institutions like Oxford, Manchester, NTNU (Norway), Kyoto University of Japan, Waterloo University of Canada, and many others. Internationally recognized faculty, coupled with well-equipped state-of-the-art labs and learning resources, provide an ideal setting for professional growth. As a result, the faculty has been receiving attractive research grants and support awards both from local and foreign sponsors. Students are fully supported and financed for initiatives in research activities. It provides opportunity of foreign research experience / research scholars' interaction with students through split research programmes and faculty-invited programmes.



## Laboratories and Infrastructure

### Chemical Engineering Laboratories

- Chemical reaction engineering lab
- Fluid mechanics lab
- Fuel and combustion lab
- Instrumentation and process control lab
- Organic & Inorganic chemistry lab
- Particulate technology lab
- Physical chemistry lab
- Polymer lab
- Simulation lab
- Thermodynamics lab
- Heat transfer lab
- Mass transfer lab
- Simultaneous heat and mass transfer Lab
- Membrane Technology Lab
- Thermal Analysis Lab
- Product Technology Lab
- Catalysis Lab
- Chemical Analysis Lab

### Materials Engineering Laboratories

- Heat treatment lab
- Mechanical testing lab
- Microscopy lab
- Nano synthesis lab
- Sample preparation lab
- Scanning electron microscopy lab
- Surface engineering lab
- Thermal transport lab
- Chemical Sensor lab
- Non Destructive Testing lab
- Welding and Joining lab
- XRD lab
- XRF lab
- AFM lab
- Materials Engineering Synthesis Lab

- Adhesives Lab
- Alloy Design & Manufacturing Lab
- Advance Composite Materials Lab

### Research Facilities in SCME

- Atomic Force Microscope (AFM)
- BET Surface Area and Porosity Analyzer
- Bomb Calorimeter
- Fourier Transform Infrared Spectrometer (FTIR)
- Gas Chromatograph-Mass Spectrometer (GC-MS)
- Gel Permeation Chromatograph (GPC)
- High Performance Liquid Chromatograph (HPLC)
- Micro Calorimeter Particle Size Analyzer
- Scanning Electron Microscope (SEM)
- Thermal Gravimetric / Differential Thermal Analyzer (TG/DTA)
- X-Ray Diffraction (XRD)
- X-Ray Fluorescence (XRF)
- Electrochemical Workstation
- Polarized Optical Microscope
- Liquid and Solid Sublimation Devices
- Potentiostat GAMRY
- Micro-Hardness Tester
- Differential Scanning Calorimeter (DSC)
- 3-D Printer
- Rheometer
- Gas Permeation Rig
- UV Vis Spectroscopy
- Contact Angle Measurement
- Vibrating Sample Magnetometer
- Refrigerated High Speed Centrifuge
- Raman Spectroscopy
- Arc Melting Furnace
- Ball Mill
- Hot Press Furnace

## Patents

SCME in its short existence has been credited with the acceptance of 24 patents (SI No 140915, 104916, 104917, 139821, EP2006005834, W02006/136345 A1, EP09012588, US2010/0264368 A1, US2011/0109855 A1, US20110240917 A1; US 2011/0240920, US 2013/0344577 A1, WO 2012175214) in the area of Liquid crystals molecules comprising Hydroazulane Structures, Synthesis, characterization of new polyimides, blue phase Liquid crystal composition, Sensor device for sensing toxins, bacteria, binding events on analytes at interfaces, filament Wound Structures, Particles, Composites, Shockwave/ Seismic Absorbance Materials and a method of tackling erosive burning in high C/D rocket motors.

## Publications

During 2019, over 10 research papers were presented at national and international conferences of high repute and in 2020 over 167 papers were published in journals with high impact factor ratings. The School promotes sharing of knowledge and exchange of research at all levels. With this objective in view, the School has recently published four books with VDM, a leading international publisher. The books are available at amazon.com. Publications include:

- » Ablative Nano Composites
- » Anti-blast Nano-polymer for Structural Retrofit
- » High Strength Composites
- » Renewable Technologies: Thermionic Energy Conservation



## SCME Milestones

- » Indigenous Windmill Rotor Fabrication
- » Carbon Nanotubes
- » Fast-track Bio-diesel Production
- » Carbon Fibre Composites
- » Advanced Bio-materials
- » Nano-membranes
- » Fabrication and characterization of CdTe thin films for semiconductors radiation detectors

- » Carcinogen-free Radiation Compatible Polymers
- » Value-addition in Gems
- » Development of low cost eco-friendly inhibitors
- » Chemical Engineering Programme of NUST ranked 251-300 world universities
- » No. 1 in Pakistani Universities in 2021 ranking



## Faculty Profile

**Dr Amir Azam Khan, Principal**  
PhD (University of Limoges) France

## Department of Chemical Engineering

**Dr Erum Pervaiz, HOD**  
PhD (NUST) Pakistan  
**Specialisation:** Nanomaterials synthesis and applications

**Dr Muhammad Bilal Khan Niazi**  
PhD (University of Groningen) Netherlands  
**Specialisation:** Product Technology

**Dr Ifikhar Ahmad Salarzi**  
PhD (Kyoto University) Japan  
**Specialisation:** Process Systems Engineering

**Dr Tayyaba Noor**  
PhD (NTNU) Norway  
**Specialisation:** Heterogenous Nano catalysis

**Dr Sarah Farrukh**  
PhD (NUST) Pakistan  
**Specialisation:** Membrane Technology, Gas Adsorption

**Dr Muhammad Ahsan**  
PhD (NUST) Pakistan  
**Specialisation:** Process modeling & simulation

**Dr Syed Salman Raza Naqvi**  
PhD (Universit Teknologi PETRONAS) Malaysia  
**Specialisation:** Biomass & Bioenergy, Catalysis

**Engr Nadeem Ehsan, Academic Coordinator**  
MSc (Cranfield University) UK  
**Specialisation:** Energetic materials

**Dr Muhammad Nouman Aslam Khan**  
PhD (COMSATS) Pakistan  
**Specialisation:** Fuzzy Algebra

**Engr Zaeem Aman**  
Ms (Karlstad University) Sweden  
**Specialisation:** Paper and Pulp



**Engr Ayesha Raza**  
MS (NUST) Pakistan  
**Specialisation:** Chemical Engineering

**Engr Syed Rafay Hussain Jaffery**  
PhD (University Technology Malaysia) Malaysia  
**Specialisation:** Enhanced Oil Recovery, Simulation

**Dr Umair Sikander**  
PhD (University Technology PETRONAS) Malaysia  
**Specialisation:** Catalysis, Hydrogen Production

**Engr Nouman Ahmed**  
BE (Punjab University) Pakistan

**Dr. Zaib Jahan**  
PhD (Norwegian University of Science & Technology) Norway  
**Specialisation:** Membrane Technology

**Dr Taqi Mehran**  
PhD (KAIST,) Korea  
**Specialisation:** Fuel Cell Technology

**Dr Ameen Shahid**  
PhD (Friedrich Alexander University) Germany  
**Specialisation:** Chemical Reaction engineering

**Engr Faiza Dilshad**  
BSc (UET Lahore) Pakistan

**Engr. Arsalan Akhtar**  
BSc (UET Lahore) Pakistan

**Engr. Israr Ahmed**  
MS (NUST) Pakistan

## Department of Materials Engineering

**Dr Zakir Hussain, HoD**  
PhD (Technical University of Braunschweig) Germany  
**Specialisation:** Display technologies, Sensors

**Dr Muhammad Shahid**  
PhD (University of Manchester) UK  
**Specialisation:** Corrosion and Protection

**Dr Nasir Mahmood Ahmad**  
PhD (University of Manchester) UK  
**Specialisation:** Polymerization reactors, Micro polymerization reactions

**Dr Ifikhar H Gul**  
PhD (Quaid-i-Azam University) Pakistan  
**Specialisation:** Nano-particle Characterization

**Dr Khurram Yaqoob**  
PhD (University of Paris East) France  
**Specialisation:** Phase Transformation

**Dr Malik Adeel Umer**  
PhD (KIAST) South Korea  
**Specialisation:** Powder Metallurgy

**Dr Sofia Javed**  
PhD (NUST) Pakistan  
**Specialisation:** Nano Materials for Energy Applications

**Dr Usman Liaqat**  
PhD (Yonsei University) South Korea  
**Specialisation:** Biomaterials, Tissue Regeneration

**Dr Muhammad Aftab Akram**  
PhD (NUST) Pakistan  
**Specialisation:** Nanomaterials & Nanostructures

**Dr Ahmad Nawaz Khan (On leave)**  
PhD (NTUST) Taiwan  
**Specialisation:** Polymer/Filler composites and nanocomposites

**Dr Mohsin Saleem**  
PhD (UST) South Korea  
**Specialisation:** Energy Harvesting Devices

**Engr Mudassar Shehzad (on leave)**  
MS (University of the Ulsan) South Korea  
**Specialisation:** Ferroelectric Polymers

**Dr Talha Masood**  
PhD (Abo Akademi University) Finland  
**Specialisation:** Materials Chemistry

**Dr Muhammad Shoaib Butt**  
PhD (South-East University of China) China  
**Specialisation:** Biomaterials

**Dr Amna Safdar**  
PhD (University of York) UK  
**Specialisation:** Solar Cells

**Dr Farhan Javaid**  
PhD (TUD) Germany  
**Specialisation:** Micro & Nano Mechanics

**Dr Mohammad Irfan**  
PhD (Rwthaachen University) Germany  
**Specialisation:** Surface pretreatment for adhesion application

**Engr Muhammad Zafar Khan**  
BE (NUST) Pakistan

**Dr Zeeshan Ali**  
PhD (Peking University) China  
**Specialisation:** **Materials Science**

**Dr Muahmmad Siyar**  
PhD (Seoul National University) South Korea  
**Specialisation:** Thermoelectric Materials

**Engr Muzamil Ahmed Khan**  
MS (NUST) Pakistan

**Engr Hamza Ul Haq**  
BE (NUST) Pakistan

## Achievements

1. National winners & Global Finalist in Reckitt Benckiser Global challenge 2019
2. Winner of Asia Pacific Youth exchange Thailand
3. In the year 2020 published record high number of 198 IF journal publications
4. 2nd position in All Pakistan Mathematics Olympiad
5. Two students selected for UGRAD exchange programme
6. Won the national finals of L'Oreal Brandstorm 2021.

### Moiz Butt

**Designation:** MPO Operations, Askari Fuelsy



Thinking back on the decision for post-graduation plans I am baffled by the amount of pressure placed on a 20 something old. Pick an employer, a job, and a career path luckily with an engineering degree from NUST; I was fortunate as I imagine many of you are to have hand on experience to handle pressure and excel in what you learn. NUST offers so many opportunities for students to learn pressure handling and make decisions in such situations by boasting more than 30 student organizations from which anyone can choose to take part.

### Maria Khan

**Designation:** Trainee Engineer, Schlumberger



The one thing that distinguishes NUST from other universities is the freedom it gives the student in both curricular as well as co curricular activities. I was an average student during my bachelors in Chemical Engineering and I would admit that the path to graduation was never clear or straightforward. However NUST gave us a platform high enough that the goal was always in sight.

## Library

SCME has a well-equipped library having a large collection of books and periodicals related to chemical and materials engineering. In addition, computers are reserved for literature search and access to HEC digital library. HEC digital library has launched an e-library, Springer books and McGraw Hill collections to provide around 50,000 online books in addition to more than 23,000 journals that have been made available through the Digital Library Programme. SCME Library is automated through library software KOHA, OPAC is also available on LAN and has started its barcode enabled circulation; local digital collection is also available on LAN. Scanning and photocopying facility is also available to facilitate the students and researchers.



# Clubs, Magazines and Societies

## Chimaera - SCME UG Student Magazine

SCME holds the distinction of being the first school to publish “Chimaera” (undergraduate student magazine) in its first year of undergraduate induction. ‘Chimaera’ is a bilingual (English and Urdu) magazine.

## Star Magazine

STAR Magazine publishes the research activities of the post graduate students of SCME. The idea of introducing “STAR Magazine” has been enthusiastically embraced especially because this offers an excellent opportunity to showcase the research activities which might not otherwise come to the attention of scientific community at NUST and other organizations in the country.

## NUST Literary Circle

The society caters for events including literary thirst of students through organisation of debates, declamations, essay competitions, elocutions, and mushaira on regular basis.

## NUST Science Society

NUST Science Society is a central NUST society, hosted by SCME. It organises interactions with top-class Pakistani and foreign scientists and caters for events / activities of scientific nature. Astronomy night, Project / Industrial Expo, Sytek are some of the events on its calendar.

## NUST Materials Society

NUST Materials Society (NMS) is one of the prestigious societies of NUST that enables students to experience more of the world of Material Science and Engineering. Our mission is to propel youngsters that have a knack for materials, towards excellence. NMS holds workshops, talk shows, debate competitions, etc. NMS comes under the international charter of American Society of Materials (ASM), American Ceramics Society (Acers), American Iron Steel Technology (AIST), and The Metals, Minerals and Materials Society (TMS).

## NUST Digital Club

NUST Digital Club (NDC) promotes and polishes technological skills among students; and provides awareness about the latest Digital-Technological Advancements; hence bringing out useful outcomes from the time spent on phones and PCs.

## SCME Alumni Association

The SCME Alumni Association was established to create a bond between alumni and the alma mater through social, cultural, educational and other such activities. It worked towards establishing a forum through which alumni could contribute towards the development of SCME and its students. It has since then helped in strengthening the sense of friendship and fraternity thus working towards mutual welfare. Within a very short time SA2 has been instrumental in planning and implementing projects for the greater benefit of students and alumni thereby creating opportunities, exposure and connectivity. SA2 has been very active and has to date organized multiple lectures which have emphasized on bridging the industry and the educational institutes. These lectures have seen a growing interest amongst students to connect with their alumni with the end result being a better understanding of the demands of the industry. SA2 had also organized a mock test that helped students prepare for actual tests conducted by companies. There are many other such upcoming projects and SA2 looks forward to become the leading forum for collaborative gain for both, the students and the alumni.

## NUST Book Club

NUST Book Club is a central NUST society, hosted by SCME. It aims at supporting all academic and research activities at NUST libraries and is responsible to organise book reading activities, annual Book-Fair and Book-Day celebrations.



## Chemical Engineering

Professional chemical engineers design, construct and manage the process operations all over the world. There is a great demand for their expertise in the national strategic sector. In addition to excellent opportunities for higher studies in world renowned universities, chemical engineers have a bright career with national and multinational companies. Potential employers include:

- » Energy sector
- » Fertilizer industry
- » Fine chemical manufacturing
- » Food and beverages
- » Oil and gas sector
- » Petroleum sector
- » Pharmaceuticals
- » Plant design and manufacturing
- » Processing sectors
- » Pulp and paper industry
- » Strategic organizations
- » Synthetic fibre manufacturing
- » Textile industry

## Materials Engineering

Materials Engineering has recently become very popular in advanced countries. It owes its existence to a natural evolution in classical metallurgical, mechanical and manufacturing engineering. Professional materials engineers are equipped

with the academic background and skills to tackle challenges related to materials industry, environmental problems, material selection and processing, design and engineering, leadership skills, quality control/assurance and understanding to work within the corporate sector. In addition to excellent opportunities to pursue higher education within NUST and in other advanced countries, materials engineers are sought after by national and multinational companies. Some important employers include:

- » Aerospace and aviation
- » Alloy and composites manufacturers
- » Biomedical Industry
- » Ceramic industry
- » Glass industry
- » Heavy industries (HIT, HMC, Steel Mills)
- » Oil and gas sector
- » Semi-conductor and electronic device manufacturing
- » Strategic organisations
- » Auto manufacturers
- » Steel making industry
- » Manufacturing Industry
- » Sports Manufacturers
- » Surgical Industry

## Contacts

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**Telephone:** 051-9085-5107  
**Fax:** 051-9085-5002





## Bachelors in Chemical Engineering

### Programme Description

Chemical Engineering deals with the process of converting raw materials or chemicals into more useful valuable products. Its primary theme resides in designing industrial processes which revolve around the rigorous application of thermodynamics, kinetics and transport phenomena at its core. The undergraduate programme covers topics as diverse as mathematics, computer applications, process diagnostics and instrumentation to facilitate plant design and unit operations. The programme is designed to produce competent engineers, with leadership qualities, capable of undertaking projects of national interest.

### Associated Careers

Chemical Engineers work in manufacturing, pharmaceuticals, healthcare, design and construction, pulp and paper, petrochemicals, food processing, specialty chemicals, polymers, biotechnology, and environmental health and safety industries, etc. Fertiliser, mining, synthetic fuels, cement, ceramics and composites, defence and aerospace are amongst the leading industries offering a multitude of employment opportunities for chemical engineers.

### Department Mission

The mission of the department of Chemical Engineering at SCME is to provide conducive learning environment with quality teaching and cutting-edge research for sustainable solutions to the industry and society. The aim is to produce graduates with strong understanding of chemical engineering principles to meet the challenges of current and forthcoming technologies and to become entrepreneurs as well.

### Programme Educational Objectives (PEOs)

The department has defined and established its PEOs as a part of implementation of the Outcome Based Education (OBE) system according to Washington Accord. Graduates of the department should:

PEO-1	Excel as chemical engineers in traditional and emerging fields with sound engineering knowledge and acquire the ability to solve complex problems using modern tools vis-a-vis chemical process industries.
PEO-2	Develop continuously the knowledge and skills through life-long learning for success in pursuing advanced degrees.
PEO-3	Possess strong communication and interpersonal skills to accomplish leadership roles in industry, business and society.
PEO-4	Practice and adhere to the principles of professional ethics, keeping in mind the social and environmental implications.

### Scheme of Studies

#### Semester-I

Course Code	Course Title	Credits
HU-107	Pakistan Studies	2-0
PHY-102	Applied Physics	2-1
CHE-101	Chemical Process Principles-I	3-0
CS-100	Fundamentals of ICT	2-1
ME-105	Workshop Practice	0-1
MATH-101	Calculus and Analytical Geometry	3-0
HU-100	English	2-0
	<b>Total</b>	<b>14-3</b>

#### Programme Code-C 625

#### Semester-II

Course Code	Course Title	Credits
CS-114	Fundamentals of Programming	2-1
CH-102	Inorganic & Analytical Chemistry	3-1
HU-101	Islamic Studies	2-0
ME-109	Engineering Drawing	0-2
MATH-121	Linear Algebra and ODEs	3-0
HU-109	Communication Skills	2-0
	<b>Total</b>	<b>12-4</b>

## Semester-III

Course Code	Course Title	Credits
CH-202	Organic & Biochemistry	3-1
CHE-221	Fluid Mechanics-I	3-0
CHE-231	Chemical Engineering Thermodynamics-I	3-0
CHE-201	Advanced Chemical Process Principles	3-0
MATH-243	Vector Calculus	3-0
MSE-101	Fundamentals of Engg Materials	3-0
	<b>Total</b>	<b>18-1</b>

## Semester-IV

Course Code	Course Title	Credits
CHE-211	Chemical Process Technology	3-0
CHE-241	Mass Transfer	2-0
CHE-242	Heat Transfer	3-1
EE-103	Electrical Engineering	2-1
HU-212	Technical & Business writing	2-0
CHE-224	Fluid Mechanics –II	2-1
	<b>Total</b>	<b>14-3</b>

## Semester-V

Course Code	Course Title	Credits
CHE-346	Particulate Technology	3-1
CHE-343	Simultaneous Heat & Mass Transfer-I	3-1
MATH-351	Numerical Methods	3-0
CHE-332	Chemical Engineering Thermodynamics-II	3-1
MGT-271	Entrepreneurship	2-0
	<b>Total</b>	<b>17</b>

## Semester-VI

Course Code	Course Title	Credits
CHE-348	Simultaneous Heat & Mass Transfer-II	3-1
CHE-323	Instrumentation & Process Control	3-1
CHE-347	Chemical Reaction Engineering	3-1
CHE-345	Transport Phenomena	3-0
ECO-130	Engineering Economics	2-0
	<b>Total</b>	<b>17</b>

## Semester-VII

Course Code	Course Title	Credits
CHE-422	Fuels & Combustion	3-1
CHE-451	Chemical Engineering Plant Design	3-0
CHE-499	Final Year Project	0-3
XXX-XXX	Elective-I	3-0
CHE-452	Chemical Process Design & Simulation	2-1
	<b>Total</b>	<b>16</b>

## Semester-VIII

Course Code	Course Title	Credits
CHE-425	Maintenance & Process Safety	3-0
CHE-499	Final Year Project	0-3
OTM-456	Production & Operational Management	3-0
XXX-XXX	Elective - II	3-0
XX-XXX	Elective - III (socail)	3-0
	<b>Total</b>	<b>15</b>
	<b>Grand Total</b>	<b>134</b>

## Electives Courses

Course Code	Course Title	Credits
CHE-340	Biochemistry	3-0
CHE-350	Petroleum Refinery Process	3-0
CHE-360	Fundamentals of Polymer Engineering	3-0
CHE-441	Fermentation Technology	3-0
CHE-442	Membrane Technology	3-0
CHE-482	Reservoir Engineering	3-0
CHE-483	Production Engineering	3-0
CHE-461	Polymer Reaction Engineering	3-0
CHE-462	Polymer Processing, Design and Characterization	3-0
CHE-484	Natural Gas Engineering	3-0
CHE-491	Sustainability in Processes & Energy Systems	3-0
MCG-126	Basic Concepts of Social Science	3-0
HU-115	Principles of Sociology	3-0
ENE-306	Fundamentals of Environmental Engineering	3-0
MCG-235	Logic & Critical Thinking	3-0

# Bachelors in Metallurgy and Materials Engineering

## Programme Description

Materials engineering is arguably the most important engineering discipline today. Starting from the study of structure, composition and properties of materials, it covers the manufacturing processes details. There is strapping interdependence between materials engineering, surface engineering and industrial engineering. The Bachelor's in Materials Engineering at SCME offers comprehensive education, with specialisation in areas of Surface Engineering. This programme covers the fundamental materials science of metals, ceramics and polymers as well as topics of particular interest in industry, such as material selection and design, environmental adaptation of products and failure analysis. This programme promotes networking of students from different backgrounds (materials science, mechanical engineering, physics and chemistry) with the aim to groom its graduates' inter-disciplinary as well as personal, interpersonal and professional skills.

## Associated Careers

Materials Engineers remain in demand in virtually all industries. These engineers may be monitoring impurities in steel destined for an assembly line (in the steel industry), shrinking the size of circuits to improve the reliability of a pager (in the ICT industry), or designing new materials for a missile casing (in the defense industry), industries may employ materials engineers to reduce the overall weight of a vehicle (in the automobile industry), remove limitations in power plants (in the manufacturing industry), or research product failures for a liability suit (in legal and corporate sectors). The Graduates can also exercise the option of working as researchers and scientists in a number of R&D organizations. Strong links exist between the Department of Materials Engineering and Foreign Universities in Europe, USA, China and the ASEAN countries. Provided they fulfill the admission criteria, graduates who would like to proceed abroad for higher studies, are facilitated to avail postgraduate education at various universities of these countries.

## Thrust areas of Materials Engineering

### 1. Metallurgy

Metallurgy is the technology of metals: the way in which science is applied to the production of metals, and the engineering of metal components for usage in products for consumers and manufacturers. It is also the study of physical and chemical behavior of metallic elements, their intermetallic compounds, and their alloys. The production of metals involves the processing of ores to extract the metal they contain, and the mixture of metals, sometimes with other elements, to produce alloys. The curriculum has been designed so as to fulfill the requirement of our industry.

### 2. Corrosion & Protection

Corrosion is a natural process, which converts a refined metal to a more stable form, such as its oxide or hydroxide. It is the gradual destruction of materials (usually metals) by chemical reaction with their environment. Corrosion Engineering is the field dedicated to controlling and stopping corrosion. The problem of corrosion is commonly present in industry like oil & gas sector, paper & pulp industry, automobile industry, railway and aircraft industry etc. SCME trains its students of Materials Engineering to understand science of corrosion and apply their knowledge towards its mitigation.

### 3. Polymers Science & Engineering

A polymer is a large molecule, or macromolecule, composed of many repeated subunits. Polymers range from familiar synthetic plastics such as polystyrene to natural biopolymers such as DNA and proteins that are fundamental to biological structure and function. The trend of promoting the light weight objects is equally important as the use of biodegradable polymer materials. Polymer science is the field of diverse studies which touched its boundaries with chemical as well as materials science and technology. The incorporation of nanotechnology in polymer science makes it diverse and robust in this domain.

Programme Code-C 626

## Scheme of Studies

### Semester-I

Course Code	Course Title	Credits
EE-103	Electrical Engineering	2-1
HU-100	English	2-0
MATH-101	Calculus and Analytical Geometry	3-0
ME-105	Workshop Practice	0-1
PHY-102	Applied Physics	2-1
HU-107	Pakistan Studies	2-0
CS-114	Fundamentals of Programming	2-1
	<b>Total</b>	<b>17</b>

### Semester-II

Course Code	Course Title	Credits
MATH 121	Linear Algebra & ODE	3-0
ME -109	Engineering Drawing	0-2
HU-109	Communication Skills	2-0
CS-100	Fundamentals of ICT	2-1
HU-101	Islamic Studies	2-0
*MSE-101	Fundamentals of Engineering Materials	3-0
	<b>Total</b>	<b>15</b>

## Semester-III

Course Code	Course Title	Credits
CH-108	Applied Chemistry	3-1
MATH-243	Vector Calculus	3-0
MSE-201	Materials Engineering Lab-1	0-1
MSE-241	Polymer Science	3-0
MSE-221	Materials Thermodynamics & Kinetics	3-0
MSE-231	X-ray Diffraction & Crystallography	3-0
	<b>Total</b>	<b>17</b>

## Semester-V

Course Code	Course Title	Credits
MSE-303	Materials Engineering Lab 3	0-2
MSE-313	Welding & Joining	2-0
MSE-316	Foundry Engineering	3-0
MSE-333	Materials Testing Techniques	3-0
MSE-342	Polymer Engineering	3-0
MSE-213	Metals and Alloys-1	3-0
MGT-271	Entrepreneurship	2-0
	<b>Total</b>	<b>18</b>

## Semester-VII

Course Code	Course Title	Credits
MSE-461	Composite Materials	3-0
OTM-454	Project Management	3-0
MSE-405	Materials Engineering Lab 5	0-1
MSE-474	Surface Engineering of Materials	3-0
MSE-325	Heat Treatment of Materials	3-0
MSE-499	Final Year Project -I	0-2
MSE-4XX	Technical Elective -II	3-0
	<b>Total</b>	<b>18</b>

## Semester-IV

Course Code	Course Title	Credits
MATH-351	Numerical Methods	3-0
MSE-202	Materials Engineering Lab 2	0-1
MSE-224	Deformation & Fracture	3-0
MSE-222	Phase Transformation & Equilibria	3-0
HU-212	Technical & Business Writing	2-0
PHY-213	Physics of Materials	2-0
ECO-130	Engineering Economics	2-0
	<b>Total</b>	<b>16</b>

## Semester-VI

Course Code	Course Title	Credits
MSE-314	Manufacturing Processes	3-0
MSE-304	Materials Engineering Lab 4	0-2
MSE-326	Corrosion & Protection	3-0
MSE-317	Metals and Alloys-2	3-0
MSE-351	Ceramics & Glasses	3-0
MSE-3XX	Technical Elective - I	3-0
MSE-3XX	Technical Elective - I	3-0
	<b>Total</b>	<b>17</b>

## Semester-VIII

Course Code	Course Title	Credits
MSE-483	Plant Design	3-0
HU-222	Professional Ethics	2-0
ME-312	Measurement & Instrumentation	2-0
MSE-463	Nano-materials	2-0
MSE-499	Final Year Project-II	0-4
MSE-XXX	Technical Elective-III	3-0
	<b>Total</b>	<b>16</b>
	<b>Grand Total</b>	<b>134</b>

## Elective Courses

Course Code	Course Title	Credits
MSE-371	Interfacial Phenomena	3-0
MSE-373	Tribological phenomena on Surfaces	3-0
MSE-381	Industrial Safety	3-0
MSE-382	Design Standards & Quality Assurance	3-0
MSE-383	Operations Research	3-0
MSE-471	Vacuum Technology in Surface Engineering	3-0
MSE-472	Surface Analysis and Characterization	3-0
MSE-473	Novel Techniques in Surface Engineering	3-0
MSE-481	Maintenance Management	3-0
MSE-482	Industrial Economics & Management	3-0
MSE-404	Design of Experiments & Data Analysis	3-0
MGT-401	Total Quality Management	3-0
MSE-452	Electronic and Magnetic Materials	3-0
MSE-362	Introduction to Computational Materials Science	3-0
MSE-485	Metallurgical Plants and Quality Control	3-0
MSE-464	Advanced Materials	3-0
MSE-465	Powder Metallurgy	3-0
MSE-385	Biomaterials and Applications	3-0

## Programme Description

In the age of nano-technology and nano-materials, research and development in the materials technology has become vital for a nation like ours. Nano-technology research has primarily focused on manufacturing, creation of tools, materials, machines and devices that will eventually enable us to untie the fundamental building blocks of nature, easily, inexpensively and in particular with defect-free properties. The Masters programme in Materials and Surface Engineering produces scientists and researchers of the future who can develop and use these materials for the betterment of the society. The emphasis of the programme is on the application of nano-technology to produce thin films, nano-composites, electronic and bio-materials, ablatives, photonics materials, armor and blast protection linings and, modern alloys and smart materials.

## MS Coursework

Programme Code-C722/822

Course Code	Course Title	Credits
<b>Core Courses</b>		
MSE 811	Materials Thermodynamics	3
MSE 812	Phase Transformation & Microstructures	3
MSE 821	Mechanical Behaviour of Materials	3
MSE 851	Surface Engineering & Characterisation	3
MSE 899	MS Thesis	6

### Elective Courses (Any four)

MSE 861	Engineering Ceramics and Glasses	3
MSE 871	Polymer Engineering	3
MSE 852	Advanced Surface Coatings	3
MSE 882	Corrosion and Control Engineering	3
MSE 862	Electronic and Magnetic Materials	3
MSE 831	Modelling of Material Processes	3
MSE 881	Manufacturing Processes	3
MSE 854	Characterization of Materials	3
MSE 872	Composite Materials	3
MSE 856	Nano Materials and Processing	3
MSE 822	Fractography and Fracture Analysis	3
CHE 843	Separation Process in Chemical Engineering	3
NSE 813	Essentials of Nanoscience and Engineering	3
NSE 812	Environmental Nanotechnology	3
NSE 842	Nano Materials for Energy Applications	3
NSE 843	Nano Technology and Photovoltaics	3
NSE 844	Innovation and Entrepreneurship in Nanotechnology	3
NSE 845	Nanolithography and Device Fabrication	3
NSE 851	Degradation of Nanomaterials	3
CHE 814	Product Technology	3
PSE 821	Polymer Chemistry	3
ME 851	Advanced Manufacturing Processes	3
CHE 816	Molecular Nano Technology	3
ME 855	Material Selection & Design	3

ME 852	Rapid Prototyping Tooling and Manufacturing	3
ME 862	Advanced Engineering Materials	3
DME 936	Advanced Laser Materials Processing	3
DME 811	Product Design and Development	3
ESE 803	Photovoltaic Devices	3
ESE 811	Solar Energy	3
ESE 814	Fuel Cells	3
ESE 815	Thin Films	3
ESE 904	Advanced Energy Materials: Synthesis and Characterization	3
ESE 817	Wind Energy	3
EME 815	Advanced Materials & Surface Treatment	3
MSE 954	Advanced Characterization of Materials	3
MSE 952	Materials for Biomedical Applications	3
MSE 963	Semiconductor and Optical Materials	3
MSE 941	Materials for High Temperature Applications	3
MSE 951	Interface Engineering	3
NSE 901	Advanced Concepts in Nanoscience & Engineering	3
NSE 941	Nano Composite Materials	3
NSE 847	Essentials of NEMS MEMS	3
CHE 873	Membrane Technology	3
CHE 816	Molecular Nanotechnology	3
NSE 961	Surface Coatings and Thin Films	3

### Energetic Material Engineering - Stream

EME 805	Explosives Manufacture, Formulation and Filling	3
EME 801	Science of Energetic Materials	3
EME 802	Advanced Energetic Materials	3
EME 812	Detection and Analysis of Explosives	3

### Additional Courses

RM 898	Research Methodology	2
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SEM/WKSP 897	Seminar / Workshop	1
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### PhD Coursework

Course Code	Course Title	Credits
MSE 901	Advanced Engineering Mathematics	3
MSE 954	Advanced Characterisation Techniques	3

### Elective Courses (Any two)

MSE 952	Materials for Biomedical Applications	3
MSE 963	Semiconductor and Optical Materials	3
MSE 941	Materials for High Temperature Applications	3
MSE 951	Interface Engineering	3

EME902	Numerical methods in chemical Engineering	3
EME 910	Advanced Chemical Analysis and Flow Diagnostics	3
EME 912	High-Speed Diagnostic Techniques	3
EME 931	Rocket Motors Design and Propellants	3
<b>MSE 999</b>	<b>PhD Thesis</b>	<b>30</b>

### Additional Course

SEM/WKSP 997	Seminar / Workshop	1
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## MS/PhD Chemical Engineering

### Programme Description

Chemical Engineering is in fact process engineering. Its primary theme resides in designing industrial processes which revolve around the rigorous application of thermodynamics, kinetics and transport phenomena at its core. The postgraduate programme covers topics as diverse as mathematics, computer applications, process diagnostics and instrumentation to facilitate plant design and unit operations. The programme is designed to produce competent engineers, who will evolve as the benchmark for competitors around the globe.

### Associated Careers

Chemical Engineers work in manufacturing, pharmaceuticals, healthcare, design and construction, pulp and paper, petro-chemicals, food processing, specialty chemicals, polymers, bio-technology, and environmental health and safety industries, etc. Fertiliser, mining, synthetic fuels, cement, ceramics and composites, defence and aerospace are amongst the leading industries offering a multitude of employment opportunities for chemical engineers.

### Scheme of Studies

Programme Code-C725/C825

### MS Coursework

Course Code	Course Title	Credits
<b>Core Courses</b>		
EME 921	Momentum Heat & Mass Transfer in Chemical Engineering	3
CHE 847	Chemical Kinetics & Reactor Design	3
CHE 843	Separation processes in CHE	3
<b>CHE 899</b>	<b>MS Thesis</b>	<b>6</b>

### Elective Courses

ABS 832	Biosafety and Ethics of Biotechnology	3
CHE 814	Product Technology	3
CHE 815	Nano Catalysis	3
CHE 816	Molecular Nanotechnology	3
CHE 823	Advanced Analytical Techniques	3
CHE 848	Gasification Processes	3
CHE 853	Green Process Engineering	3
CHE 873	Membrane Technology	3
CSE 801	Computational Fluid Dynamics (CFD)	3

EME 803	Combustion and Propulsion	3
EME 810	Materials Technology	3
EME 902	Numerical Methods in CHE	3
EME 981	Advanced Fuel Technology	3
ENE 809	Waste Water Treatment & Design	3
ENV 830	Cleaner Production Techniques	3
ESE 801	Biofuel Engineering	3
ESE 824	Nuclear Energy Engineering	3
ESE 826	Industrial Catalysis for Energy Systems	3
ESE 911	Carbon Capture and Utilization	3
MSE 871	Polymer Engineering	3
MSE 880	Corrosion and Protection	3
MSE 952	Materials for Biomedical Application	3
CHE 872	Adsorption Science and Technology	3
CHE 976	Advanced Chemical Kinetics & Its Applications	3

### Energetic Material Engineering - Stream

EME 805	Explosives Manufacture, Formulation and Filling	3
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EME 812	Detection and Analysis of Explosives	3
EME 801	Science of Energetic Materials	3
EME 802	Advanced Energetic Materials	3

#### Additional Courses

RM 898	Research Methodology	2
SEM/WKSP 897	Seminar / Workshop	1

#### PhD Core Courses

CHE 906	Advanced Transport Phenomena	3
CHE 910	Advanced Chemical Engineering Thermodynamics	3
CHE 920	Advanced Reaction Engineering	3
CHE 915	Colloids & Surface Chemistry	3
CHE 999	PhD Thesis	30

#### Elective Courses

EME 810	Materials Technology	3
ESE 801	Biofuel Engineering	3
EME 981	Advanced Fuel Technology	3
CHE 873	Membrane Technology	3
EME 902	Numerical Methods in CHE	3
CHE 853	Green Process Engineering	3
CHE 848	Gasification Processes	3
EME 803	Combustion and Propulsion	3
MSE 880	Corrosion and Protection	3
MSE 871	Polymer Engineering	3
ENE 809	Waste Water Treatment & Design	3
CSE 801	Computation Fluid Dynamics (CFD)	3
CHE 823	Advanced Analytical Techniques	3
MSE 952	Materials for Biomedical Application	3
MATH 901	Advance Engineering Mathematics	3
CHE 816	Molecular Nanotechnology	3
MSE 871	Polymer Engineering	3
MSE 872	Composite Material	3
MSE 856	Nano Materials & Nano Processing	3
EME 902	Numerical methods in chemical Engineering	3
EME 910	Advanced Chemical Analysis and Flow Diagnostics	3
EME 912	High-Speed Diagnostic Techniques	3
EME 931	Rocket Motors Design and Propellants	3

#### Additional Course

SEM/WKSP 997	Seminar / Workshop	1
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# MS Process Systems Engineering

## Programme Description

PSE is a blended knowledge of chemical engineering, computer science and mathematics applied to solve industrial problems. It has been observed that the continuation of higher education up to the ladder in this area is the need of the hour. Hence, SCME took the initiative and is offering the first ever degree programme in PSE at any university in the country. The rationale behind this programme is aimed at developing a pool of highly trained engineers with master's degree in the specialized field of PSE to lead research and development activities in academic and industrial domains.

## Scheme of Studies

Programme Code: C767-

Course Code	Course Title	Credits
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### Core Courses

PSE-801	Process Systems Theory	3
PSE-852	Process Modelling and Simulation	3
PSE-823	Advanced Process Control	3
PSE-802	Optimization and Decision Analysis	3
<b>PSE-899</b>	<b>MS Thesis</b>	<b>6</b>

### Elective Courses (any four)

CSE-801	Computation Fluid Dynamics (CFD)	3
MGT-924	Supply Chain Management	3
EME-902	Numerical Methods for CHE (Chemical Engineering)	3
TEE-820	Process Intensification	3
ENE-809	Waste water treatment & Design	3
EME-921	Momentum Heat and Mass Transfer (MHMT) in Chemical Engineering	3
CHE-847	Chemical Kinetics & Reactor Design	3
CHE-814	Product Technology	3
ESE-801	Biofuel Engineering	3

TEE-810	Advanced Process Energy Analysis & Optimization	3
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### Energetic Materials Engineering - Stream

EME-805	Explosives Manufacture, Formulation and Filling	3
EME-812	Detection and Analysis of Explosives	3
EME-801	Science of Energetic Materials	3
EME-802	Advanced Energetic Materials	3

### Additional Courses

RM-898	Research Methodology	2
SEM/WKSP-897	Seminar / Workshop	1





## Programme Description

MS in Nano Science and Engineering will prepare students to take leadership roles in emerging hi-tech industries as well as traditional industries that exploit nanoscale phenomena. Graduates with MS in Nano-science and Engineering will be in great demand in industry, academic institutions and research organizations. The programme caters to a growing demand for Scientists and Engineers who can fabricate systems of sensors, actuators, functional materials and who can integrate electronics at the micro and nanoscale. The graduates of this programme are expected to possess the necessary insights in nano-science to develop new products using these skills

The cross-disciplinary nature of the programme will provide exciting careers in environment, biomedicine, chemistry, and industries such as building, electronics, materials and renewable energy. Graduates with MS in Nano-science and Engineering will also find a range of opportunities outside Pakistan as well. Some of the key areas may include but not limited to nano-medicine, nano-devices, nano-biotechnology, nano-photonics and energy harvesting devices. The programme is offered with the mission that Nano-science and Engineering Postgraduate programme will provide qualified manpower with inter-disciplinary academic foundations needed to develop Nano-science products for the society. The programme is aligned to integrate critical thinking, scholarly training, leadership qualities and sustainable vision in graduates to enable them to cope with the complex problems of the Nano-science and allied industries.

## Scheme of Studies

Course Codes	Course Title	Credit
<b>Core Courses</b>		
NSE 813	Essentials of Nanoscience and Engineering	3
MSE 856	Nano Materials and Processing	3
MSE 854	Characterization of Materials	3
NSE 899	MS Thesis	6
<b>Elective Courses (Choose any three)</b>		
NSE 812	Environmental Nanotechnology	3
NSE 821	Nanofabrication by Self-Assembly	3
NSE 842	Nano Materials for Energy Applications	3
NSE 843	Nano Technology and Photovoltaics	3
NSE 844	Innovation and Entrepreneurship in Nanotechnology	3
NSE 845	Nanolithography and Device Fabrication	3
NSE 847	Essentials of NEMS/MEMS	3
NSE 851	Degradation of Nanomaterials	3
CHE 815	Nano Catalysis	3
ABS 832	Biosafety & Ethics of Biotechnology	3
IBT 820	Industrial Biotechnology & Microbiology	3
IBT 920	Tissue Engineering & Biomaterials Sciences	3
ESE 815	Thin Films	3
ESE 904	Advanced Energy Materials: Synthesis & Characterization	3
ESE 803	Photovoltaic Devices	3
ESE 811	Solar Energy	3
ESE 911	Carbon Capture and Utilization	3
EE 831	Advanced Digital Signal Processing	3
EE 846	RF Circuit Design	3

## Programme Code-C750/C850

NSE 901	Advanced Concepts in Nanoscience & Engineering	3
NSE 921	Selected Topics in Nanotechnology	3
NSE 931	Advanced Synthesis and Fabrication Techniques	3
NSE 941	Nano Composite Materials	3
NSE 951	Nano Structured Materials	3
NSE 961	Surface Coatings and Thin Films	3
MSE 963	Semiconductor and Optical Materials	3
MSE 952	Materials for Biomedical Applications	3
MSE 954	Advanced Characterization of Materials	3
MSE 862	Electronic and Magnetic Materials	3
MSE 851	Surface Engineering and Characterization	3
CHE 873	Membrane Technology	3
MSE 872	Composite Materials	3
ESE 829	Functional Nanomaterials for Renewable Energy	3
<b>Energetic Material Engineering - Stream</b>		
EME 805	Explosives Manufacture, Formulation and Filling	3
EME 812	Detection and Analysis of Explosives	3
EME 801	Science of Energetic Materials	3
EME 802	Advanced Energetic Materials	3
<b>Additional Courses</b>		
RM 898	Research Methodology	2
SEM/WKSP 897	Seminar / Workshop	1

## PhD Courses

Course Codes	Course Title	Credit
NSE 901	Advanced Concepts in Nanoscience & Engineering	3
MATH 901	Advanced Engineering Mathematics	3
NSE 999	PhD Thesis	30

## Elective Courses

NSE 921	Selected Topics in Nanotechnology	3
NSE 931	Advanced Synthesis and Fabrication Techniques	3
NSE 941	Nano Composite Materials	3
NSE 951	Nano Structured Materials	3
NSE 961	Surface Coatings and Thin Films	3
NSE 842	Nano Materials for Energy Applications	3
NSE 845	Nanolithography and Device Fabrication	3
NSE 821	Nanofabrication by Self-Assembly	3
MSE 963	Semiconductor and Optical Materials	3
MSE 952	Materials for Biomedical Applications	3
MSE 901	Advanced Characterization of Materials	3
MSE 854	Characterization of Materials	3
CHE 915	Colloids & Surface Chemistry	3
CHE 873	Membrane Technology	3
CHE 816	Molecular Nanotechnology	3
PHY 925	Optical Properties and Spectroscopy of Nanomaterials	3
PHY 918	Introduction to Quantum Optics	3
PHY 922	Nanophysics	3
CH 905	Nano/Biodevices	3
CH 816	Supramolecular Chemistry	3
ABS 932	Genomics, Proteomics and Bioinformatics	3
IBT 829	Nanobiotechnology: Concepts and Applications	3
IBT 920	Tissue Engineering and Biomaterials Science	3
BMES 941	Advances in Biomedical Materials	3
EME 902	Numerical methods in chemical Engineering	3
EME 910	Advanced Chemical Analysis and Flow Diagnostics	3
EME 912	High-Speed Diagnostic Techniques	3
EME 931	Rocket Motors Design and Propellants	3

## Additional Course

SEM/WKSP 997	Seminar / Workshop	1
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**SCEE**

School of Civil and Environmental  
Engineering, Islamabad

# School of Civil and Environmental Engineering

SCEE is a modern and progressive engineering school of the country, the first of its kind that offers a wide choice of BE programmes in Civil, Geoinformatics and Environmental Engineering. In BE programmes, the students are given the option of selecting elective majors. SCEE has very strong postgraduate programmes (MS/PhD) in Structural Engineering, Geotechnical Engineering, Transportation Engineering, Water Resources Engineering, Environmental Engineering, Environmental Science, Geographic Information Systems & Remote Sensing, Urban & Regional Planning and Construction Engineering & Management.

School of Civil and Environmental Engineering (SCEE) was established in November, 2008. It comprises four vibrant institutes, namely National Institute of Transportation (NIT), Institute of Environmental Sciences and Engineering (IESE), Institute of Geographical Information Systems (IGIS) and NUST Institute of Civil Engineering (NICE). SCEE is a modern and progressive school, the first of its kind that offers a wide choice of programmes in the disciplines of Civil and Environmental Engineering. In BE programmes, students are given the option of selecting an elective major. This means that while remaining Civil or Environmental Engineering graduates, they specialise in a particular field of their discipline. SCEE has advanced postgraduate programmes in Structural Engineering, Geotechnical Engineering, Transportation engineering, Water Resource Engineering and Management, Environmental Engineering, Remote Sensing & Geographic Information Systems, Urban & Regional Planning and Construction Engineering and Management. The programmes are tailored to equip graduates with the requisite knowledge and skills in order to meet the latest challenges in their respective fields. The goal of SCEE is to undertake basic and applied research to educate the next generation of academia and industry leaders, and prepare students for successful careers in relevant professions. SCEE has a competent and experienced faculty, and is equipped with state-of-the-art laboratories, sophisticated equipment and computing facilities. It has an excellent library with the latest books, journals and technical reports pertaining to relevant disciplines. It offers an enabling environment for dynamic students looking for challenging and adventurous professions such as Civil and Environmental Engineering and Geographical Information Systems. In 2020, SCEE and its constituent institute which include IESE, IGIS, NIT and NICE have published 162 publications in research journals and 5 conference papers in proceedings of international conferences.

## Vision

To evolve SCEE into a leading center of excellence which will offer an enabling environment that fosters learning, discovery, innovation and ethics. SCEE aims to produce such bright graduates who can impact the society and the environment through cutting-edge research and innovative technology, and who become a vehicle to transform Pakistan into a progressive and thriving country.

## Mission

In pursuance to our vision, SCEE strives to:

- » Develop means and methods to advance humanity's progress by understanding, building, operating and fostering the infrastructure;
- » Support our growing society and human needs through highly meritorious, innovative and sustainable pedagogy;
- » Advance the frontiers of knowledge and create innovative approaches to serve the humanity by helping it create and sustain a better environment;
- » Produce scholars, academic leaders, professionals, innovators and entrepreneurs, who are agents of change and can impact the world;
- » Assimilate interpersonal and social skills to help our graduates operate ethically, professionally and effectively in the real-world.



**Dr Tariq Mahmood, Principal**

PhD (Michigan State University) USA

**Discipline:** Civil Engineering

**Specialisation:** Transportation Engineering

**Dr S Muhammad Jamil, Dean**

PhD (University of Illinois Urbana Champaign) USA

**Discipline:** Civil Engineering

**Specialisation:** Geotechnical Engineering

**Dr Imran Hashmi, Associate Dean IESE**

PhD (University of Karachi) Pakistan

**Discipline:** Environmental Sciences

**Specialisation:** Environmental Microbiology

**Dr Ejaz Hussain, Associate Dean IGIS**

PhD (Purdue University) USA

**Discipline:** Civil Engineering

**Specialisation:** Remote Sensing & GIS

## PG Wing (NICE)

**Dr Khurram Iqbal Ahmad Khan HoD CE&M**

PhD, MS (University of Reading United Kingdom), UK

**Discipline:** Civil Engineering

**Specialisation:** Construction Engineering & Management

**Engr Mansoor Ahmed Malik, Coordinator**

MSc (NUST) Pakistan

**Discipline:** Civil (Transportation) Engineering

**Specialisation:** Transportation

**Dr. Sameer-ud-Din**

PhD (KAIST, South Korea), MS (UoS, UK)

**Discipline:** Civil (Transportation) Engineering

**Specialisation:** Traffic Engineering, Policy, Strategy & Evaluation

**Dr Abdur Rehman Nasir, HoD Research**

PhD (Bauhaus University, Weimar) Germany

**Discipline:** Civil Engineering

**Specialisation:** Construction Engineering & Management

**Dr. Muhammad Asif Khan**

PhD (MBSU, USA), MS (NUST, Pakistan)

**Discipline:** Civil (Transportation) Engineering

**Specialisation:** Transportation & Logistics

**Dr Arshad Hussain, HoD Tn Engg, OIC Transportation Lab**

PhD (Southwest Jiatong University, Chengdu) China

**Discipline:** Civil (Transportation) Engineering

**Specialisation:** Road & Railway Engineering

**Dr. Muhammad Usman Hassan**

PhD (METU Ankara) Turkey

**Discipline:** Civil Engineering

**Specialisation:** Construction Engineering & Management, AI

**Dr Muhammad Umer Zubair**

PhD (HKUST) Hong Kong

**Discipline:** Civil Engineering

**Specialisation:** Construction Engineering & Management

**Dr Abdul Waheed, HoD U&RP**

PhD (Asian Institute of Technology, Bangkok) Thailand

**Discipline:** Regional & Urban Planning

**Specialisation:** Regional & Rural Development Planning

**Engr Muhammad Hasnain**

MS (NUST, Pakistan)

**Discipline:** Civil Engineering

**Specialisation:** Construction Engineering & Management

**Dr Irfan Ahmad Rana**

PhD (Asian Institute of Technology, Thailand)

**Discipline:** Urban & Regional Planning

**Specialisation:** Regional & Rural Development Planning

**Engr Muhammad Zaeem Sheikh**

MS (NUST, Pakistan)

**Discipline:** Civil (Transportation) Engineering

**Specialisation:** Transportation / Traffic Engineering

**Dr Kamran Ahmed**

PhD, MS (MSU, MI) USA

**Discipline:** Civil (Transportation) Engineering

**Specialisation:** Transportation/Traffic Engineering

**Engr Malik Saqib Mahmood**

MS (Michigan State University) USA

**Discipline:** Civil (Transportation) Engineering

**Specialisation:** Traffic Engineering

## IGIS Faculty

**Dr Ejaz Hussain Associate Dean IGIS**

PhD (Purdue University) USA

**Discipline:** Civil Engineering

**Specialisation:** Remote Sensing & GIS

**Dr Javed Iqbal HoD**

PhD (Mississippi State University) USA

**Discipline:** Soil Science

**Specialisation:** GIS and RS Application in Natural Sciences

**Dr Ali Tahir**

PhD, University College Dublin, Ireland

**Discipline:** Geoinformatics

**Specialisation:** Geovisualisation

**Dr Salman Atif**

PhD, University of Paris Diderot France

**Discipline:** Physical Geography

**Specialisation:** Geography and Natural Environment, Geo Environment

**Dr Muhammad Azmat**

PhD (Water Resources Engineering, Politecnico Di Torino, Italy)

**Discipline:** Engg for Natural & Built Environment

**Specialisation:** Water Resource Engineering, Agricultural Engineering

**Engr Mansoor Ahmed Malik**

MSc (NUST) Pakistan

**Specialisation:** Transportation Engineering

**Discipline:** Civil Engineering

**Engr Muhammad Hasnain**

MS (NUST) Pakistan

**Discipline:** Civil Engineering

**Specialisation:** Construction Engg & Management

**Ms Quratulain Shafi**

MS, National University of Science & Technology

**Discipline:** Information Technology

**Specialisation:** Communication Systems Engineering

**Mr Junaid Aziz Khan**

MS, National University of Science & Technology

**Discipline:** Remote Sensing and GIS

**Specialisation:** Remote Sensing and GIS

**Syeda Maria Zafar**

MS (NUST)

**Discipline:** RS & GIS

**Specialisation:** RS & GIS

**Engr Muhammad Naqash Taj Abbasi**

BE, National University of Science & Technology

**Discipline:** GeoInformatics

**Specialisation:** Web GIS

**Engr Kashmala Ikram Chaudhry**

MS, City University of New York, USA

**Discipline:** Geographic Information Sciences

**Specialisation:** Advanced Remote Sensing and GIS Applications

**Engr Dr Muhammad Umair**

PhD Sungkyunkwan University, Korea

**Discipline:** Water Resources Engineering

**Specialisation:** Land Surface Modeling, carbon cycle and water cycle interactions, Satellite Remote sensing, GIS, and Machine learning.

## IESE Faculty

**Dr Imran Hashmi, Associate Dean**

PhD (University of Karachi) Pakistan

**Discipline:** Environmental Sciences

**Specialisation:** Environmental Microbiology

**Dr Muhammad Fahim Khokhar HoD**

**Environmental Sciences**

PhD (Institute of Experimental Physics II, University of Leipzig) Germany

**Discipline:** Experimental Physics

**Specialisation:** Satellite Remote Sensing

**Dr Zeeshan Ali Khan HoD Environmental Engineering**

PhD (Asian Institute of Technology) Thailand, Bangkok

**Discipline:** Environmental Engineering and Management

**Specialisation:** Satellite Remote Sensing of Atmospheric Particulate Matter

**Dr Muhammad Arshad**

PhD (Institute of National Polytechnique de Toulouse) France

**Discipline:** Environmental Biotechnology

**Specialisation:** Environmental Biotechnology

**Dr Sher Jamal Khan**

PhD (Asian Institute of Technology) Thailand, Bangkok

**Discipline:** Environmental Engineering and Management

**Specialisation:** Water Resource Management

**Dr Zeshan**

PhD (Asian Institute of Technology) Thailand, Bangkok

**Discipline:** Environmental Engineering

**Specialisation:** Anaerobic Technology and Waste Treatment (Environmental Technology and Management)

**Dr Sofia Baig**

PhD (Macquarie University) Australia

**Discipline:** Environmental Sciences

**Specialisation:** Plant Ecology

**Dr Deedar Nabi**

PhD (EPFL) Switzerland

**Discipline:** Environmental Engineering

**Specialisation:** Environmental Chemistry

**Engr Nida Maqbool**

PhD (In-progress, IESE, NUST) Pakistan

**Discipline:** Environmental Engineering

**Specialisation:** Wastewater Treatment

**Engr Arsalan Khalid (on study leave)**

MS (Chemical Engineering) King Fahd University

of Petroleum and Minerals, Saudi Arabia

**Discipline:** Chemical Engineering

**Specialisation:** Polymer Nanocomposite Membranes

**Engr Rashid Iftikhar (on study leave)**

MS/M.Phil (International Masters of Environmental Science)

University of Cologne, Germany

**Discipline:** Environmental Engineering

**Specialisation:** Algae Biotechnology

**Engr Erum Aamir**

MS (Florida International University) USA

**Discipline:** Environmental Engineering

**Specialisation:** Desalination

**Engr Aamir Khan**

Bachelor (Institute of Environmental Sciences and Engineering, NUST) Pakistan

**Discipline:** Environmental Engineering

**Engr Naveed Ahmad**

BE (University of Agriculture Faisalabad) Pakistan

**Discipline:** Environmental Engineering

**Engr Muhammad Irfan**

BE (UET Lahore) Pakistan

**Discipline:** Environmental Engineering

**Engr Amal Sarfraz (on study leave)**

MS (University of Bristol), UK

**Discipline:** Environmental Engineering

**Specialisation:** Water and Environmental Management

**Engr Saleem Nawaz Khan (on study leave)**

MS (Universiti Teknologi PETRONAS, Malaysia)

**Discipline:** Chemical Engineering

**Ms Mehwish Khalid**

MS (NUST)

**Discipline:** Environmental Sciences

**Noor Haleem**

MS (NUST)

**Discipline:** Environmental Sciences

**Dr Hira Amjad**

PhD (NUST) Pakistan

**Discipline:** Environmental Engineering

**Specialisation:** Water and Wastewater Monitoring and Treatment

**Dr Muhammad Ali Inam**

PhD (Sungkyunkwan University) South Korea

**Discipline:** Environmental Engineering

**Specialisation:** Water and Wastewater Treatment

**Dr Waqas Qamar Zaman**

PhD (East China University of Science and Technology) China

**Discipline:** Environmental Engineering

**Specialisation:** Electrocatalytic Water Splitting and Waste Valorization

**Dr Musharib Khan**

PhD (Hong Kong University of Science and Technology) Hong Kong

**Discipline:** Environmental Engineering

**Specialisation:** Water/Wastewater Treatment and Waste Management

**Mr Zain Ul Abdeen (on study-leave)**

MS (NUST) Pakistan

**Discipline:** Mathematics

**Ms Anisa Tahir**

MS (NUST) Pakistan

**Discipline:** Biomedical Sciences

**Ms Romana Khan**

MS (NUST) Pakistan

**Discipline:** Environmental Sciences

## NICE Faculty

**Dr Syed Muhammad Jamil, Acting Associate Dean**

PhD (University of Michigan) USA

**Discipline:** Civil Engg

**Specialisation:** Geotechnical Engg

**Dr Hamza Farooq Gabriel, HoD Hydraulics**

PhD (Charles Sturt University (CSU), Australia)

**Discipline:** Civil Engg

**Specialisation:** WRE&M

**Dr Sajjad Haider**

PhD (National Institute of Applied Sciences) France

**Discipline:** Civil Engg

**Specialisation:** WRE&M

**Dr Shakil Ahmad**

PhD (University of Tokyo (UT), Japan)

**Discipline:** Civil Engg

**Specialisation:** WRE&M

**Dr Rao Arsalan Khushnood**

PhD (Politecnico Di Torino) Italy

**Discipline:** Civil Engg  
**Specialisation:** Structural Engg

**Dr Umar Saeed**

PhD (NUST) Pakistan  
**Discipline:** Mathematics  
**Specialisation:** Mathematics

**Dr Muhammad Usman**

PhD (KAIST) South Korea  
**Discipline:** Civil Engineering  
**Specialisation:** Structural Engineering

**Mr Abdul Jabbar Khan**

MSc (University of Punjab)  
**Discipline:** Geology  
**Specialisation:** Geology

**Engr Ammara Mubeen**

MSc (UET, Lahore) Pakistan  
**Discipline:** Civil Engg  
**Specialisation:** WRE&M

**Dr Muhammad Imran**

PhD from Beijing Institute of Technology (BIT), China  
**Discipline:** Physics  
**Specialisation:** Material Science and Material

**Dr Musaad Zaheer**

PhD from Curtin University, Australia  
**Discipline:** Civil Engg  
**Specialisation:** Structural Engg

**Engr Abdul Basir Awan**

MS (MSU) USA  
**Discipline:** Civil Engg  
**Specialisation:** Structural Engg

**Engr Malik Kamran Shakir**

MS (NUST) Pakistan  
**Discipline:** Civil Engg  
**Specialisation:** Civil Engg

**Muhammad Asad Hanif**

MS (Air University, Islamabad) Pakistan  
**Discipline:** Finance  
**Specialisation:** Finance

**Engr Ameer Hamza**

MS (NUST) Pakistan  
**Discipline:** Civil Engg  
**Specialisation:** Civil Engg

**Engr Muhammad Ibtasam Bin Latif**

MS (University of Warwick) UK  
**Discipline:** Engg Management  
**Specialisation:** Engineering of Business Management

**Engr Junaid Ahmad**

MS (UET Taxila) Pakistan  
**Discipline:** Civil Engg  
**Specialisation:** Structural Engg

**Engr Sara Farooq**

MS (Hokkaido University) Japan  
**Discipline:** Civil Engineering  
**Specialisation:** Structural Engineering

**Engr Arslan Mushtaq**

MS (NUST) Pakistan

**Discipline:** Civil Engineering  
**Specialisation:** Structural Engineering

**Engr Muhammad Fawad**

BE (NUST) Pakistan  
**Discipline:** Civil Engineering  
**Specialisation:** Civil Engineering

**Dr Athar Ali**

PhD (Manchester), UK  
**Discipline:** Civil Engineering  
**Specialisation:** Structural Engineering

**Dr Fawad Ahmed Najam**

PhD (Asian Institute of Technology), Thailand  
**Discipline:** Civil Engineering  
**Specialisation:** Structural Engineering

**Dr Muhammad Israr**

PhD (University Technology PETRONAS), Malaysia  
**Discipline:** Mathematics  
**Specialisation:** Mathematics (Science/Fluid Mechanics)

**Dr Syed Muhammad Turab Haider Jafri**

PhD (Hanyang University), South Korea  
**Discipline:** Civil Engineering  
**Specialisation:** Geotechnical Engineering

**Dr Tariq Mahmood Bajwa**

PhD (Carleton University Ottawa), Canada  
**Discipline:** Civil Engineering  
**Specialisation:** Geotechnical Engineering

**Dr Muhammad Usman Hanif**

PhD (University of Malaya), Malaysia  
**Discipline:** Civil Engineering  
**Specialisation:** Structural Engineering

**Dr Azam Khan**

PhD (Imperial College/London University), UK  
**Discipline:** Civil Engineering  
**Specialisation:** Structural Engineering

**Dr Muhammad Usman Hassan**

PhD (Middle East Technical University, Ankara), Turkey  
**Discipline:** Civil Engineering  
**Specialisation:** Structural Engineering

**RVF Muhammad Anwar**

MS: (Grandfield University)  
**Discipline:** Explosive Ordnance Engg  
**Specialisation:** Explosive Ordnance Engg

**Lecturer Umm-e-Habiba**

MPhil (Quaid-i-Azam University) Islamabad  
**Discipline:** Pak Studies  
**Specialisation:** Pak Studies

**Lecturer Qurat-ul-Ain**

MS (NUST), Islamabad  
**Discipline:** Information Technology  
**Specialisation:** Information Technology

**Lecturer Sami Ullah Khan Bangash**

MS (University of Illinois Urbana Champaign), USA  
**Discipline:** Civil Engineering  
**Specialisation:** Structural Engineering

**Lecturer Sadia Arshad**

MPhil (Air University), Islamabad  
**Discipline:** English  
**Specialisation:** English Linguistics/Literature

**Engr Muhammad Nageeb Nawaz**

BE (University of Engineering & Technology), Taxila  
**Discipline:** Civil Engineering  
**Specialisation:** Civil Engineering

**Engr Matiullah Shah**

BE (NUST), Pakistan  
**Discipline:** Civil Engineering  
**Specialisation:** Civil Engineering

**Engr Muhammad Hamza Khalid**

BE (NUST), Islamabad  
**Discipline:** Civil Engineering  
**Specialisation:** Civil Engineering

**Engr Atif Mehmood Khan**

BE (NUST), Islamabad  
**Discipline:** Civil Engineering  
**Specialisation:** Civil Engineering

**Engr Bilal Ahmed Khan**

BE (NUST), Islamabad  
**Discipline:** Civil Engineering  
**Specialisation:** Civil Engineering

**Dr Hammad Anis Khan**

PhD – University of New South Wales (UNSW) Australia  
**Discipline:** Civil Engineering  
**Specialisation:** Structural Engg

**Dr Sarmad Shakeel**

PhD – University of Naples Federico II, Italy  
**Discipline:** Civil Engineering  
**Specialisation:** Structural Engg

**Dr Badee Abdulqawi Hamood Alshameri**

PhD- University Tun Hussein Onn Malaysia, Malaysia  
**Discipline:** Civil Engineering  
**Specialisation:** Geotech Engg

**Dr Abbas Haider**

PhD – Tsinghua University, Beijing, China  
**Discipline:** Civil Engineering  
**Specialisation:** Geotech Engg

**Dr Zain Maqsood**

PhD. The University of Tokyo, Japan  
**Discipline:** Civil Engineering  
**Specialisation:** Geotech Engg

**Dr Muhammad Shahid**

PhD – Tsinghua University, China  
**Discipline:** Civil Engineering  
**Specialisation:** Hydrology and Water Resources

**Dr Aisha Shabbir**

PhD – University Technology Malaysia  
**Discipline:** Computer Science  
**Specialisation:** Big Data Analytics

**Engr Ibrahim Sarwar**

BE (NUST), Islamabad  
**Discipline:** Civil Engineering  
**Specialisation:** Civil Engineering

**Mr Muhammad Ismaeel**  
 B-Tech (Civil)  
**Discipline:** Civil Engineering  
**Specialisation:** Civil Engineering

## MS Transportation Engineering

The programme focuses on solving civil engineering problems in the context of transportation issues. The programme concentrates on practical problems concerned with structural, transportation, traffic and highways, airport and railways engineering. The course aims at encouraging intellectual pursuit of creative ideas to improve human and natural environments.

### Why join this programme?

Transportation engineers design and operate highways, airports, railroads and public transit. They conduct research in the field of transportation including design & operation, traffic flow & control, demand analysis & planning; and related work in economics, finance & administration. Study in the field of transportation engineering provides opportunities for the study of land-use transportation planning, infrastructure planning & management and environmental aspects of transportation.

### Scheme of Studies

Programme Code-T712

#### Core Courses

Course Code	Course Title	Credits
CE-860	Pavement Design and Analysis	3
CE-862	Pavement Materials Engineering	3
CE-863	Transportation Planning	3
CE-865	Traffic Engineering	3
<b>CE-899</b>	<b>MS Thesis</b>	<b>6</b>

#### Elective Courses (Any four)

Course Code	Course Title	Credits
CE-803	Concrete Materials and Technology	3
CE-806	Reinforced Concrete Members	3
CE-818	Coastal Engineering	3
CE-821	Soil & Site Improvement	3
CE-823	Slope Stability	3
CE-824	Mechanical Properties of Soil	3
CE-828	Advanced Geotechnical Design	3
CE-829	Geotechnical Site Investigation	3
CE-831	Advanced Soil Mechanics	3
CE-836	Construction Management	3
CE-859	Logistics and Supply Chain Management	3
CE-861	Pavement Rehabilitation & Management	3
CE-864	Geometric Design of Highways/ Freeways	3
CE-866	Airport Engineering	3
CE-867	Urban Transportation System Evaluation	3
CE-868	Public Mass Transportation	3
CE-869	Advanced Traffic Control & Management System	3
CE-870	Transportation Economics	3
CE-881	Soil Dynamics	3
CE-897	Special Topics in Civil Engineering	3
CE-898	Contract Management	3
CEM-801	Construction Project Administration	3
CEM-802	Construction Planning, Scheduling and Control	3
CEM-803	Economic Decision Analysis in Construction	3
CEM-804	Construction Cost Estimating and Control	3
CEM-805	Safety Management in Construction	3
CEM-806	Construction Equipment Management	3
CEM-807	Risk Management in Construction	3
ENE-802	Environmental Impact Assessment	3
GIS-802	GIS & Remote Sensing and Its Application For Civil Engineering	3
GIS-851	Land use Planning and Management	3



GIS-853	Urban Planning	3
GIS-854	Infrastructure and Transport Planning	3
GIS-862	Tourism Development	3
GIS-865	Land Information System	3
GIS-867	Demographic Analysis and Modeling	3
OTM-521	Operations Management	3
OTM-745	Supply Chain Management	3
OTM-802	Inventory and Warehouse Management	3
STAT-835	Probability & Statistics	3
URP-801	Advanced Planning Techniques	3
URP-802	Comparative Urban Planning	3
URP-804	Regional Development Planning	3

URP-805	Urban & Regional Transportation Systems	3
URP-806	Sustainable Urban Land-Use Planning	3
URP-807	Disaster Management	3
URP-810	Urban Environmental Systems Management	3
URP-901	Comprehensive Urban Planning Process	3
URP-902	Contemporary Urban Planning	3
URP-904	Urban Mass Transit	3

#### Additional Courses

RM-898	Research Methodology	2
SEM/WKSP-897	Seminar / Workshop	1



# MS/PhD Structural Engineering

The course focuses on solution of problems in structural engineering by enlarging and deepening students' knowledge so that they have a good grasp of new design concepts and technologies. The course contents encompass advance techniques for structural analysis, structural dynamics, reinforced concrete structures, and analysis and design of pre-stressed concrete structures.

## Why join this programme?

Structural engineers combine science and art to design and build infrastructure that will resist natural and manmade forces. Buildings, bridges, stadiums and other civil facilities define the traditional core focus of structural engineers. At the periphery of the field, structural engineering extends more broadly to share common interests with mechanical, aerospace and naval engineering for the design of often large, complex systems including power plants, pipelines, aerospace vehicles and ships-submarines.

## Scheme of Studies

Programme Code-I711/811

### Core Courses

Course Code	Course Title	Credits
CE-801	Advance Structural Mechanics	3
CE-805	Advanced Concrete Design	3
CE-809	Structural Dynamics	3
CE-816	Advanced Structural Material	3
<b>CE-899</b>	<b>MS Thesis</b>	<b>6</b>

### Elective Courses

Course Code	Course Title	Credits
CE-804	Pre-stressed Concrete Structures	3
CE-807	Steel Structures Design	3
CE-808	Finite Element Method	3
CE-810	Earthquake Seismology and Earthquake Hazard	3
CE-811	Disaster Risk Evaluation and Retrofitting of Existing Structures	3
CE-814	Structural Fire Engineering	3
CE-818	Coastal Engineering	3
CE-819	Masonry Structures	3
CE-822	Disaster Risk Assessment and Mitigation	3
CE-836	Construction Management	3
CE-840	Nano Secrets in Concrete	3
CE-842	Performance Based Design	3
CE-851	Vibration Control of Structures	3
CE-854	Stability of Structures	3
CE-857	Theory of Plates and Shells	3
CE-874	Non-linear Structural Analysis	3
CE-879	Design of Hydraulic Structures	3
CE-882	Deep Foundation	3
CE-897	Special Topics in Civil Engineering	3

STAT-835	Probability and Statistics	3
GIS-802	GIS & Remote Sensing Application for Civil Engineering	3
ME-812	Advance Control System	3
ME-815	Advance Modelling & Simulation	3
ME-820	Advance Instrumentation and Experimental Methods	3

### Additional Courses

RM-898	Research Methodology	2
SEM/WKSP-897	Seminar / Workshop	1
SEM/WKSP-997	Seminar / Workshop	1

## Programme Description

The Department of Urban & Regional Planning in National Institute of Transportation (NIT) at School of Civil & Environmental Engineering (SCEE) offers a graduate / PhD degree. The objectives of the Urban & Regional Planning Programme are:

- To provide profound understanding of the forces that give meaning and value to built-environment through acts of creation, design, construction and analysis.
- The proposed programme will produce professionals equipped with academic knowledge and practical/field skills to tackle challenges of urbanized world.
- To serve the people of Pakistan through professionally trained leaders in the field of Urban & Regional Planning.

## Why Join This Programme

The Master of Science degree in Urban and Regional Planning is designed to prepare students for leadership roles and careers in the public and private sectors for the purpose of planning and designing communities and regions. The programme has a strong focus on land use planning; design; policy; and economic, environmental, and cultural issues that shape urban and regional land development patterns in terms of infrastructure, housing, and open space systems. Emphasis is placed on developing research capabilities and graphic skills needed in planning and design. The programme's primary focus is to prepare students to become practitioners in the planning profession.

## Scheme of Studies

Programme Code-T752/T852

### Core Courses

Course Code	Course Title	Credits
URP-801	Advanced Planning Techniques	3
URP-804	Regional Development Planning	3
URP-805	Urban & Regional Transportation Systems	3
URP-806	Sustainable Urban Land-Use Planning	3
URP-899	MS Thesis	6

### Electives

URP-802	Comparative Urban Planning	3
URP-803	Planning Research Methods	3
URP-807	Disaster Management	3
URP-808	Social Engineering for Sustainable Development	3
URP-809	Development Planning in Pakistan	3
URP-810	Urban Environmental Systems Management	3
URP-811	Implementation of Plans	3
URP-812	Urban Finance Management	3
URP-813	Special Topics in URP	3
URP-901	Comprehensive Urban Planning Process	3
URP-902	Contemporary Urban Planning	3
URP-903	Urban Hydrology	3
URP-904	Urban Mass Transit	3
URP-913	Special Topics in URP	3
STAT-835	Probability and Statistics	3
CE-836	Construction Management	3
CE-865	Traffic Engineering	3
CE-863	Transportation Planning	3
CE-897	Special Topics in Civil Engineering	3

GIS-801	Advanced Geographical Information Systems	3
GIS-802	GIS & Remote Sensing Application for Civil Engineering	3
GIS-812	GPS Surveying Techniques	3
GIS-851	Land use Planning and Management	3
GIS-852	District Planning and Management	3
GIS-853	Urban Planning	3
GIS-854	Infrastructure and Transport Planning	3
GIS-856	Planning and Management of Housing	3
GIS-861	Poverty Alleviation	3
GIS-862	Tourism Development	3
GIS-863	Education and Health Services	3
GIS-865	Land Information System	3
GIS-866	Utilities and services Management	3
GIS-867	Demographic Analysis and Modeling	3
GIS-877	Spatial Decision Support System	3
ENE-802	Environmental Impact Assessment	3
ENE-804	Energy and Environment	3
ENE-806	Solid Waste Management	3
ENE-821	Environmental Management & Impact Assessment	3
ENE-824	Solid & Hazardous Waste Management	3
CEM-801	Construction Project Administration	3
CEM-805	Safety Management in Construction	3
CEM-807	Risk Management in Construction	3
URP-999	PhD Thesis	30

# MS/PhD Construction Engineering & Management

The course is designed to prepare potential industry leaders, capable of implementing the best engineering and management practices and technologies in construction industry.

## Why join this programme?

In Construction Engineering and Management, civil engineers manage and direct physical construction of a project from start to finish. This field is also known as construction management. Construction engineers apply the knowledge of construction methods and equipment along with principles of financing, scheduling, planning, organisation, and coordination to convert paper designs into completed usable facilities. They maintain a continuous record of personnel, time, materials, and costs and prepare periodic reports depicting the project's progress to completion.

## Coursework

Programme Code-T733/T833

### Core Courses

Course Code	Course Title	Credits
CEM-801	Construction Project Administration	3
CEM-802	Construction Planning, Scheduling and Control	3
CEM-805	Safety Management in Construction	3
CE-898	Contract Management	3
<b>CEM-899</b>	<b>MS Thesis</b>	<b>6</b>

### Elective Courses

Course Code	Course Title	Credits
CE-803	Concrete Materials and Technology	3
CE-829	Geotechnical Site Investigation	3
CE-835	Water Supply and Wastewater Engineering	3
CE-836	Construction Management	3
CE-843	Urban Flood Management and Disaster Risk Mitigation	3
CE-846	Modeling Theory and Information Management	3
CE-861	Pavement Rehabilitation & Management	3
CE-862	Pavement Materials Engineering	3
CE-863	Transportation Planning	3
CE-866	Airport Engineering	3
CE-886	Water Resources, Economics, Planning and Management	3
CE-897	Special Topics in Civil Engineering	3
CEM-803	Economic Decision Analysis in Construction	3
CEM-804	Construction Cost Estimating and Control	3
CEM-806	Construction Equipment Management	3
CEM-807	Risk Management in Construction	3
CEM-811	Construction Quality & Productivity Management	3
CEM-812	Sustainable Construction	3
CEM-813	Supply Chain Management in Construction	3
CEM-814	Human Resources Management in Construction	3
CEM-816	Building Information Modeling	2+1
CSE-800	Introduction to Modeling and Analysis	3
DM-801	Policies, Planning and Strategies for Disaster Management	3
DM-802	Disaster Risk and Vulnerabilities Assessment	3
DM-803	Disaster Risk Reduction and Preparedness	3
DM-804	Disaster Response and Recovery	3
DM-811	Community Based Disaster Risk Management	3
DM-812	Environmental Framework on Disasters	3
DM-821	Earthquake Disaster Assessment and Mitigation	3
DME-801	Fundamentals of Disaster Management	3
DME-802	Environmental Impact Assessment	3
ENE-804	Energy and Environment	3
ENE-843	Environmental Health and Safety	3
ENV-844	Sustainable Development	3
ESE-812	Energy Management in Buildings	3

GIS-802	GIS & Remote Sensing Application for Civil Engineering	3
GIS-836	Management of Energy Resources	3
GIS-854	Infrastructure and Transport Planning	3
GIS-856	Planning and Management of Housing	3
STAT-835	Probability and Statistics	3
SYSE-806	Complex Systems and Dynamics	2+1
URP-804	Regional Development Planning	3
URP-808	Social Engineering for Sustainable Development	3
<b>CEM-999</b>	<b>PhD Thesis</b>	<b>30</b>

### Additional Courses

RM-898	Research Methodology	2
SEM/ WKSP 897	Seminar / Workshop	1



# Institute of Environmental Sciences & Engineering (IESE)

IESE is a leading research institute in Pakistan that graduates culturally enlightened, technologically knowledgeable, academically competent, and research-oriented productive citizens who are prepared to lead, inspire and serve humanity. It offers BE Environmental Engineering, MS Environmental Engineering, MS Environmental Science, PhD Environmental Engineering and PhD Environmental Science degrees.

## Bachelors in Environmental Engineering

This programme, at the Institute of Environmental Sciences and Engineering, aims to produce environmental engineers with a sound theoretical foundation and practical knowledge of science and engineering principles to improve the environment for human habitation and to remediate polluted sites. This degree programme addresses water and air pollution control, recycling, waste disposal, and public health issues. It also includes studies on the environmental impact of proposed construction projects through Environmental Impact Assessment (EIA).

### Programme Educational Objectives (PEOs)

- » Graduate will acquire engineering knowledge and skills to address environmental concerns at national and international level.
- » Graduate will progress in their professions while demonstrating continual improvement in interpersonal and collaborative skills.
- » Graduate will demonstrate their professional and societal obligations displaying high moral and ethical standards.
- » Graduate will remain committed towards learning through postgraduate education and continued development of technical and managerial skills.

## Scheme of Studies

Programme Code-E609

### Semester-I

Course Code	Course Title	Credits
HU-101	Islamic Studies	2-0
HU-100	English	2-0
MATH-101	Calculus & Analytical Geometry	3-0
*ENE-213	Environmental Chemistry	2-1
ME-105	Workshop Practice	0-1
*CE-183	Surveying	1-2
CS-114	Fundamentals of Programming	2-1
	<b>Total</b>	<b>12-5</b>

### Semester-II

Course Code	Course Title	Credits
PHY-102	Applied Physics	2-1
ME-109	Engineering Drawing	0-2
HU-107	Pakistan Studies	2-0
HU-109	Communication Skills	2-0
*EE-101	Electrical Technology	2-1
MATH-121	Linear Algebra and Ordinary Differential Equations	3-0
	<b>Total</b>	<b>11-4</b>

### Semester-III

Course Code	Course Title	Credits
ENE-101	Introduction to Environmental Engineering	3-0
ENE-251	Ecological Management	2-0
MATH-361	Probability & Statistics	3-0
ENE-262	Computer Aided Design and Drafting	2-2
ENE-111	Introduction to Microbiology	3-0
	<b>Total</b>	<b>13-2</b>

### Semester-IV

Course Code	Course Title	Credits
CE-253	Fluid Mechanics	3-1
ENE-212	Environmental Microbiology	2-1
MATH-331	Numerical Analysis	3-0
ME-204	Thermodynamics	3-1
ME-100	Engineering Mechanics	3-0
	<b>Total</b>	<b>14-3</b>

## Semester-V

Course Code	Course Title	Credits
ENE-302	Water Treatment and Supply Network Design	3-1
GIE-201	Introduction to GIS and Remote Sensing	2-1
CE-223	Soil Mechanics	3-1
CE-356	Engineering Hydrology	3-1
ENE-421	Solid Waste Management	3-0
	<b>Total</b>	<b>14-4</b>

## Semester-VI

Course Code	Course Title	Credits
ENE-353	Project Planning & Management	2-0
ENE-303	Wastewater Collection & Treatment	3-1
	Elective - I	3-0
ENE-304	Environmental Engineering Lab Techniques	2-2
MGT-271	Entrepreneurship	2-0
ENE-332	Environmental Impact Assessment	2-0
ENE-252	Environmental Economics	2-0
	<b>Total</b>	<b>16-3</b>

## Semester-VII

Course Code	Course Title	Credits
HU-222	Professional Ethics	2-0
ENE-434	Environmental Health & Safety	2-0
HU-212	Technical and Business Writing	2-0
ENE-435	Cleaner Production Techniques	2-0
ENE-441	Air & Noise Pollution Control	3-1
ENE-499	Final Year Project - I	0-3
	<b>Total</b>	<b>11-4</b>

## Semester-VIII

Course Code	Course Title	Credits
CE-455	Water Resources & Irrigation Engineering	2-1
ENE-454	Energy Resources and Management	3-0
	Elective - II	3-0
	Elective - III	3-0
CSL-401	Community Service Learning Course	0-2
ENE-499	Final Year Project - II	0-3
	<b>Total</b>	<b>11-6</b>
	<b>Grand Total</b>	<b>133</b>



## Elective Courses

Course Code	Course Title	Credits
CHE-442	Membrane Technology	3(3-0)
GOE-341	Geosciences	3(3-0)
ENE-422	Industrial Waste Management	3(3-0)
ENE-455	Environmental Modeling	3(3-0)
CE-207	Structural Analysis	3(3-0)
ENE-414	Environmental Law and Policy	3(3-0)
ENE-413	Environmental Nanotechnology	3(3-0)
ENE-411	Separation Processes in Environmental Engineering	3(3-0)
ENE-412	Fermentation Engineering and Environment	3(3-0)

# MS/PhD Environmental Engineering/Environmental Science

As postgraduate programmes, the research themes are directed towards local environmental issues. IESE can address real-life challenges and, as a result, benefit people from all walks of life. Our research benefits from strong synergy that has been developed between science, engineering and management disciplines. This provides a powerful combination of skills and capability that ensures both industrial relevance and academic rigor. This complements our state-of-the-art research and development facilities that differentiate the IESE research activities from other universities/institutes.

## Research Focus

Well thought-out courses build an understanding of the fundamental principles of physical, chemical, and biological processes, employing mathematics and computational tools where relevant. The programme strives for appropriate balance between theory, computation and experimental observation, including both laboratory and field-scale experiments. It offers a healthy balance between research and practical application.

## Research Facilities

IESE has a wide range of facilities and equipment to support research activities including Atomic Absorption Spectrophotometer, Gas Chromatography, High Performance Liquid Chromatography, Air Quality Monitoring Station equipped with NO<sub>x</sub>, SO<sub>2</sub>, and O<sub>3</sub> Analyzers, Total Kjeldahl Nitrogen (TKN) Apparatus, Automatic COD Analyzer, Automatic Nitrogen Analyzer, Chlorophyll Analyzer, Clinical Chemistry Analyzer, Fluorescent Imaging, Laser Particle Size Analyzer, Microscope Trinocular, Thermocycler, Total Organic Carbon Analyzer, UV/Vis Spectrophotometer, etc. Well established Teaching & Research labs are available including Advanced Analytical Lab, Water and Wastewater Lab, Environmental Biotechnology Lab, Air, Noise & Solid Waste Lab, Microbiology Lab, Chemistry Lab, Toxicology Lab, and Computer Lab to facilitate students to promote their research work in their respective areas.

## MS/PhD in Environmental Engineering

This programme addresses subject themes such as physico-chemical processes in Environmental Systems, Wastewater Treatment and Design, Solid Waste Management, and Environmental Chemistry and Microbiology. It includes courses on Modelling of Environmental Systems, Water Resource Management, Industrial and Hazardous Waste Management, Remote Sensing and GIS, Contaminated Site Remediation, etc.

## MS/PhD in Environmental Science

The postgraduate (PG) degree in Environmental Science aims to produce environmental scientists with a sound theoretical foundation and practical knowledge of basic and advanced science principles to improve the environment from pollutant sources such as air, water, soil, etc. This degree programme offers courses in disciplines such as Environmental Biotechnology, Environmental Chemistry, Pollution Control Technologies, Environmental Impact Assessment, Environmental Analytical Techniques, Environmental Microbiology, Environmental Policy, Health Safety and Environment. It also includes courses on the Freshwater Ecology, Municipal Environmental Geology, Environmental Biotechnology, Statistics for Environmental Analysis, Wetland Management, Remote Sensing and GIS, etc.

## Associated Careers

- » Service in the federal or provincial environment departments/Divisions or environmental protection agencies
- » Affiliation with NGOs, international donors and development agencies such as World Bank, Islamic Development Bank, UNDP, UNICEF, UNEP, etc.
- » Environmental engineering portfolio
- » Environmental management in the industry
- » Academics
- » Waste management companies in major cities. WAPDA, WASA.

## Why study Environmental Science and Engineering?

Demand for professionals of Environmental Engineering & Scientists is rising every day. Environmental scientists and engineers solve problems related to:

- » Water Pollution
- » Air Pollution Control
- » Wastewater Treatment
- » Noise Pollution Control
- » Industrial Waste Management
- » Municipal Solid Waste Management
- » Site Remediation
- » EIA Development & Green Growth



### Core Courses

Course Code	Course Title	Credits
ENE-809	Wastewater Treatment and Design	3
ENE-813	Physico-Chemical Processes in Environmental Engineering	3
ENE-822	Solid and Hazardous Waste Management	3
ENE-817	Air and Noise Pollution Control	3

### Elective Courses (Any three of the following)

ENS-801	Environmental Analytical Techniques	3
ENS-832	RS & GIS Applications in Environment	3
ENS-827	Climate Change Adaptation and Mitigation	3
ENS-829	Environmental Risk Assessment and Management	3
ENS-823	Applied Environmental Microbiology	3
ENS-843	Health, Safety and Environmental Management	3
ENE-802	Environmental Impact Assessment	3
ENE-805	Water Resources Management	3
ENE-812	Modeling of Environmental Systems	3
ENE-820	Environmental Chemistry and Microbiology	3
ENE-825	Agricultural Pollution and Control	3
ENE-840	Membrane Tech for Water & Wastewater Treatment	3
ENE-843	Environmental Health and Safety	3
ENE-921	Contaminated Site Remediation	3
ENE-922	Environmental Biotechnology	3
ENE-923	Advanced Analytical Techniques	3
ENE-924	Special Topics in Environmental Engineering	3
STAT-835	Probability and Statistics	3
DM-812	Environmental Framework on Disaster Management	3
URP-806	Sustainable Urban Land use Planning	3
GIS-801	Advanced Geographical Information System	3
ENS-804	Energy and Environment	3
ENS-820	Environmental Chemistry	3
ENS-824	Freshwater Ecology	3

ENS-826	Environmental Biotechnology	3
ENS-852	Advance Analytical Techniques	3
ENS-854	Principles & Applications of Bioremediation	3
CE-886	Water Resources, Economics, Planning & Management	3
CE-888	Watershed Management	3
<b>ENE-899</b>	<b>MS Thesis</b>	<b>6</b>
<b>ENE-999</b>	<b>PhD Thesis</b>	<b>30</b>

### Additional Courses

RM-898	Research Methodology	2
SEM/ WKSP-897	Seminar / Workshop	1
SEM/ WKSP-997	Seminar / Workshop	1



### Core Courses

Course Code	Course Title	Credits
ENS-801	Environmental Analytical Techniques	3
ENS-827	Climate Change Adaptation and Mitigation	3
ENS-808	Strategic Environmental Assessment	3
ENS-810	Research Methods in Environmental Sciences	3

### Elective Courses (Any Three of the following)

Course Code	Course Title	Credits
ENS-804	Energy and Environment	3
ENS-806	Environmental Policy & Governance	3
ENS-820	Environmental Chemistry	3
ENS-822	Solid and Hazardous Waste Management	3
ENS-823	Applied Environmental Microbiology	2+1
ENS-824	Freshwater Ecology	3
ENS-825	Agrochemicals in the Environment	3
ENS-826	Environmental Biotechnology	3
ENS-832	Remote Sensing & GIS Applications in Environment	3
ENS-829	Environmental Risk Assessment and Management	3
ENS-843	Health, Safety and Environmental Management	3
ENS-850	Advances in Plant Ecology	3
ENS-852	Advance Analytical Techniques	3
ENS-854	Principles and Applications of Bioremediation	3
ENS-855	Carbon Sequestration and Environment	3
ENS-860	Treatment and Management of Wastewater	3
ENE-805	Water Resources Management	3
ENE-812	Modeling of Environmental Systems	3
ENE-817	Air and Noise Pollution Control	3

ENE-825	Agricultural Pollution and Control	3
CE-834	Climate Change and Hydrologic Cycle	3
CE-887	Water Quality Management	3
GIS-811	Advance Remote Sensing & Image Processing	3
GIS-842	Natural Hazard and Disaster Management	3
GIS-912	Advanced Digital Image Processing	3
URP-806	Sustainable Urban Land-Use Planning	3
STAT-835	Probability & Statistics	3
ENS-901	Special Topics in Environmental Science	3
<b>ENE-899</b>	<b>MS Thesis</b>	<b>6</b>
<b>ENE-999</b>	<b>PhD Thesis</b>	<b>30</b>

### Additional Courses

RM-898	Research Methodology	2
SEM/WKSP-897	Seminar / Workshop	1
SEM/WKSP-997	Seminar / Workshop	1

# Institute of Geographical Information System (IGIS)

IGIS is the first-of-its-kind higher education institute in Pakistan where state-of-the-art spatial education is delivered. The institute offers four-year Bachelors of Engineering in Geoinformatics, two-year Masters in Remote Sensing & GIS and PhD in Remote Sensing & GIS. The institute has well-experienced teaching faculty holding PhD and MS degrees from foreign universities who are actively involved in research and development. IGIS conducts short courses from time to time according to the demand of industry in GIS and Remote Sensing related disciplines. IGIS has also signed several MOUs with other national and international organization/institutes for collaboration in research.

In the years ahead, we hope to pursue, with renewed vigor and zeal; our vision is to expand not only our academic programmes but also the student intake, without diluting our traditional standards of excellence. Our graduates are working in public and private sectors getting salary comparatively high then other discipline. Some of the well-known organizations which require Geoinformatics skills include but not limited to Planning Commission, SUPARCO, Survey of Pakistan, Pakistan Meteorological Department, Punjab Urban Unit, Soil Survey of Pakistan, Army Survey Group, C4I, LMKT, FWO, GCISC, Urban Policy Unit KPK, DHA Islamabad and Lahore, NESPAK, WWF, UNDP etc. Similarly there are number of startups which are actively seeking Geoinformatics graduates. It is envisaged that Geoinformatics will be widely used as a planning mechanism in e government and g-government era.

## Bachelors in Geoinformatics Engineering

### Programme Educational Objectives

IGIS has defined and established its Programme Educational Objectives (PEOs) keeping in view the desirable attributes of our graduates and with valued input from stakeholders. The educational objectives of undergraduate Geoinformatics Engineering programme at IGIS-SCEE are:

- » Graduates will be highly competent and employable demonstrating Geoinformatics knowledge and skills.
- » Graduates will be leaders demonstrating effective teamwork and interpersonal skills.
- » Graduates will discharge their professional and societal obligations displaying high moral and ethical standards.
- » Graduates will pursue lifelong learning through postgraduate education and continued development of technical and managerial skills.

The PEOs for Geoinformatics Engineering programme are also aligned with vision and mission of university and IGIS.

### Programme Learning Objectives

1. Engineering Knowledge 2. Problem Analysis 3. Design/Development of Solutions 4. Investigation 5. Modern Tool Usage 6. The Engineer and Society 7. Environment and Sustainability 8. Ethics 9. Individual and Team Work 10. Communication 11. Project Management 12. Lifelong Learning

## Scheme of Studies

Programme Code: G636

### Semester-I

Course Code	Course Title	Credits
HU-100	English	2-0
ME-109	Engineering Drawing	0-2
HU-101	Islamic Studies	2-0
MATH-101	Calculus & Analytical Geometry	3-0
PHY-102	Applied Physics	2-1
GIE-100	Geography	3-0
OHS-101	Occupational Health and Safety	1-0
<b>Total</b>		<b>13-3</b>

### Semester-II

Course Code	Course Title	Credits
GIE-103	Introduction to GIS	2-1
HU-107	Pakistan Studies	2-0
ME-105	Workshop Practice	0-1
MATH-108	Differential Equations	3-0
CS-114	Fundamentals of Programming	2-1
HU-109	Communication Skills	2-0
CE-182	Surveying-I	2-1
ME-105	Workshop Practice	0-1
<b>Total</b>		<b>13-4</b>

### Semester-III

Course Code	Course Title	Credits
GIE-104	Introduction to Remote Sensing	2-1
ECO-130	Engineering Economics	2-0
CS-212	Object Oriented Programming	3-1
MATH-222	Linear Algebra	3-0
GIE-112	Computer Aided Drawing	1-2
HU-212	Technical & Business Writing	2-0
<b>Total</b>		<b>13-4</b>

### Semester-IV

Course Code	Course Title	Credits
CS-250	Data Structures and Algorithms	3-1
GIE-203	Digital Mapping & Image Processing	2-1
GIE-204	Photogrammetry	2-1
MATH-361	Probability & Statistics	3-0
CE-224	Soil Mechanics	2-1
HU-222	Professional Ethics	2-0
<b>Total</b>		<b>14-4</b>

## Semester-V

Course Code	Course Title	Credits	Course Code	Course Title	Credits
GIE-321	Database Management Systems	2-1	GIE-312	Geodesy and Map Projections	2-1
GIE-306	Cartography and Map Production	2-1	GIE-409	Spatial Databases	2-1
GIE-205	Spatial Data Analysis	2-1	GIE-341	Geosciences	3-0
GIE-342	GIS Applications	2-1	GIE-474	Web GIS	2-1
GIE-	Elective I	3-0	GIE-	Elective II	3-0
MATH-334	Neumerical Analysis	2-1	GIE	Elective III	3-0
<b>Total</b>		<b>13-5</b>	<b>Total</b>		<b>15-3</b>

## Semester-VI

## Semester-VII

Course Code	Course Title	Credits	Course Code	Course Title	Credits
GIE-415	GPS Surveying	1-2	MGT-471	Entrepreneurship	2-0
GIE-419	Spatial Decision Support Systems	2-1	GIE-499	Project II (GI Design Project)	0-3
GIE-499	Project I (GI Design Project)	0-3	GIE-	Elective VI	3-1
GIE-	Elective IV	3-0	GIE-	Elective VII	2-1
GIE-	Elective V	3-0		*Community Service	0-2*
GIE-475	Geospatial Project Management	2-0			
			<b>Total CHs</b>		<b>7-5</b>
<b>Total</b>		<b>11-6</b>	<b>Grand Total CHs</b>		<b>133</b>

## Semester-VIII

\*2 Credit Hours compulsory course (non-credit)

## Elective Courses

## Civil Engineering

Course Code	Course Title	Credits
CE-357	Water Resources Engineering and Management	3
CE-121	Engineering Geology	3
CE-371	Construction Project Management	3
CE-463	Irrigation Engineering	3
CE-462	River Engineering	3

## Computer Science / Electronics Engineering

Course Code	Course Title	Credits
EE-231	Signals and Systems	3
CS-423	Data Warehousing and Data Mining	4
CS-471	Machine Learning	4
EC-312	Digital Image Processing	3
CS-340	Web Technologies-I	3

## Geoinformatics

GIE-471	GIS Programming	3
GIE-473	Integrated Geo-Technologies	3

## Natural Resources Management

ENE-101	Introduction to Environmental Engineering	3
ENE-406	Water Supply and Waste Water Engineering	4
GIE-451	Elements of Weather	3
GIE-456	Environmental Impact Assessment	3
GIE-455	Renewable Energy Resources	3
ENE-421	Solid Waste Management	3

## Land Use Planning

GIE-461	Regional Planning and Management	3
GIE-462	Introduction to Urban and Transport Planning	3
GIE-414	Land use Planning	3
GIE-465	Fundamentals of Urban Planning	3
GIE-468	Land Information System	3
CEM-300	Procurement Management	3

## Special Topics

GIE-482	Special Topic in GIS	2-1
GIE-483	Special Topic in RS	2-1
CS-340	Web Technologies-I	2-1
CE-463	Irrigation Engineering	2-1
CE-462	River Engineering	3-0
CEM-300	Procurement Management	3-0



### Core Courses

Course Code	Course Title	Credits
GIS-824	Advanced Geographical Information Systems	2+1
GIS-825	Advanced Remote Sensing and Image Processing	2+1
GIS-826	Advanced Geodatabase and Programming	2+1
GIS-915	Spatial Analysis and Modeling	2+1
<b>GIS-899</b>	<b>MS Thesis</b>	<b>6</b>

### Elective Courses

GIS-803	GIS Pattern Analysis	3	GIS-846	Disease Ecology	3
GIS-804	GIS Application Software Development	3	GIS-847	Climatology	3
GIS-805	Internet Mapping and Information Management	3	GIS-848	Spatial Epidemiology	3
GIS-806	Spatial Statistics	3	GIS-851	Land use Planning and Management	3
GIS-807	Theory of GIS	3	GIS-852	District Planning and Management	3
GIS-808	Data Analysis for Geoscientists	3	GIS-853	Urban Planning	3
GIS-810	Photogrammetry	3	GIS-854	Infrastructure and Transport Planning	3
GIS-812	GPS Surveying Techniques	3	GIS-855	E-Economics	3
GIS-813	3-D GIS Data Capture and Ground LiDAR	3	GIS-856	Planning and Management of Housing	3
GIS-815	Engineering Aspects of RS	3	GIS-861	Poverty Alleviation	3
GIS-816	Remote Sensing in Hydrology	3	GIS-862	Tourism Development	3
GIS-817	Remote Sensing of the Environment	3	GIS-863	Education and Health Services	3
GIS-818	Terrain Mapping	3	GIS-864	Business and Marketing	3
GIS-819	Observations of the Earth and its Climate	3	GIS-865	Land Information System	3
GIS-823	Spatial Algorithms and Programming for GIS	3	GIS-866	Utilities and services Management	3
GIS-831	Agriculture and Food Security	3	GIS-867	Demographic Analysis and Modeling	3
GIS-832	Forest Management	3	GIS-871	Geodesy	3
GIS-833	Soil Geomorphology and Classifications	3	GIS-874	Web GIS	3
GIS-834	Hydrology and Water Resources	3	GIS-875	Project Management	3
GIS-835	Conservation of Biodiversity	3	GIS-876	Geo-statistics	3
GIS-836	Management of Energy Resources	3	GIS-880	GIS Standards, Security and Ethics	3
GIS-837	Management of Mineral Resources	3	GIS-883	Structural Equation and Multi-level (Hierarchical) Modeling	3
GIS-838	Spatial Hydrology	3	GIS-884	Advanced Regression Analysis	3
GIS-841	Coastal Zone Management	3			
GIS-842	Natural Hazards and Disaster Management	3			
GIS-843	Environmental Pollution	3			
GIS-845	Environmental Decisions and Conflict Resolution	3			

GIS-901	Special Topics in GIS	3
GIS-911	Special Topics in RS	3
GIS-903	Advanced Spatial Data Management	3
GIS-912	Advanced Digital Image Processing	3
GIS-913	Microwave and Hyperspectral Remote Sensing	3
GIS-914	Advanced Mapping Technology	3
GIS-820	GIS in Agriculture and Natural Resources	3
GIS-814	Remote Sensing Applications in Urban Areas	3
ENE-802	Environmental Impact Assessment	3
ENE-820	Solid Waste Management	3
ENE-828	Solid & Hazardous Waste Management	3
ENE-805	Water Resources Management	3
ENE-812	Modeling of Environmental Systems	3
ENE-825	Agricultural Pollution Control	3
ENE-921	Contaminated Site Remediation	3
ENE-923	Advanced Analytical Techniques	3
ENS-832	RS & GIS Applications in Environment	3
ENS-805	Climate Change	3
ENS-834	Environmental Risk Assessment	3
ENS-836	Epidemiology	3
CS-861	Advanced Computer Graphics	3
CS-877	Artificial Intelligence & Machine Learning	3
CE-853	Transportation Planning	3
CE-821	Soil and Site Improvement	3
CE-823	Slope Stability	3
CE-835	Water Supply and Wastewater Engineering	3
CE-887	Water Quality Management	3
CE-856	Ground Water Modeling	3
CE-872	Applied Hydrology	3

CE-850	Hydrometeorology	3
CE-883	Hydrologic Systems Modeling	3
CE-885	Groundwater Exploration	3
CE-888	Watershed Management	3
CE-886	Water resources, Economics, Planning and Management	3
CE-897	Special Topics in Civil Engineering	3
CSE-800	Introduction to Modeling and Analysis	3
URP-807	Disaster Management	3
URP-810	Urban Environmental System Management	3
URP-903	Urban Hydrology	3
URP-904	Urban Mass Transit	3
URP-804	Regional Development Planning	3
URP-805	Urban & Regional Transportation Systems	3
URP-806	Sustainable Urban Land-Use Planning	3
DM-803	Disaster Risk Reduction and Disaster Management	3
DM-804	Disaster Response & Recovery	3
DM-812	Environmental Framework on Disaster Management	3
GIS-999	PhD Thesis	30

#### Additional Courses

RM-898	Research Methodology	2
SEM/WKSP-897	Seminar / Workshop	1
SEM/WKSP-997	Seminar / Workshop	1



# NUST Institute of Civil Engineering (NICE)

The institute is designed and developed on the most modern lines which are tailored to strengthen student's knowledge in Civil Engineering and its related specialties. NICE consists of the following departments;

- » Structural Engineering
- » Geo Technical Engineering
- » Water Resources Engineering and Management
- » Survey and Geodesy
- » Water Resources Engineering
- » Water Resources Management
- » Glaciology
- » Hydro-Informatics
- » International Water Law & Conflict Management
- » Climate Change

## Teaching & Research Facilities

### Laboratories

- » Structures
- » Geotech
- » Survey
- » Fluid Mechanics
- » Geology
- » Computer

### Library

The library of the department is equipped with

- » Books (hard copies)
- » Online books through HEC
- » CD's/DVD's
- » MS Theses
- » Manuals

### Library Equipment

Library is fully furnished with new furniture, electronic detector and necessary equipment including computers, photocopy machines, scanner and printers. Wireless and line internet is also available in the library to access other international and HEC library.

### Access to National and International Data-Bases

Line and wireless internet is available in the library to access other libraries. Access to various databases is available:-

- » McGraw Hill Books
- » Springer Link
- » ASCE
- » Science Direct
- » E-brary
- » Jstore
- » Taylor & Francis Journals, etc.

## NICE Vision

To excel as leading educational and research hub in civil engineering that fosters learning, discovery, innovation and ethics to produce globally competent professionals striving in the progress and prosperity of the society.

## NICE Mission

In pursuance to our vision, NICE strives to:

- Provide a high quality learning environment to produce exceptionally competent scholars, academic leaders, professionals, innovators and entrepreneurs in civil engineering, who are the agents of change and can impact the world
- Promote forward-looking research both applied and theoretical that will positively impact and improve our profession and society
- Assimilate interpersonal and social skills to help our graduates operate ethically, professionally and effectively in the real-world

## Programme Educational Objectives (PEOs) for Civil Engineering at NICE

The educational objectives of undergraduate civil engineering programme at NICE are:

- Graduates will be highly competent and employable demonstrating sound knowledge and skills.
- Graduates will be leaders demonstrating effective teamwork and interpersonal skills.
- Graduates, will discharge their professional and societal obligations displaying high moral and ethical standards.
- Graduates will pursue lifelong learning through postgraduate education and continued development of technical and managerial skills.



## Programme Learning Outcomes (PLOs) for Civil Engineering at NICE

The graduates of NICE will demonstrate the following attributes for the organization they join;

- **Engineering Knowledge:** An ability to apply knowledge of mathematics, science, engineering fundamentals and an engineering specialisation to the solution of complex engineering problems.
- **Problem Analysis:** An ability to identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
- **Design/Development of Solutions:** An ability to design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
- **Investigation:** An ability to investigate complex engineering problems in a methodical way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data, and synthesis of information to derive valid conclusions.
- **Modern Tool Usage:** An ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering activities, with an understanding of the limitations.
- **The Engineer and Society:** An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solution to complex engineering problems.
- **Environment and Sustainability:** An ability to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
- **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
- **Individual and Team Work:** An ability to work effectively, as an individual or in a team, on multifaceted and /or multidisciplinary settings.
- **Communication:** An ability to communicate effectively, orally as well as in writing, on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **Project Management:** An ability to demonstrate management skills and apply engineering principles to one's own work, as a member and/or leader in a team, to manage projects in a multidisciplinary environment.
- **Lifelong Learning:** An ability to recognize importance of, and pursue lifelong learning in the broader context of innovation and technological developments.

### Semester-I

Course Code	Course Title	Credits
HU-100	English	2-0
CS-114	Fundamentals of Programming	2-1
HU-107	Pakistan Studies	2-0
MATH-101	Calculus and Analytical Geometry	3-0
PHY-102	Applied Physics	2-1
ME-105	Workshop Practice	0-1
CE-102	Civil Engineering Materials	3-0
	<b>Total</b>	<b>14-3</b>

### Semester-II

Course Code	Course Title	Credits
HU-101	Islamic Studies	2-0
MATH-121	Linear Algebra & ODE	3-0
ME-109	Engineering Drawing	0-2
HU-109	Communication Skills	2-0
CE-121	Engineering Geology	3-0
ME-107	Engineering Mechanics	2-1
	<b>Total</b>	<b>12-3</b>

### Semester-III

Course Code	Course Title	Credits
MATH-355	Numerical Methods	3-1
CE-103	Mechanics of Solids-I	2-1
CE-251	Fluid Mechanics-I	2-1
CE-182	Surveying-I	2-1
CE-222	Soil Mechanics -I	2-1
CE-241	Transportation Engineering-I	3-0
	<b>Total</b>	<b>14-5</b>

### Semester-IV

Course Code	Course Title	Credits
CE-252	Fluid Mechanics - II	2-1
CE-206	Structural Analysis-I	3-0
CE-286	Surveying-II	1-2
CE-324	Soil Mechanics - II	2-1
CE-205	Mechanics of Solids-II	2-1
CE-342	Transportation Engineering - II	2-1
	<b>Total</b>	<b>12-6</b>

### Semester-V

Course Code	Course Title	Credits
HU-212	Technical and Business Writing	2-0
CE-306	Structural Analysis-II	3-0
CE-308	Plain & Reinforced Concrete-I	3-1
CE-358	Engineering Hydrology	2-1
CE-371	Construction Project Management	2-1
CE-388	Computer Aided Civil Engineering Design and Graphics	1-2
	<b>TOTAL</b>	<b>13-5</b>

### Semester-VI

Course Code	Course Title	Credits
CE-310	Plain & Reinforced Concrete-II	3-1
CE-309	Structural Analysis-III	3-0
CE-372	Quantity Surveying and Cost Estimation	3-0
CE-339	Environmental Engineering - I	2-0
MATH-361	Probability & Statistics	3-0
CE-00	Elective - I	3-0
	<b>Total</b>	<b>17-1</b>

## Semester-VII

Course Code	Course Title	Credits
ARCH-305	Architecture & Town Planning	2-0
CE-341	Environmental Engineering-II	2-1
CE-411	Steel Structures	3-0
CE-375	Construction Engineering	3-0
HU-222	Professional Ethics	2-0
CE-499	Project-I	0-3
CE-00	Elective-II	3-0
	<b>Total</b>	<b>15-4</b>

## Semester-VIII

Course Code	Course Title	Credits
MGT-271	Entrepreneurship	2-0
ECO-130	Engineering Economics	2-0
CE-463	Irrigation Engineering	2-1
CE-288	Geoinformatics	1-1
CE-499	Project-II	0-3
CE-00	Elective-III	3-0
	<b>Total</b>	<b>10-5</b>
	<b>Grand Total</b>	<b>139</b>

## Elective Courses

### Structures

CE-412	Design of Concrete Structures	3-0
CE-413	Design of Steel Structures	3-0
CE-414	Bridge Engineering	3-0
CE-415	Special Application Structures	3-0
CE-416	Earthquake Engineering	3-0
CE-410	Structural Fire Engineering	

### Geotech

CE-425	Introduction to Rock Mechanics	3-0
CE-426	Slope Stability	3-0
CE-427	Soil and Site Improvement	3-0
CE-428	Design & Construction of Earthen Dams	3-0
CE-429	Introduction to Geotechnical Earthquake Engineering	3-0
CE-430	Applied Soil Mechanics	2-1
CE-431	Investigation and Instrumentation in Geotechnical Engineering	2-1
CE-440	Design of Tunnels and Underground Structures	3-0

### Water Resources

CE-459	Hydraulic Engineering	3-0
CE-460	Computational Hydraulics	3-0
CE-461	Open Channel Flow	3-0
CE-462	River Engineering	3-0

### Construction Management

ENE-433	Environment Management & Impact Assessment	3-0
CE-474	Construction Project Scheduling	3-0
HRM-443	Human Resource Management in Construction	3-0
CE-476	Construction Contract Management	3-0

### Transportation

CE-443	Pavement Design & Rehabilitation	3-0
CE-444	Traffic Engineering & Safety	2.5-0.5
CE-445	Road Construction, Materials & Practices	2.5-0.5
CE-446	Geometric Design of Highway	2.5-0.5

# MS/PhD Geotechnical Engineering

The course focuses on strengthening students' knowledge in geotechnical engineering, exposing them to issues related to engineering geology, geotechnical foundation engineering, geological and rock engineering, hydrology, soil structure and pavement design/analysis/rehabilitation.

## Why join this programme?

Geotechnical Engineering provides flexibility, broad subject coverage, high quality delivery and excellent job prospects on graduation. The course allows development of important technical aspects associated with Geotechnical Engineering. It provides the students with comprehensive and diverse understanding of Geotechnical Engineering which will allow the students to develop their careers. It is not only successful in providing essential technical aspects in the subject, but also allows a sound practical application of the skills learnt.

## Scheme of Studies

Programme Code-I710/I810

### Core Courses

Course Code	Course Title	Credits
CE 821	Soil and Site Improvement	3
CE 828	Advanced Geotechnical Design	3
CE 837	Design & Construction of Earthen Dams	3
CE 829	Geotechnical Site Investigation	3
<b>CE 899</b>	<b>MS Thesis</b>	<b>6</b>

### Elective Courses

CE 830	Rock Mechanics-II	3
CE 836	Construction Management	3
CE 841	Earth Structures	3
CE 860	Pavement Design and Analysis	3
CE 881	Soil Dynamics	3
STAT 835	Probability & Statistics	3
CE 823	Slope Stability	3
CE 824	Mechanical Properties of Soil	3
CE 831	Advanced Soil Mechanics	3
CE 884	Rock Mechanics-I	3
CE 803	Concrete Materials & Technology	3
CE 804	Pre-stressed Concrete Structures	3
CE 806	Reinforced Concrete Members	3
CE 808	Finite Element Method	3
CE 818	Coastal Engineering	3
CE 835	Water Supply and Wastewater Engg	3
CE 872	Applied Hydrology	3
CE 873	River Engineering	3
CE 875	Computational Hydraulics	3
CE 876	Sediment Transport	3

CE 880	Groundwater Hydrology	3
CE 885	Groundwater Exploration	3
CE 886	Water Resources Economics, Planning & Management	3
CE 888	Watershed Management	3
CE 889	Irrigation & Drainage Engineering	3
CE 890	Ground Water Modeling	3
CE 844	Hydropower Engineering	3
CE 861	Pavement Rehabilitation & Management	3
CE 862	Pavement Materials Engineering	3
CE 897	Special Topics in Civil Engineering	3
CE 898	Contract Management	3
CEM 802	Construction Planning, Scheduling and Control	3
CEM 806	Construction Equipment Management	3
CEM 807	Risk Management in Construction	3
URP 904	Urban Mass Transit	3
GIS 802	GIS & RS and Its Application for Civil Engg	3
GIS 807	Theory of GIS	3
GIS 815	Engineering Aspects of RS	3
GIS 833	Soil Geomorphology and Classification	3
GIS 842	Natural Hazards and Disaster Management	3
ENE 822	Solid & Hazardous Waste Management	3
ENE 921	Contaminated Site Remediation	3
ENV 848	Environmental Geology	3
<b>CE 999</b>	<b>PhD Thesis</b>	<b>30</b>

# MS/PhD Water Resource Engineering & Management

The course enables students to appreciate the wide range of activities related to Water Resources Engineering and produce engineering experts with updated knowledge in the fields of Water Resources, Hydrology and Environmental Management.

## Why join this programme?

Preservation and systematic regulation of water resources is the dire need of the present era. This course provides maximum job opportunities to students to work in different departments in the country.

## Scheme of Studies

Programme Code-I718/I818

### Core Courses

Course Code	Course Title	Credits
CE-871	Advanced Open Channel Hydraulics	3
CE-872	Applied Hydrology	3
CE-873	River Engineering	3
CE-875	Computational Hydraulics	3
<b>CE-899</b>	<b>MS Thesis</b>	<b>6</b>

### Elective Courses

Course Code	Course Title	Credits
CE 810	Hydrodynamics	3
CE 811	Data-Driven Modeling and Real-Time Control of Water Systems	3
CE 812	Modeling Theory and Information Management	3
CE 813	River Flood Modeling	3
CE 818	Coastal Engineering	3
CE 821	Soil and Site Improvement	3
CE 832	River Basin Modeling	3
CE 833	Urban Flood Management and Disaster Risk Mitigation	3
CE 834	Climate Change and Hydrological Cycle	3
CE 836	Construction Management	3
CE 822	Water Law & Policy	3
CE 838	Planning, Development & Management of Hydropower Systems	3
CE 839	Design of Hydropower Plants	3
CE 844	Hydropower Engineering	3
CE 848	Groundwater Hydrology	3
CE 850	Hydrometeorology	3
CE 856	Groundwater Modeling	3
CE 858	Dam Engineering	3
CE 876	Sediment Transport	3
CE 878	Water Management Computations	3
CE 879	Design of Hydraulic Structures	3

CE	886	Water Resources Economics, Planning & Management	3
CE	883	Hydrologic System Modeling	3
CE	885	Groundwater Exploration	3
CE	888	Watershed Management	3
CE	889	Irrigation & Drainage Engineering	3
CE	892	Geographic Information Systems in Water Resources	3
STAT	835	Probability & Statistics	3
CE	837	Design & Construction of Earthen Dams	3
CE	824	Mechanical Properties of Soils	3
CE	829	Geotechnical Site Investigation	3
CE	897	Special Topics in Civil Engineering	3
GIS	802	GIS & Remote Sensing (RS) Application for Civil Engg	3
ENE	802	Environmental Impact Assessment	3
ENE	824	Water Supply and Waste Water Collection Systems	3
ENE	827	Solid Waste Management	3
ENE	887	Water Quality Modeling	3
URP	807	Disaster Management	3
URP	903	Urban Hydrology	3
CSE	801	Computational Fluid Dynamics	3
ME	833	Computational Fluid Dynamics-II	3
ME	881	Advanced Fluid Mechanics	3
SYSE	804	Modelling, Simulation & Optimization	3
<b>CE</b>	<b>999</b>	<b>PhD Thesis</b>	<b>30</b>



**SMME**

School of Mechanical &  
Manufacturing Engineering,  
Islamabad

The School of Mechanical & Manufacturing Engineering has been established to prepare human resource with essential skills in Mechanical Engineering and related disciplines. Its areas of specialisation include manufacturing, automobile and power/energy sectors so as to prepare its graduates to perform effectively in the technological world. Though newly established, it has state-of-the-art laboratories related to mechanical and manufacturing fields. In addition, high-tech laboratories of Robotics, Biomedical and Manufacturing Resource Center (MRC) have also been developed.

The School is running undergraduate programme in Mechanical Engineering and MS and PhD in Mechanical Engineering, Robotics & Intelligent Machine Engineering, Design & Manufacturing Engineering (DME) and Biomedical Engineering. The programmes have been developed to address a growing concern within industry that fresh graduates do not meet the expectations of today's corporate and industry leaders. It has been noted that the current graduates have little awareness of the actual state of the industry, its culture, and the complex interactive management and operating systems which are based on value-added effort, team performance and result oriented leadership. The graduates of SMME are trained to assist the industry in its effort to meet the challenges posed by domestic and global competition. These graduates will have the knowledge of corporate culture, its internal and external competitive pressures, leadership qualities, team performance,

and an expanded understanding of technologies required for industry for effective utilisation of human and financial resources.

The programmes are designed to inculcate the following attributes and skills in the students:

- » Ability to design and conduct experiments, analyse data, use relevant tools/models and evaluate alternative mechanical/thermal/manufacturing system designs based on technical/non-technical criteria
- » Capability of providing leadership while working in a team, exhibiting a high degree of professionalism
- » Ability to work in diverse environments and address multidisciplinary challenges
- » Strength and critical understanding of moral values and professional ethics, with a passion for life-long learning and self-improvement
- » Ability to visualise and transform their innovation & creativity into practical form

## Faculty

### **Dr Javaid Iqbal, Principal**

PhD (University of New South Wales) Australia

**Discipline:** Mechatronics Engineering

**Specialisation:** Artificial Intelligence/Mobile Robots

### **Dr Muhammad Sajid, HoD Research**

PhD (University of Cergy Pontiose), France

**Discipline:** Mechanical Engineering

**Specialisation:** Computational Fluid Mechanics, Heat Transfer, Multiphase Flow

### **Dr Emad Uddin, HoD Mechanical Engineering**

PhD (Korea Advanced Institute of Science and Technology, KAIST), UK

**Discipline:** Mechanical Engineering

**Specialisation:** Computational fluid dynamics (CFD), Fluid structure interaction (FSI)

### **Dr Shahid Ikramullah Butt, HoD Design & Manufacturing Engineering**

PhD (Beijing Institute of Technology), China

**Discipline:** Mechanical/Manufacturing Engineering

**Specialisation:** Industrial Manufacturing & Automation

### **Dr Hassan Sajid Hassan Sajid, HoD Robotics & Artificial Intelligence**

PhD (University of Kentucky) USA

**Discipline:** Electrical Engineering

**Specialisation:** Electrical Engineering, Controls and Perception

### **Dr Nosheen Fatima, HoD Biomedical Engg & Sciences**

PhD (Université de Caen), France

**Discipline:** Biomedical Engineering and Science

**Specialisation:** Molecular Microbiology

### **Dr Yasar Ayaz, Central Project Director (NCAI)**

PhD (Tohoku University) Japan

**Discipline:** Robotics Engineering

**Specialisation:** Robotics & Machine Intelligence

### **Engr Muhammad Sohail**

MS (George Washington University), USA

**Discipline:** Mechanical Engineering

**Specialisation:** Structures

### **Dr Riaz Ahmad Mufti**

PhD (University of Leeds) UK

**Discipline:** Mechanical Engineering

**Specialisation:** Automotive Engineering

### **Dr Mushtaq Khan**

PhD (Loughborough University), UK

**Discipline:** Mechanical/Manufacturing Engineering

**Specialisation:** Rapid Prototyping / Laser Manufacturing

### **Dr Khalid Akhtar**

PhD (Asian Institute of Technology), Thailand

**Discipline:** Manufacturing Engineering

**Specialisation:** Industrial Engineering

**Dr Samiur Rahman Shah**

PhD (Ecole Centrale Nantes), France

**Discipline:** Automotive Engineering**Specialisation:** Engine Thermodynamics, Combustion and Emissions**Dr Syed Husain Imran**

PhD (University of Manchester) UK

**Discipline:** Mechanical Engineering**Specialisation:** Industrial Manufacturing Engineering**Dr Syed Omer Gilani**

PhD (National University of Singapore), Singapore

**Discipline:** Robotics and Intelligent Machine Engineering**Specialisation:** Visual Neuroscience**Engr Abdul Naeem Khan**

MS (Michigan State University (MSU)), USA

**Discipline:** Mechanical Engineering**Specialisation:** Thermo-fluids, Propulsion**Shoaib Ahmed**

MSc (The Royal Institute of Technology KTH), Sweden

**Discipline:** Mechanical Engineering**Specialisation:** Optimization and Control Theory**Dr Aamir Mubashir**

PhD (Loughborough University), UK

**Discipline:** Mechanical Engineering**Specialisation:** Advanced Mechanics of Materials**Dr Riaz Ahmad Khan**

PhD (NUST), Pakistan

**Discipline:** Applied Mathematics**Specialisation:** Elastodynamics**Mrs Sara Baber Sial**

MS (Middlesex University), London, UK

**Discipline:** Mechanical Engineering**Dr Jawad Aslam**

PhD (BUAA, Beijing), China

**Discipline:** Automotive Engineering**Specialisation:** Control Theory and System Engineering**Dr Muhammad Safdar**

PhD (NUST), Pakistan

**Specialisation:** Differential Equations**Dr Mian Ashfaq Ali**

MS (Hanyang University), Korea

**Discipline:** Mechanical Engineering**Specialisation:** Automotive Engineering**Dr Rehan Zahid**

PhD (University of Malaya), Malaysia

**Discipline:** Mechanical Engineering**Specialisation:** Mechanical Engineering**Dr Umar Ansari**

PhD (University of New South Wales) Australia

**Discipline:** Biomedical Engineering and Sciences**Specialisation:** Prosthetic Implants designing, Functional Electronic Stimulation (FES) Systems**Dr Zaib Ali**

PhD (University of Cambridge), UK

**Discipline:** Mechanical Engineering**Specialisation:** Engineering/Computational Mechanics**Dr Kashif Javed**

PhD (Åbo Akademi University), Finland

**Discipline:** Computer Science**Specialisation:** Fault Tolerance**Dr Syed Ali Abbas Zaidi (ON STUDY LEAVE)**

PhD (Osaka University), Japan

**Discipline:** Mechanical Engineering**Specialisation:** Computational Fluid Dynamics**Dr Muhammad Jawad Khan**

PhD (Pusan National University), South Korea

**Discipline:** Mechanical Engineering**Specialisation:** Brain-computer interface/ brain controlled robots**Dr Najam-ul-Qadir**

PhD (King Fahd University of Petroleum and Minerals), Saudi Arabia

**Discipline:** Mechanical Engineering**Specialisation:** Materials Science**Dr Niaz Bahadur Khan**

PhD (University of Malaya), Malaysia

**Discipline:** Mechanical Engineering**Specialisation:** Computational Mechanics, CFD**Dr Muhammad Asim Waris**

PhD (Aalborg University), Denmark

**Discipline:** Biomedical**Specialisation:** Neural Engg**Dr Waqas Khalid**

PhD (University Name required), (Country)

**Engr Ikhtlaq Khattak**

PhD (CEME NUST), Pakistan

**Discipline:** Mechanical Engineering**Specialisation:** Mechanical Engineering**Mr Muhammad Shams ur Rahman**

MA Islamic Studies (University of the Punjab) Pakistan

**Discipline:** Islamic Studies**Engr Hafiz Abdur Rehman**

MS (King Fahad University) Saudi Arabia

**Discipline:** Mechanical Engineering**Engr Muhammad Umer (ON STUDY LEAVE)**

MS (NUST) Pakistan

**Discipline:** Mechanical Engineering**Engr Hamza Asif Nizami (ON STUDY LEAVE)**

MS (NUST) Pakistan

**Discipline:** RIME**Specialisation:** Robotics



**Engr Wajid Ali**

BE (UET) Peshawar, Pakistan

**Discipline:** Mechanical Engineering**Engr M Kashif Farooq**

BE (UET Lahore) Pakistan

**Discipline:** Mechanical Engineering**Engr Muhammad Mansoor Ud Din**

BE (UET Lahore) Pakistan

**Discipline:** Mechanical Engineering**Engr Usman Abdullah (ON STUDY LEAVE)**

MS (NUST), Pakistan

**Discipline:** Mechanical, Automotive**Dr Mohsin Jamil (ON STUDY LEAVE)**

PhD (University of Southampton) UIC

**Discipline:** Mechanical Engineering**Specialisation:** Control System**Ammar Tariq (ON STUDY LEAVE)**

MSc (The Royal Institute of Technology), Sweden

**Discipline:** Mechanical Engineering**Specialisation:** Engineering Mechanics**Dr Adeeb Shehzad**

PhD (Life Sciences), South Korea

**Discipline:** Biomedical Engineering and Sciences**Specialisation:** Cancer Biology & Biochemistry**Dr Waqas Hassan Tanveer (ON STUDY LEAVE)**

PhD (Seoul National University), South Korea

**Discipline:** Mechanical & Aerospace Engg**Specialisation:** Energy Efficiency (process and simulation) via Industrial Waste Utilization**Naqash Hafiz Malik (ON STUDY LEAVE)**

BE (Air University) Pakistan

**Discipline:** Mechatronics**Specialisation:** Automation and Robotics**Engr Khawaja Fahad Iqbal (ON STUDY LEAVE)**

BE (NUST) Pakistan

**Discipline:** Robotics and Intelligent Machine Engineering**Specialisation:** Mechatronics Engineering**Muhammad Adnan Hanif (ON STUDY LEAVE)**

MSc (Bleking Institute of Technology) Sweden

**Discipline:** Mechanical Engineering**Specialisation:** Structural Mechanics, Strategic Sustainability**Engr Muhammad Usman Bhutta (ON STUDY LEAVE)**

MS (Technical University Dortmund) Germany

**Discipline:** Mechatronics**Specialisation:** Process Automation**Fahad Islam (ON STUDY LEAVE)**

MS (Carnegie Mellon University, Pittsburgh,PA) USA

**Discipline:** Robotics**Dr Sadaqat Ali**

PhD (Universiti Teknologi PETRONAS), Malaysia

**Discipline:** Mechanical Engineering**Specialisation:** Material and Manufacturing Engg**Dr Adnan Munir**

PhD (Western Sydney University), Australia

**Discipline:** Mechanical Engineering**Specialisation:** Mechanical Engineering**Dr Shamraiz Ahmad**

PhD (University Technology) Malaysia

**Discipline:** Mechanical Engineering**Specialisation:** Sustainable Manufacturing**Dr Muhammad Salman Khan**

PhD (Universiti Teknologi) Malaysia

**Discipline:** Mechanical Engineering (Applied Mechanics and Design)**Specialisation:** Computational Solid Mechanics, Damage Mechanics**Dr Karam Dad Kallu**

PhD (Pusan National University), South Korea

**Discipline:** Mechanical Engineering**Specialisation:** Intelligent Control & Automation System**Dr Saima Zafar**

PhD (Georg August University), Germany

**Discipline:** Biomedical**Specialisation:** Molecular Biology/Proteomics/Interatomic**Dr Amer Sohail Kashif**

PhD (University of Canterbury), New Zealand

**Discipline:** Bioengineering**Specialisation:** Bioengineering**Dr Abida Ayesha**

PhD (University of Glasgow), UK

**Discipline:** English Linguistics & Literature**Specialisation:** Applied Linguistics**Dr Sara Ali**

PhD (NUST) Pakistan

**Discipline:** Robotics and Intelligent Machine Engineering**Specialisation:** Human-Robot Interaction**Dr Waqas Khalid**

PhD (University of Technology), Malaysia

**Discipline:** Mechanical Engineering**Specialisation:** Mechanical Engineering**Dr Muhammad Usman Bhutta**

PhD (Bournemouth University), UK

**Discipline:** Mechanical Engineering**Specialisation:** Surface Coating & Tribology

# N-ovative Health Technologies (NHT) at National University of Sciences and Technology (NUST) Islamabad

N-ovative Health Technologies (NHT) Pvt Ltd, based at National University of Sciences & Technology (NUST), Islamabad, is a state-of-the-art medical device manufacturing facility. It is actively working in research and development of healthcare technologies as well as mass production of life-saving medical devices and implants such as Bare Metal stents, Drug-Eluting Stents, Angioplasty Balloon Catheters, Diagnostic Angiographic Catheters, ventilators etc. Under special directives of the Prime Minister's Office and Supreme Court of Pakistan, N-ovative Health Technologies (NHT) Pvt Ltd was established at NUST owing to the university's well-established research and development ecosystem. NHT is sponsored by the Ministry of Sciences & Technology (MoST) with the mandate of indigenously manufacturing cost-effective high-quality medical devices.

## Establishment of National Centre of Artificial Intelligence (NCAI) at National University of Science and Technology (NUST), Islamabad

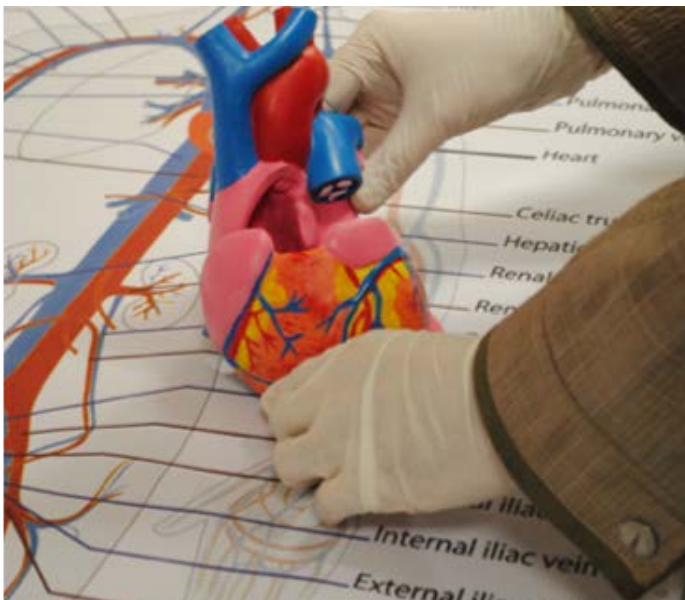
The National Center of Artificial Intelligence (NCAI) is the latest technology initiatives of Government of Pakistan under the government's Vision 2025 plan for Pakistan which envisions creating a modern and prosperous Pakistan by the year 2025. NCAI is designed to become the leading hub of innovation, scientific research, knowledge transfer to local economy, and training in the area of Artificial Intelligence (AI) and its closely affiliated fields. The central aim is to facilitate the researchers in the field of AI, help them establish and grow AI industry following international trend and seek solutions to the indigenous problems through AI.

Approved by Government of Pakistan in January 2018, NCAI is designed on a consortium model where the most leading researchers in the field of AI are identified on competitive grounds and new state of the art labs are established under their supervision. The project has a funding of PKR 1098.387 Million (US \$ 10 Million) which is to be expended in 3 years for development and initial running of the following main labs located in 6 universities of Pakistan:

- » Intelligent Field Robotics Lab at NUST, Islamabad
- » Deep Learning Lab at NUST, Islamabad
- » Medical Imaging and Diagnostics Lab at CIIT, Islamabad
- » Smart City Lab at NED UET, Karachi
- » Neuro-computation Lab at NED UET, Karachi
- » Intelligent Information Processing Lab at UET Peshawar
- » Intelligent System Design Lab at UET Peshawar
- » Intelligent Criminology Lab at UET Lahore
- » Agent Based Modeling Lab at Punjab University, Lahore

The labs and their respective Principal Investigators have been selected through competitive evaluation and rigorous selection process carried out by Higher Education Commission (HEC) and Planning Commission of Pakistan. Out of all the chosen top researchers of Artificial Intelligence in Pakistan, Dr Yasar Ayaz (NUST SMME) has been selected (on competitive grounds) to take the top position of Chairman / Central Project Director of the National Center of Artificial Intelligence (NCAI) of Pakistan.

NUST hosted conference was organized and conducted by the National Center for Artificial Intelligence (NCAI). The center hosted the conference with the title "International Conference on Artificial Intelligence (ICAI, 2021)". The conference was held from the 05th-07th April 2021 in an online modality. The Conference Chief Guest were Dr. Rizwan Younis (CTO Zong) and Mr. Shahzad (CTO Huawei).



## Lab Facilities

S#	Department	Labs
1	Design and Manufacturing	CIM/Micro CIM Lab, Metallography Lab, Heat Treatment Lab, CNC Lab (Lathe and Milling), Rapid Prototyping Lab, CAD/CAM Lab
2	Mechanical	Refrigeration & Air-conditioning Lab, Heat & Mass Transfer Lab, Engineering Mechanics Lab, Mechanics of Machine Lab, CAD / CAM-1, CAD / CAM-2, Drawing Hall, Vibration Lab, Ergonomics Lab, IC Engine Lab, Power Plant Lab, Instrumentation Lab, Electronics Lab, Fluid Mechanics Lab, Thermodynamics Lab, Mechanics of Material Lab, Advance Control Lab, Tribology Lab, Microfluidics & Aeroacoustics Lab, Flow Visualization Lab
3	Robotics & Artificial Intelligence	Hydraulic & Pneumatic Lab, Robotics & Intelligent System Engineering Lab, Embedded System Lab, Aerial Robotics Lab, Machine Vision Lab, Printed Circuit Board Lab
4	Manufacturing Resource Center	Surface Treatment Lab, Electrical Shop, Bench Fitting Lab, Wood Work and Pattern Making shop, Machine shop, Welding Fabrication shop, Forging & Foundry shop, Tool room.
5	Biomedical	Electromyography and Brain Computer Interface Lab, Biochemistry Lab, Prosthetic Lab, Human Systems Lab



## Institution of Mechanical Engineers (IMechE) Chapter

IMechE NSC made a monumental change in its vision. It has emerged as a strong technical society with prime focus on high quality student projects with the aim to bridge the gap between Academia and the Industry. The recent success of IMechE NSC to obtain a project from Shell Pakistan is a testament to its vision and hard work. Its ambitions do not end here. The launching of the project to completely design and fabricate an RC Plane coupled with an Aluminium engine - that too designed in house spells the extensive and strenuous learning curve that members of IMechE NSC go through.

IMechE NSC conduction of Speak Out for Engineering (SOfe - NUST) enabled it to sweep two of the three top spots in the SOfe - North '16-'17 round. All Pakistan CAD competition gathered the top CADers from all over Islamabad under one roof and pitched them against each other. The success of the event has encouraged IMechE to feature this regularly.

## ASME NUST SMME Student Section

American Society of Mechanical Engineers (ASME) promotes the practice of multidisciplinary engineering and allied sciences around the globe by training, professional development, codes and standards, research, conferences and publications, government relations, and other forms of outreach. ASME NUST SMME Student Section was established in May 2013. ASME NUST SMME Student Section has organized workshops for CV writing, freshmen mixer, Human Powered Vehicle challenge (HPVC) in academic year 2015-2016.

## ASHRAE Student Chapter

The American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE) is another prestigious organization, a chapter of which has been established at SMME. The Society focuses on "building systems, energy efficiency, indoor air quality and sustainability within the industry". Through research, standards writing, publishing and continuing education, ASHRAE shapes tomorrow's built environment today".

## Student Support Services

A panel of faculty members is designated as advisors who are available to the students for career counseling. They also guide students and solve their problems related to university life.

## Alliances and Partnerships

SMME has developed strong links with local and international industry and has conducted joint events and workshops. The school has also designed and developed number of products for these companies.

### Millat Tractors

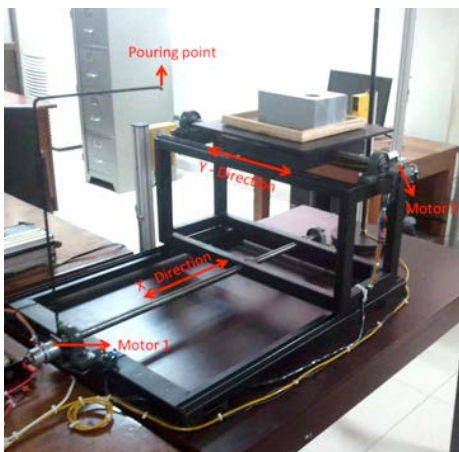
Along with international companies, SMME is also closely working with and supporting local industries. One of the examples is the technical link developed with Millat Tractors. Knowing our expertise in the field of engines, Millat Tractors and SMME are working on a number of joint projects. This includes, development of engine blow-by monitoring system, real time oil consumption measurement system etc. SMME has designed and developed Green engine test cell, the first of its kind in Pakistan for Millat Tractors

### Pakistan Association of Automotive Parts & Accessories Manufactures (PAAPAM)

Along with international companies, SMME is also closely working with and supporting local industries. One of the examples is the technical link developed with PAAPAM. SMME has recently signed an Memorandum of Understanding (MoU) with PAAPAM to provide placement of students from SMME in different industries related to automotive sector for permanent job, training and internships

### Sakura Wheelchairs (Japan)

SMME has signed a Memorandum of Understanding (MoU) with Sakura Wheelchair Project (Japan) under which researchers from leading Japanese Wheelchair Industries and associated Japanese Universities have joined hands with researchers of the Robotics and Intelligent Systems Engineering (RISE) Research Center at SMME to introduce active wheelchairs technology in Pakistan. The researchers are also working to collaborate on research projects for development of state of the art technologies to further research into Autonomous and Semi-Autonomous Active Wheelchairs.



## DICE Foundation (USA)

SMME joined hands with DICE Foundation, USA which is a non-profit organization registered and working in Michigan, USA. Its vision is to foster Innovation and Entrepreneurship culture in the country, make it part of the nation's DNA and achieve rapid socio-economic development through Innovation. It also aims at using Innovation as a tool to generate wealth for the nation and fully commoditize digital technologies to bring it to the masses in the country. DICE Foundation and SMME established NUST DICE Automotive Innovation Centre (NDAIC) at NUST which was inaugurated by the President of Pakistan. The centre combined academic knowledge with Industry expertise to produce the first completely indigenous Multi-Purpose Vehicle (MPV) in the country. Using the platform of NDAIC, Pakistan's first multi-purpose vehicle (MPV-1) has been designed with combined efforts of NUST-SMME and its consortium universities namely COMSATS Institute of Information Technology (CIIT) Sahiwal, NED University of Engineering and Technology and Capital University of Science and Technology (CUST).

## Patents

- » Method and apparatus for measuring the torque on the camshaft of an internal combustion engine (Patent No: EP1816456)
- » Method for the measurement of the rotation of a valve train follower and apparatus for carrying out the method (Patent No: EP1835135)
- » Development of engine blow-by meter RAM-BB2, Patent Application No: 854/2011.
- » Oil film thickness measurement system for engine journal bearings using localized capacitive technique, Patent Application No: 188/2013
- » Development of engine blow-by meter based on micro controller, Patent Application No: 190/2013.
- » Technique and apparatus for engine tappet speed monitoring system, Patent Application No: 189/2013.
- » Engine direct acting follower rotational speed measuring system, Patent Application No: 507/2013
- » Vision based Automatic mold Positioning System in a Sand Casting Process (Patent Application No. 696/2013) dated 11/10/2013.
- » Pin on Disk Tribometer (Patent filed on 28/10/2013)
- » Auxetic structures and their application in non-vascular pathologies (Patent Application No. 104/2013) dated 22/02/2013.
- » Anisotropic stent device for the treatment of coronary heart disease dated
- » Counter-intuitive auxetic intramedullary bone stent and a method for treating long bone fractures"
- » Skeletal Plate system with unique features for the repair of tubular and flat fractured bone (396/2014)
- » Intelligent Bandage with drug dispensation and adjustable porosity system for topical wounds
- » A Multifunctional Device that Promotes Wound Healing through Drug Delivery and Exudate Removal" 401/2014
- » Pin on Disk Tribometer (Patent filed on 28/10/2013)
- » Robotic Mannequin, Patent Application No: 332/2013, Filed on: 24 May 2013
- » Electronic Valve Train for internal combustion engines ( Patent Filed: 2015)
- » Dynamic Oil Film Thickness Measurement System for Engine (Patent Filed: 2015)
- » Valve Trains using Electrical Capacitive Technique(Patent Filed: 2015)
- » Technique and Apparatus for Rotational Speed and Sliding Measurement of Roller in Roller Follower Valve Train in Engine (Patent Filed: 2015)

# Industrial Projects

- » Follower Rotation Measurement on the VWTDI (AUDI) -Cylinder Head sponsored by British Petroleum
- » Slip Roll Ratio Measurement on Low Friction Valve Trains sponsored by British Petroleum
- » Design and Development of Engine Test Cell for Green Engine sponsored by Millat Tractors
- » Development of Standalone Blow By Monitoring System
- » Vision Based quality control solution for football shape analysis sponsored by AKI (Pvt.) Ltd.
- » Radiator Dry lead Detection System
- » Solar Space Heating of the SMME Building sponsored by HEC
- » APU test rig sponsored by HIT
- » Fabrication of Jatropa Biodiesel Prototype Pilot Plant sponsored by ST Venture
- » Development of 5000 Meter Range Unmanned Helicopter along with all its System sponsored by UNESCO
- » APU sponsored by HIT
- » Mobile Science Lab sponsored by NUST
- » Knee Joint Project sponsored by MVRDE
- » Measurement on the Multifunctional Valve Trains RIG (Cummins B Project) sponsored by British Petroleum
- » Design, Development & Rapid Prototyping of casing for secure communication device sponsored by AWC
- » Development of a 10 KM Range Flight Control System for Helicopter sponsored by NUST
- » NUST SMME Fun Stent Graft Treat OES/Cancer sponsored by NUST
- » NUST- Dev of Mobile Automotive Technology Test Bed sponsored by NUST
- » Tool Analysis for the Drilling of Hard Rocks in Petroleum sponsored by HEC
- » Open Source Platform for Numerical Simulation (OPN) sponsored by HEC
- » An Industrial project with Fan Industry member of PEFMA to optimize Ceiling Fan production line. Investigating the Oil Film Strength in a Dynamically Loaded Bearing using Localized Capacitance Technique by HEC
- » Modeling and robust control of grid connected converters sponsored by HEC
- » Manufacturing and Fabrication of Electric Bus for H-12 Sector NUST Campus sponsored by NUST
- » Design and Modification of Dinosaur and Solar System sponsored by Pakistan Muesum of National History Islamabad
- » Tribological Performance of Cam/Tappet Interaction in a Direct Acting Over Head Valve Train Engine sponsored by PSF

- » A Functional Stent-graft for the Treatment of Oesophageal Cancer
- » Design and Development of Bioresorbable Drug eluted Stents for Treatment of Coronary Heart Diseases sponsored by HEC
- » Human Detection sponsored by NESCOM
- » Human Torso Detection sponsored by NESCOM
- » Development of computational model saliency for videos sponsored by HEC
- » Modeling of Biomechanical Movement for Active Prosthetic Hand Manufacturing and Assembly sponsored by NESCOM
- » Piezoelectric Materials Synthesis and Development sponsored by NESCOM

## Research Publications

In 2020, SMME has published 93 publications in research journals and 9 conference papers in proceedings of international conferences.

## Summer Internships

SMME has strong relationships with many national and international companies. Due to these strong ties, SMME is able to arrange summer internships for all the students who have completed their first four semesters of Mechanical Engineering in local and international industries. Following are the companies in which SMME placed its students for summer internships.

- |                                   |                                    |
|-----------------------------------|------------------------------------|
| » Atlas Power                     | » PARCO                            |
| » Alpha Chemicals                 | » Rastgar Engineering Company      |
| » Atlas Honda                     | » Ravi Autos (Pvt.) Ltd            |
| » Attock Oil Refinery             | » Sazgar Engineering Works         |
| » Descon                          | » Schlumberger                     |
| » Fauji Fertilizer                | » Sitara Chemicals                 |
| » Heavy Industries Taxila         | » Spel Group                       |
| » IAESTE Pakistan                 | » Tesla Technologies               |
| » Infinity Engineering (Pvt.) Ltd | » Thermosole Industries (Pvt.) Ltd |
| » Interloop (Pvt.) Ltd            | » Trojans                          |
| » Kohinoor Mills (Pvt.) Ltd       | » Bestway Cement Limited           |
| » Laser Sports                    | » Askari Cement Limited            |
| » Mecas Engineering (Pvt.) Ltd    | » Maple Leaf Cement Limited        |
| » Metaline Industries (Pvt.) Ltd  | » Fauji Cement Company Limited     |
| » MGR Air Filters (Turkey)        | » Cherat Cement Company            |
| » Millat Equipment Limited        |                                    |
| » Millat Tractors Limited         |                                    |
| » National Instruments            |                                    |
| » OGDCL                           |                                    |
| » Pak Gen                         |                                    |
| » Pakistan Aeronautical Complex   |                                    |
| » Pakistan Oilfields              |                                    |
| » Pakistan Ordnance Factory       |                                    |
| » Pakistan Tobacco Company        |                                    |



“In realization of the fact we gratefully acknowledge & appreciate the efforts made by you (SMME) and your team for successful development of Blow-by meter for Millat Tractors engine testing facility.”

**Deputy General Manager Technical**  
Millat Tractors Limited

## Foreign Students Internship

Besides offering internships to our students, school also provides internship to foreign students from countries like Canada, Turkey and Spain in our state of the art laboratories. We have offered internships to students from more than 21 different countries.

## Industrial Visits

SMME arranges Industrial visits for students to renowned industries on regular basis. The main objective behind these visits is to explain the working of industrial equipment in running conditions to the students and tell them about the expectations of the industrialists from the fresh engineers. Some of the industries where students of SMME were taken for visits are:

- » Fazal Steel, Islamabad
- » Students visited Kohinoor Textile Mills
- » Askari Cement, Wah Cantt
- » Fazal Steel, Islamabad
- » Heavy Mechanical Complex, Taxila
- » Heavy Mechanical Complex, Taxila
- » HIT
- » HMC, Taxila
- » Honda Atlas
- » KSB Pumps
- » KSB Pumps
- » PAC Kamra
- » Rastgar Engineering
- » Silicaon CPV (Pvt) Ltd, Hattar
- » Tarbela Dam & Power House, Tarbela
- » Tesla
- » Wilson Pharmaceuticals
- » Heavy Mechanical Complex, Taxila
- » Ittehad Mills, Industrial Area I-9, Islamabad

- » Islamabad Polymer
- » Attock Refinery Limited
- » Mari Petroleum Company Ltd
- » KSB Pumps, Hasanabdal
- » PAC Kamra
- » Pakistan Ordinance Factories, Wah Cantt
- » Pakistan Tobacco Company, Jhelum
- » Rawat Industrial State, Rawat
- » STARCO Fans, Gujrat
- » Bestway Cement Limited
- » Askari Cement Limited
- » Maple Leaf Cement Limited
- » Fauji Cement Company Limited
- » Cherat Cement Company

## Short Courses:

Beside Regular curriculum school offers different short courses to student for enhancing their technical qualities and capabilities like:

- CNC/Lathes Training
- CNC Programming short Course
- Short course on pro e Wildfire 5
- Lab View Course
- GRE short Course
- Short course on CNC CAD/ CAM
- Advance Manufacturing Techniques
- Introductory Internship for High School Students
- Hydraulic & Pneumatics Course

## Conferences/Seminars/Workshops Conducted

S.No	Title of Conference/ Seminar/ Workshop / Symposium /Exhibition	Type of Event Conference/ Seminar/ Workshop / Symposium /Exhibition	Date	
1.	International Conference on Robotics and Emerging Allied Technologies in Engineering (iCREATE )	International Conference	22 Apr 2014	24 Apr 2014
2	DICE Automotive 2014	Symposium	16th Dec 2014	16th Dec 2014
3	First International Symposium on Automotive and Manufacturing Engineering (SAME)	Symposium	16th Dec 2014	16th Dec 2014
4	Dice Automotive 2015	Symposium	26 Nov 2015	27 Nov 2015
5	Second International Symposium on Automotive and Manufacturing Engineering (SAME)	Symposium	26 Nov 2015	27 Nov 2015
6	Role of Universities in Community Development and Empowerment	PCTN Seminar	30th Mar 2016	30th Mar 2016
7	DICE 2016 Mega Innovation & Entrepreneurship Event	Exhibition	21 Dec 2016	22 Dec 2016
8	International Symposium on Advancements in Innovation and Commercialization (ISAIC) 2016	Symposium	21 Dec 2016	22 Dec 2016

9	Application of Robotics Technology for Industrial Development in Pakistan	Workshop	28th Mar 2017	28th Mar 2017
10	The 4th Convention and 25th General Assembly Meeting of 2017 FEIAP in Pakistan (Federation of Engineering Institutes of South Asia and Pacific)	Conference (Organized by the PEC and NUST)	16th May 2017	17th May 2017
11	International Conference on Automotive Engineering	International Conference	26 Mar 2019	26 Mar 2019
12	First International Conference on Artificial Intelligence (ICAI) 2021	International Conference	5th Apr 2021	7th Apr 2021

## Vocational Skill Development Course

School offers vocational skill development courses every year in summer for unskilled persons

- Supervisory Level Course on Industrial Management
- Vocation Skill development course on Welding, Machinist, Electrical
- CNC Programming (Operators Level)

## Life at School

In order to keep students in touch with the outer world and provide them with cyber environment, there is high speed wireless internet facility inside the campus. A tea-bar and common room along with indoor games facility are also provided in the School so that students can spend their leisure time. The library and labs remains open from 9 AM to 9PM.

## Student Societies

Extracurricular and co-curricular activities play a vital role in the personal grooming of the students.

### NUST Robotics Club

NUST Robotics Club was established in September 2018. It aims to conduct Robotics competitions between schools and preparing teams for Robotics competitions at National and International level. It has a total of 56 members from various schools of NUST. It has been active in arranging different workshops and competitions to foster the novice learners to innovation incorporating Artificial Intelligence and increasing pursuits of higher studies.

### NUST Paragliding Club

NUST Paragliding Club was established in September 2018 with an endeavour to trigger the adventurous aptitude among students. It not only enables them to explore adventures but also helps in developing important life skills. Its mission is to pursue advocacy, communications, community, development of flying sites, impart learning by providing an organization framework for instructor, Pilot training and certification while steadily fostering a culture of safety. Comprising of 44 members, including both female and male, it has successfully completed Paragliding Training Courses and Paragliding at various spots like Mong, Khanpur and Abbotabad.

### Institute of Engineering and Technology (IET on Campus NUST)

The Institution of Engineering and Technology (IET) is a UK based multidisciplinary professional engineering institution, which has a local chapter formed in SMME NUST Islamabad. We aim to engineer a better environment for students and young professionals. With a focus on fostering innovation in engineering and technology, it has consistently organized competitions in which 35 members (SMME) have been able to set a benchmark through their accomplishments.

### NUST Society of Mechanical Engineers (NSME)

NSME is a platform developed at SMME to groom the young future engineers by organizing various technical workshops, interactive sessions, and entrepreneurial competitions. The mission of NSME is to provide mechanical engineers with a solid foundation in skills pertaining to their field by organizing a series of interactive sessions as well as technical and project management workshops, with the aim of expanding the reasoning and problem-solving abilities of the students so that they, as graduates, can confidently step into the engineering world and can pursue lifelong growth in their professional careers. Membership comprises of 91 members (SMME).

# Departments

School of Mechanical and Manufacturing Engineering (SMME) along with its 30 PhDs educated from reputed international and national universities, consist of following departments:

- » Department of Mechanical Engineering
- » Department of Design and Manufacturing Engineering
- » Department of Robotics and Intelligent Machine Engineering (RIME)
- » Department of Biomedical Engineering and Sciences (BMES)

## Quick Facts

### Undergraduate Programmes

Course Starting: September 2021  
Duration: 4 years  
Eligibility: Matric/ Equivalent (minimum 60% marks)  
FSc/ equivalent with Physics,  
Maths & Chemistry (Minimum 60% marks)

### Postgraduate Programmes

Course Starting: September 2021  
Duration: Minimum 1.5 years (For MS) and 3 years (For PhD)  
Eligibility: BE in Mechanical / Industrial/ Manufacturing/ Mechatronics or equivalent Engineering degree from a PEC/HEC recognized institution of Pakistan or abroad. (For Robotics and Intelligent Machine Engineering BE Computer Science Student can also apply.)

## Department of Design and Manufacturing Engineering (DME)

Mechanical Engineering is the oldest and broadest field of Engineering which combines skills in designing of components and systems in a wide range of engineering technologies. Mechanical Engineering department is an integral part of SMME PhD faculty educated from reputed international and national universities and around four hundred undergraduate students and an additional four hundred and fifteen postgraduate students and sixteen PhD students. The mission of the Mechanical Engineering programme is to provide students with the fundamental knowledge, skills and professional experience necessary for successful careers in industrial or academic roles. The department of Mechanical Engineering provides excellent platform for young students to study and perform in challenging environments. The Department is equipped with all laboratory equipment necessary for undergraduate and postgraduate studies in the area of Mechanical Engineering. The Department also works in close coordination with our newly developed Manufacturing Resource Center (MRC). MRC has a large number of manufacturing facilities where the ideas of the young students and researchers are brought into reality. The curriculum is designed to meet challenges faced by the industry and expectations of the modern corporate world. Due to excellent academic record in the last couple of years, the department is receiving large number of applications for admission at undergraduate and postgraduate level.



## Bachelors in Mechanical Engineering

The aim of the undergraduate programme in Mechanical Engineering is to train young graduates with technical, analytical, business and interpersonal skills to meet the challenges of the modern industries. The curriculum is tailored to provide skills in various areas



of Mechanical Engineering such as design, thermo-fluids, refrigeration and air conditioning, heat and mass transfer, industrial manufacturing, management and interpersonal skills. The programme is structured to create ability in the students to apply a multi-disciplinary approach to conceive, plan, design and implement solutions to a large number of Mechanical Engineering problems. The curriculum is integrated with computer based technologies facilitating the design and simulation of mechanical components and systems. In addition to all, the curriculum is set so that it helps students to choose a specific area or interdisciplinary fields such as industrial, manufacturing, materials and other wide range of engineering technologies. Modern mechanical engineers use sophisticated computer-aided design and engineering skills to ensure the reliability, efficiency and economics of products. There is an increasing demand for trained graduates with technical, analytical, business and interpersonal skills. The modern industry has led the world in innovation for almost a century, and its operations are now firmly integrated with computer-aided design, manufacturing and engineering. Our programme in Mechanical Engineering with its relevant specialisations provides skill, knowledge and understanding in the areas of computer-based technologies and innovative design processes. These are associated with current and future generations of machines.

Within a few years of graduation, the students with Bachelors in Mechanical Engineering are expected to attain the following.

PEO 1: Have strong competence in Mechanical Engineering resulting in successful careers.

PEO 2: Pursuing research and innovation and be able to provide industrial solutions for engineering and technical problems.

PEO 3: Leading or participating in efforts to address societal and technical / business challenges.

PEO 4: Enhancing their professional development and technical knowledge through continuing education.

## Scheme of Studies

Programme Code M 604

### Semester-I

Course Code	Course Title	Credits	Course Code	Course Title	Credits
MATH-101	Calculus & Analytical Geometry	3-0	MATH-121	Linear Algebra & ODEs	3-0
HU-100	English	2-0	ME-221	Engineering Materials	3-0
HU-107	Pakistan Studies	2-0	ME-113	Engineering Mechanics-I: Statics	3-0
CH-109	Applied Chemistry	2-0	HU-101	Islamic Studies	2-0
PHY-102	Applied Physics	2-1	HU-109	Communication Skills	2-0
CS-114	Fundamentals of Programming	2-1	ME-109	Engineering Drawing	0-2
ME-105	Workshop Practice	0-1		<b>Total</b>	<b>15</b>
	<b>Total</b>	<b>16</b>			

### Semester-III

Course Code	Course Title	Credits	Course Code	Course Title	Credits
MATH-232	Complex Variables and Transforms	3-0	MATH-351	Numerical Methods	3-0
ME-230	Fluid Mechanics-I	3-0	ME-210	Mechanics of Materials-I	3-0
ME-130	Thermodynamics-I	3-0	ME-330	Fluid Mechanics-II	3-0
ME-114	Engineering Mechanics-II: Dynamics	3-0	ME-231	Thermodynamics-II	3-0
EE-103	Electrical Engineering	2-1	EE-227	Electronics Engineering	2-1
ME-223	Advanced Workshop Practice	1-1	HU-212	Technical and Business Writing	2-0
ME-211	Computer Aided Drawing	0-1	ME-337	Fluid Mechanics Lab	0-1
ME-115	Engineering Mechanics Lab	0-1	<b>ME-232</b>	<b>Thermodynamics Lab</b>	<b>0-1</b>
	<b>Total</b>	<b>19</b>		<b>Total</b>	<b>19</b>

### Semester-V

Course Code	Course Title	Credits	Course Code	Course Title	Credits
ME-218	Machine Design-I	3-0	ME-310	Mechanics of Machines	3-0
ME-212	Mechanics of Materials-II	3-0	ME-327	Instrumentations Measurement	2-1
ME-331	Heat & Mass Transfer	3-0	ME-320	Machine Design-II	2-0
ME-322	Manufacturing Processes	3-1	ME-326	Heating, Ventilating and Air Conditioning	3-0
ME-325	Engineering Economics	2-0	ME-332	Heat Transfer and HVAC Lab	0-1
ME-216	Mechanics of Materials Lab	0-1	MATH-361	Probability & Statistics	3-0
ME-339	Control Engineering	2-1	ME-XXX	Technical Elective-1	2-0

CSL-401	Community Service Learning	0-2*
<b>Total</b>	<b>Total</b>	<b>19</b>

### Semester-VII

Course Code	Course Title	Credits
MGT-271	Entrepreneurship	2-0
ME-411	Introduction to Finite Element Analysis	2-1
ME-421	Mechanical Vibrations	3-0
ME-433	Mechanisms and Mechanical Vibrations Lab	0-1
XXX-000	Technical Elective-2	2-0
ME-430	Power Plants	3-0
ME-499	Final Year Project-1	0-3
<b>Total</b>		<b>17</b>

### Semester-VIII

Course Code	Course Title	Credits
HU-222	Professional Ethics	2-0
ME-420	Project Management (Management Elective)	2-0
ME-424	Health, Safety and Environment	1-0
XXX-000	Technical Elective-3	2-0
ME-439	Internal Combustion Engines	3-0
ME-431	IC Engines & Power Plants Lab	0-1
ME-498	Internship (Pass/Fail basis)	-
ME-499	Final Year Project-II	0-3
	<b>Total:</b>	<b>14</b>
	<b>Grand Total</b>	<b>136+2*</b>

\*CSL-401 (1+1) is not counted towards CGPA calculation. College of E&ME will offer CSL-401 in 7th Semester.  
CH-101 Applied Chemistry will be offered as 3-0 at College of E&ME until the establishment of Chemistry Lab.

### Electives

Course Code	Course Title	Credits
ME-401	Fundamentals of Aerodynamics	2-0
ME-408	Applied Heat Transfer	2-0
ME-409	Applied Thermodynamics	2-0
ME-412	Automotive Technology	2-0
ME-413	Basic Naval Architecture	2-0
ME-414	Computational Fluid Dynamics	2-0
ME-415	Computer Aided Engineering	1-1
ME-416	Computer Aided Thermal System Design	1-1
ME-424	Introduction to Oil and Natural Gas Engineering	2-0
ME-429	Laser & its applications	2-0
ME-438	Mechanical Engineering Design	2-0
ME-470	Marine Environment Issues	2-0
ME-471	Optimization Techniques	2-0
ME-473	Power Generation and Distribution	2-0
ME-474	Electrical Machines	2-0
ME-475	Energy Conversion and Power Electronics	2-0
ME-476	Engine Tribology	2-0
ME-477	FEM applications in Automobile	2-0
ME-478	Finite Element Methods	2-0
ME-479	Gas Dynamics	2-0
ME-484	Gas Turbines	2-0
ME-485	Fuel Cell Technology	2-0
ME-486	Power Plant Engineering	2-0
ME-487	Power System Analysis	2-0

ME-488	Renewable Energy Technologies	2-0
ME-489	Robotics and Automation	2-0
ME-490	Ship Propulsion Engineering	2-0
ME-491	Solar Energy Systems	2-0
ME-492	Vehicle Design Performance	2-0
ME-493	Production Tooling & Automation	2-0
ME-496	Vehicle Dynamics	2-0
ME-497	Advanced Engineering Design	2-0
ME-498	Power Train Systems	2-0
DME-480	Automotive Manufacturing Systems	2-0
DME-481	Computer Applications in Automobile Manufacturing	2-0
DME-482	Computer Applications in Manufacturing Systems	2-0
DME-483	Industrial Maintenance Management	2-0
DME-484	Logic Design & Micro-processors	2-0
DME-485	Logistics and Inventory Management	2-0
DME-486	Ergonomics, Work Study and Methods Engineering	2-0
DME-487	FEM applications in Manufacturing	2-0
M&S-402	Introduction to Modeling and Simulation	1-1
RIME-222	Introduction to Mechatronics Design Fundamentals	2-0
<b>Management Electives</b>		
ME-384	Operations Management	2-0
ME-427	Operations Research	2-0
ME-425	Total Quality Management	2-0
ME-428	Engineering Law	2-0

# MS/PhD in Mechanical Engineering

The mission of the MS programme in Mechanical Engineering is to impart knowledge in the art and science of Mechanical Engineering through a comprehensive and advanced curriculum that produces specialized mechanical engineers of having adequate skill, fully prepared for entry into industry, government, graduate school and private enterprise. The curriculum covers broad range of areas such as design, thermo-fluids and management. The laboratories are equipped with state-of-the-art facilities in material characterization, design and analysis of automotive systems, instrumentation and computational mechanics. The programme is expected to enable the students to research, design, develop, test, evaluate and implement engineering solutions to problems that are of a complexity encountered in professional practice. The interdisciplinary nature of the curriculum allows the students to communicate effectively with colleagues in other disciplines such as manufacturing, biomedical engineering, robotics and architecture etc. The student will be made proficient with computer-based design simulation and analysis tools. The department has dedicated, student-focused faculty available to guide the students at every stage of their research.

## Scheme of Studies

Programme Code: M704/M804

### Core Courses

Course Code	Course Title	Credits
MATH 812	Advanced Engineering Mathematics	3
ME 801	Optimization of Engineering Systems	3
ME 802	Finite Element Methods	3
ME 803	Continuum Mechanics	3
ME 899	MS Thesis	6

### Dynamics & Control

**Electives --- Minimum 2 Courses from One Stream & any Two NUST approved courses (duly recommended by the concerned department & GEC)**

EE 873	Fuzzy Control	3
EE 977	Nonlinear Control Systems	3
EM 800	Introduction to Advanced Robotics	3
EM 806	Operations Research	3
MATH 850	Advanced Numerical Analysis	3
ME 811	Modeling & Artificial Intelligence	3
ME 812	Advanced Control Systems-I	3
ME 813	Advanced Control Systems-II	3
ME 814	Digital Control Systems	3
ME 815	Advanced Modeling & Simulation	3
ME 816	Modeling & Simulation of Dynamic Systems	3
ME 817	Advanced Theory of Vibrations	3
ME 818	Kinematics & Rigid Body Dynamics	3
ME 819	Instrumentation & Data Acquisition Systems	3
ME 820	Advanced Instrumentation and experimental methods	3
ME 831	Computational Fluid Dynamics-I	3
ME 837	Nonlinear Dynamics	3
ME 852	Rapid Prototyping, Tooling & Manufacturing	3
ME 853	Manufacturing System Design & Management	3
ME 854	Computer Integrated Manufacturing	3

ME 898	Special Topics	3
MTS 852	Advanced Measurement Techniques	3
RM 896	Research Methodologies	3
<b>Computational Mechanics</b>		
EM 843	Advanced Research Methods	3
MATH 850	Advanced Numerical Analysis	3
ME 815	Advanced Modeling & Simulation	3
ME 817	Advanced Theory of Vibrations	3
ME 820	Advanced Instrumentation and experimental methods	3
ME 831	Computational Fluid Dynamics-I	3
ME 832	Parallel & Distributed Simulation for Research	3
ME 833	Computational Fluid Dynamics-II	3
ME 834	Fracture Mechanics	3
ME 835	Advanced Mechanics of Materials	3
ME 836	Theory of Elasticity	3
ME 837	Nonlinear Dynamics	3
ME 838	Advanced Stress Analysis	3
ME 839	Advanced Finite Element Analysis	3
ME 840	Computational Fluid Dynamics and Heat Transfer	3
ME 841	Finite Element Analysis of Composite	3
ME 851	Advanced Manufacturing Processes	3
ME 857	Product Design Fundamentals	3
ME 859	Mechanics of Fibre Reinforced Composites (FRC Materials)	3
ME 861	Theory of Plasticity	3
ME 874	Reliability Based Design	3
ME 881	Advanced Fluid Mechanics	3
ME 882	Heat & Mass Transfer	3
ME 883	Gas Dynamics	3
ME 898	Special Topics	3
MTS 858	Smart Materials & Structures	3
RM 896	Research Methodologies	3

<b>Product &amp; Manufacturing Systems Design</b>			
EM	806	Operations Research	3
EM	843	Advanced Research Methods	3
MATH	850	Advanced Numerical Analysis	3
ME	812	Advanced Control Systems-I	3
ME	816	Modeling & Simulation of Dynamic Systems	3
ME	818	Kinematics & Rigid Body Dynamics	3
ME	819	Instrumentation & Data Acquisition Systems	3
ME	834	Fracture Mechanics	3
ME	835	Advanced Mechanics of Materials	3
ME	836	Theory of Elasticity	3
ME	841	Finite Element Analysis of Composite	3
ME	842	Additive Manufacturing	3
ME	851	Advanced Manufacturing Processes	3
ME	852	Rapid Prototyping, Tooling & Manufacturing	3
ME	853	Manufacturing System Design & Management	3
ME	854	Computer Integrated Manufacturing	3
ME	855	Material Selection & Design	3
ME	856	Joining of Materials & Structures	3
ME	857	Product Design Fundamentals	3
ME	858	Laser Material Processing	3
ME	859	Mechanics of Fibre Reinforced Composites (FRC Materials)	3
ME	860	Form Synthesis & Stress Analysis of Machinery	3
ME	861	Theory of Plasticity	3
ME	862	Advanced Engineering Materials	3
ME	863	Product Lifecycle Management	3
ME	864	Advanced Manufacturing Technologies	3
ME	865	Lean and Agile Manufacturing	3
ME	866	Industrial Design and Human Factor	3
ME	867	Quality and Reliability Management	3
ME	868	Operations Management	3
ME	869	Project Management	3
ME	870	Supply Chain Management	3
ME	871	Product Design & Development	3
ME	874	Reliability Based Design	3
ME	875	Computer Aided Engineering Design	3
ME	876	Product Design and Development	3
RM	898	Research Methodology	3
MTS	820	Advanced Manufacturing Design Techniques	3

MTS	851	Precision Manufacturing Systems	3
MTS	852	Advanced Measurement Techniques	3
MTS	858	Smart Materials & Structures	3
RM	896	Research Methodologies	3
<b>Design</b>			
EM	843	Advanced Research Methods	3
MATH	850	Advanced Numerical Analysis	3
ME	817	Advanced Theory of Vibrations	3
ME	818	Kinematics & Rigid Body Dynamics	3
ME	824	Engine Tribology	3
ME	834	Fracture Mechanics	3
ME	836	Theory of Elasticity	3
ME	837	Nonlinear Dynamics	3
ME	838	Advanced Stress Analysis	3
ME	851	Advanced Manufacturing Processes	3
ME	855	Material Selection & Design	3
ME	857	Product Design Fundamentals	3
ME	858	Laser Material Processing	3
ME	862	Advanced Engineering Materials	3
ME	865	Lean and Agile Manufacturing	3
ME	866	Industrial Design and Human Factor	3
ME	867	Quality and Reliability Management	3
ME	868	Operations Management	3
ME	869	Project Management	3
ME	870	Supply Chain Management	3
ME	871	Product Design & Development	3
ME	873	Advanced Engineering Design	3
ME	874	Reliability Based Design	3
ME	875	Computer Aided Engineering Design	3
ME	876	Product Design and Development	3
ME	898	Special Topics	3
RM	896	Research Methodologies	3
<b>Thermofluids</b>			
EM	806	Operations Research	3
MATH	850	Advanced Numerical Analysis	3
ME	816	Modeling & Simulation of Dynamic Systems	3
ME	819	Instrumentation & Data Acquisition Systems	3
ME	820	Advanced Instrumentation and experimental methods	3
ME	831	Computational Fluid Dynamics-I	3
ME	832	Parallel & Distributed Simulation for Research	3
ME	840	Computational Fluid Dynamics and Heat transfer	3
ME	855	Material Selection & Design	3

ME	858	Laser Material Processing	3
ME	881	Advanced Fluid Mechanics	3
ME	882	Heat & Mass Transfer	3
ME	883	Gas Dynamics	3
ME	884	Convection Heat Transfer	3
ME	885	Thermal System Design	3
ME	886	Power Plant Engineering	3
ME	887	Sustainable Energy Systems	3
ME	888	Radiation Heat Transfer	3
ME	889	Conduction Heat Transfer	3
ME	890	Advanced Turbo Machinery	3
ME	891	Internal Combustion Engines	3
ME	892	Advanced Propulsion	3
ME	893	Advanced Combustion	3
ME	894	Advanced Refrigeration and Airconditioning	3
ME	898	Research Methodology	2
RM	896	Research Methodologies	3
<b>Thermal &amp; Energy Stream</b>			
MATH	812	Advanced Engineering Mathematics	3
ME	884	Convection Heat Transfer	3
ME	881	Advanced Fluid Mechanics	3
ME	831	Computational Fluid Dynamics-I	3
ME	899	MS Thesis	6
<b>Thermal Power &amp; Fluids Engg</b>			
MATH	850	Advanced Numerical Analysis	3
ME	802	Finite Element Methods	3
ME	816	Modeling & Simulation of Dynamic Systems	3
ME	819	Instrumentation & Data Acquisition Systems	3
ME	832	Parallel & Distributed Simulation for Research	3
ME	855	Material Selection & Design	3
ME	867	Quality and Reliability Management	3
ME	869	Project Management	3
ME	883	Gas Dynamics	3
ME	885	Thermal Systems Design	3
ME	886	Power Plant Engineering	3
ME	887	Sustainable Energy Systems	3
ME	888	Radiation Heat Transfer	3
ME	889	Conduction Heat Transfer	3
ME	890	Advanced Turbo Machinery	3
ME	891	Internal Combustion Engines	3
ME	898	Special Topics	3
MEA	801	Fundamentals of Maintenance	3
MEA	802	Maintenance Planning & Control	3
MEA	803	Failure Analysis & Condition Based Maintenance	3

RM	896	Research Methodologies	3
<b>Energy Systems Engg</b>			
ENV	804	Energy & Environment	3
ESE	800	Clean Coal Technologies	3
ESE	801	Biofuel Engineering	3
ESE	802	Photobioreactor Engineering & Bio-Processing	3
ESE	803	Photovoltaic Devices	3
ESE	810	Computer Applications in Energy Systems	3
ESE	811	Solar Energy	3
ESE	812	Energy Management in Buildings	3
ESE	813	Energy Economics & Policy	3
ESE	814	Fuel Cells	3
ESE	816	Development & Evaluation of Energy Projects	3
ESE	817	Wind Energy	3
ESE	818	Power Distribution Systems	3
ESE	819	Environment Impact Assessment	3
ESE	821	Energy Resources & Technologies	3
ME	898	Special Topics	3
RM	896	Research Methodologies	3

<b>PhD Courses (Any Six)</b>			
ME	931	Internal Combustion Engine Technology	3
ME	932	Combustion and Pollution Chemistry	3
ME	933	Industrial Energy Management	3
ME	934	Economical Aspects of Energy Conversion	3
ME	935	Renewable Energy	3
ME	936	Solar Technologies	3
ME	937	Vehicle Design and Analysis	3
ME	938	Mechanical Vibration and Noise	3
ME	939	Mechatronics and Robotics Applications	3
ME	940	Vehicle Dynamics and Control	3
ME	941	Analytical Dynamics	3
ME	942	Advanced Stress Analysis	3
ME	943	Laser Manufacturing	3
ME	944	Special topics for PhD programme	3
<b>ME</b>	<b>999</b>	<b>PhD Thesis</b>	<b>30</b>
<b>Additional Course PhD</b>			
SEM/ WKSP	997	Seminar / Workshop	1
<b>Additional Courses MS</b>			
RM	898	Research Methodology	2
SEM/ WKSP	897	Seminar / Workshop	1

# Department of Design & Manufacturing Engineering

The Department of Design and Manufacturing Engineering (DME) was established at SMME in September 2011. DME has PhD faculty educated from reputed international and national universities and more than 120 postgraduate students. The role of DME is to offer such programmes which address industrial needs and also focuses on the leading research areas in design, manufacturing and industrial engineering.

## MS/PhD in Design & Manufacturing Engineering

This educational programme has been started to address the demands of the modern industry. We at SMME are well-aware of the fact that today's graduates must have the knowledge of the actual state of the industry, its culture and the complex interactive management and operating systems which are based on value-added efforts, team performance and result-oriented leadership. SMME is offering MS and PhD programme in Design & Manufacturing Engineering and aspires to develop expertise in other disciplines as well. The purpose of the programme is to develop understanding of manufacturing and management techniques along with specialisation in Manufacturing Engineering, Design Engineering and Industrial Engineering. The programme provides a firm foundation in lean manufacturing, product engineering, quality systems, and skills for effective utilisation of human and corporate resources necessary to improve manufacturing business performance. It integrates systems perspectives, combining the classroom learning of engineering and business with laboratory work, plant tours, industry-related internship & research project. It also provides ample opportunities to work in teams with other manufacturing professionals to analyse real-time problems and develop economical solutions.

The Masters Programme students are required to complete 24 classroom credit hours, 2 laboratory credit hours and an industrial research thesis of 6 credit hours. Laboratory work includes understanding and use of CIM, Micro CIM, CNC and Rapid Prototyping. The thesis is designed to provide a platform for the students to demonstrate competencies in learned methodologies and acquired skills to enhance real-time manufacturing and business performance. The "partner manufacturing industry" serves as a laboratory for the research project. The Programme will inculcate the skills and ability in the students to effectively fulfill the requirements of such positions as Manufacturing Systems Engineer, Process Improvement Specialist, Lean Manufacturing Consultant, Supply Chain / Logistics Systems Specialist and Manufacturing Business Planner / Consultant.



### Scheme of Studies

Programme Code: M735/M835

#### Core Courses

Course Code	Course Title	Credits
MATH-815	Applied Engineering Mathematics	3
DME-811	Product Design and Development	3
DME-812	Advanced Manufacturing Processes	3
DME-813	Product Lifecycle Management	3
DME-814	Computer Integrated Manufacturing	3
Elective-I*	To be selected from the list of electives in respective disciplines	3
Elective-II*	To be selected from the list of electives in respective disciplines	3
Elective-III*	To be selected from the list of electives in respective disciplines	3
<b>DME-899</b>	<b>MS Thesis</b>	<b>6</b>

#### Elective Courses

##### Specialisation in "Manufacturing Engineering" (Any Three)

Code	Course Title	Credits
DME-821	Rapid Prototyping, Tooling and Manufacturing	3
DME-822	Laser Material Processing	3
DME-823	Advanced Manufacturing Technologies	3
DME-824	Design for Manufacturing	3
DME-825	Lean and Agile Manufacturing	3
DME-826	Manufacturing Systems Design and Management	3
DME-827	Special Topics in Manufacturing Engineering	3

### Specialisation in “Design Engineering” (Any Three)

Course Code	Course Title	Credits
DME-828	Design of Machine Elements	3
DME-829	Design of Mechanisms	3
DME-830	Cognitive Ergonomics in Design	3
DME-831	Integrated Product Design	3
DME-832	Design of Mechatronics Systems	3
DME-833	Medical Device Design and Standards	3
DME-834	Engineering Design Management and Business Studies	3
DME-835	Industrial Design and Human Factors	3
DME-836	Statistics for Design	3
DME-837	Materials Selection and Design	3
DME-838	Special Topics in Design Engineering	3
CSE-820	Finite Element Methods	3
CSE-805	Introduction to Modelling & Analysis	3

### Specialisation in “Industrial Engineering” (Any Three)

Course Code	Course Title	Credits
DME-839	Quality and Reliability Management	3
DME-840	Financial Management of Operations and Enterprise	3
DME-841	Leadership and Entrepreneurship	3
DME-842	Operations Management	3
DME-843	Special Topics in Industrial/Engineering Management	3
MEM-801	Project Management	3
MEM-820	Supply Chain Management	3
MEM-823	Operations Research	3

### PhD Programme (Any Six)

DME-931	Advances in Manufacturing Technologies	3
DME-932	Rapid Prototyping and Manufacturing	3
DME-933	Advanced Topics in Systems Engineering & Management	3
DME-934	Advanced Information Systems for Manufacturing	3
DME-935	Special Topics for PhD Programme	3
DME-936	Advanced Laser Material Processing	3
DME-941	System Safety Engineering and Management	3
DME-942	Facility Planning and Layout	3
DME-943	Production Planning and Control	3
DME-944	Production Scheduling Techniques	3
DME-945	Special Topics for PhD Programme	3
DME-951	Design and Analysis of Allocation Mechanism	3
DME-952	Advanced Topics in Human Factors in Product Design	3

DME-953	Advanced Optimal Design of Mechanical System	3
DME-954	Special Topics for PhD Programme	3
DME-961	Service Engineering	3
DME-962	Advanced Topics in Quality Management	3
ME-820	Advanced Instrumentation and Experimental Methods	3
ME-812	Advance Control Systems-1	3
ME-801	Optimization of Engineering Systems	3
EE-810	Principles of Control Systems	3
DME-963	Special Topics for PhD Programme	3
EE-871	Linear Control Systems	3
BMES-811	Signals and Images in Medicines	3
RM-898	Research Methodology	3
<b>DME-999</b>	<b>PhD Thesis</b>	<b>30</b>

# Department of Robotics and Artificial Intelligence (R&AI)

Intelligent robotics is widely believed to spearhead the upcoming technological revolution where robots and intelligent machines will become an integral part of everyday human life. Be it industrial automation, surgical robotics, household robotics or active prosthetic rehabilitation, robotic technology is being introduced everywhere in order to assist humans in their everyday tasks. Moreover, recent developments in industry have led to more and more automation being introduced in operations ranging from simple to most complex.

The Department of Robotics and Artificial Intelligence (R&AI) was established in September 2011 and currently seventy two postgraduate students are completing their Master and PhD in Robotics and Intelligent Machine Engineering (RIME). Department of R&AI houses dedicated laboratories for Robotics, Machine Vision, Control Systems, Industrial Automation, Electronics and Computer Aided Engineering whereas it is supported by other labs at the SMME including Rapid Prototyping (RP) and Computer Numerical Control (CNC) etc. which facilitate mechanical fabrication of indigenously designed robot prototypes. These laboratories comprise equipment both for research as well as teaching purposes including robotic arms of various types, mobile robots, stereo vision camera systems, robot designing kits, advanced microcontroller instrumentation, pneumatic / hydraulic workstations and PCB board fabrication facilities. These enable the student to get maximum practical exposure to modern day robotic technology at par with similar graduate programmes in other leading international universities.

The department is home to highly qualified faculty from leading universities of Japan, USA, UK, France and Singapore.

## MS/PhD in Robotics and Intelligent Machine Engineering

The postgraduate programme of Robotics and Intelligent Machine Engineering (RIME) is focused towards advanced level education and state of the art research in the cutting edge areas of:

- » Robotics & Automation
- » Mechatronics & MEMS
- » Control Systems Engineering
- » Machine Intelligence
- » Computer Vision

The Master's programme requires the student to complete 22 – 23 credit hours of theory and 1 – 2 credit hours of lab work including 6 core and 2 elective courses. The students are required to take up a research thesis in any of the streams identified above. The PhD programme requires the students to study 6 courses focusing on the stream of their choice and then undertake research for a PhD dissertation. The laboratories housing most modern equipment available at the department make it possible for the students to gather practical results for their experiments wherever required.

### MS Coursework

Programme Code: M741/M841

#### Core Courses

Course Code	Course Title	Credits
RIME-811	Robot Mechanics and Control	3
CSE-860	Artificial Intelligence	3
EC-803	Computer Vision	3
RIME-812	Mobile Robotics	3
RIME-899	MS Thesis	6

#### Electives

Any two from the following Streams and Two from NUST approved Courses (Subject to availability of Faculty)

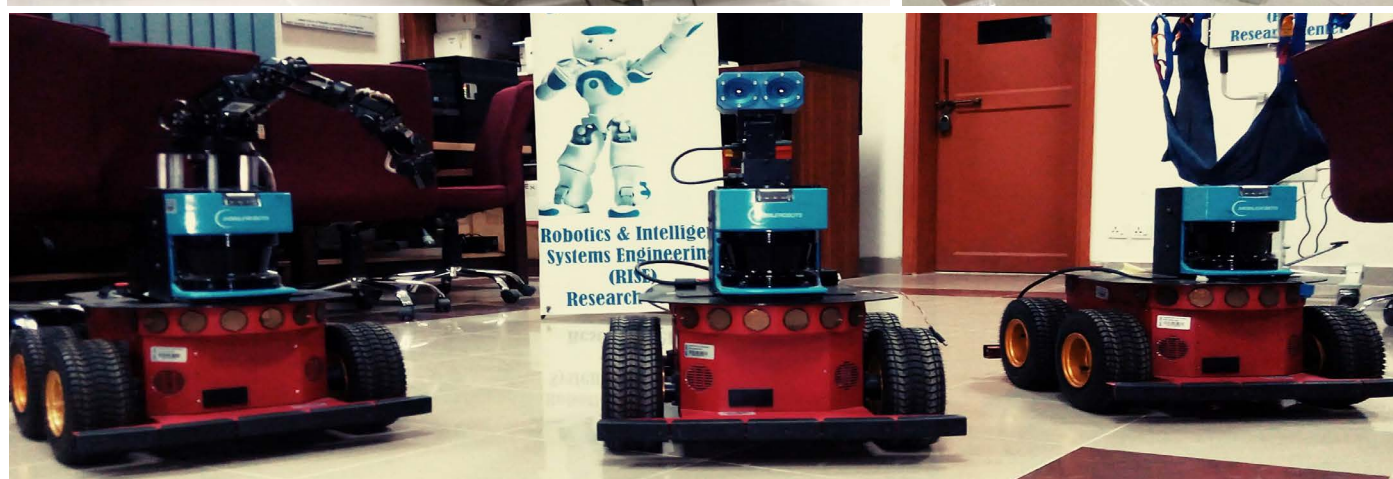
Course Code	Course Title	Credits
RIME-821	MEMS Design and Fabrication	3
RIME-832	Machine Learning	3
MATH-812	Advanced Engineering Mathematics	3
RIME-813	Computer Integrated Manufacturing	3
EE-840	RF MEMS: Theory and Applications	3
EM-870	Advanced Embedded Systems / Micro-Controllers	3
EM-890	Modeling and Simulation	3
EE-873	Fuzzy Control	3
EE-827	Non Linear Control Systems	3
EE-830	Adaptive Control	3
EM-800	Robotics – I	3
EM-805	Robotics – II	3
EE-871	Linear Control Systems	3
EE-822	Advanced Logic Design	3
RIME-833	Deep Learning	3
RIME-813	Robotic Grasping and Fixturing	3



RIME-814	Rehabilitation and Assistive Robotics	3	RIME-823	Medical Devices and Robotics	3
RIME-815	Legged Robotics	3	EE-840	RF MEMS:Theory and Applications	3
RIME-816	Robot Design	3	NSE-847	Essentials of NEMS / MEMS	3
RIME-835	Human Robot Interaction	3	RIME-852	Digital Control Systems	3
RIME -836	Probabilistic Robotics	3	RIME-834	Artificial Intelligence for Robotics Systems	3
RIME-843	Sensors and Sensing	3	RIME-823	Medical Devices and Robotics	3
RIME-837	Simultaneous Localization and Mapping	3			
RIME-817	BioRobotics	3			

### PhD Courses (Any six of the following)

RIME-913	Robotic Manipulation	3
RIME-914	Robot Motion Planning	3
RIME-916	Special Topics for PhD programme (Robotics)	3
RIME-922	Microfluidics and BioMEMS	3
RIME-923	Special Topics for PhD programme (Mechatronics)	3
RIME-933	Advanced Artificial Intelligence	3
RIME-934	Special Topics for PhD programme (Artificial Intelligence)	3
RIME-942	Pattern Recognition	3
RIME-943	Special Topics for PhD programme (Machine Vision)	3
RIME-921	Design of Fault-Tolerant Systems	3
RIME-932	Social Robotics	3
RIME-911	Humanoid Robotics	3
<b>RIME-999</b>	<b>PhD Thesis</b>	<b>30</b>



# Department of Biomedical Engineering & Sciences

Biomedical is among the fastest growing multidisciplinary area which combines design and problem solving Engineering skills with Medical and Biology. The demand for more sophisticated medical equipment and procedures, cost efficiency and effectiveness will boost demand for biomedical professionals. In future biomedical professionals will have an enormous impact on the improvement of health services and related industry.

The Biomedical Engineering and Sciences programme at SMME with its one hundred and nineteen post graduate students is aimed to meet the requirement of skilled and professional engineers and scientists in the market including hospitals, biomedical equipment and prosthetic manufacturers etc.

## Biomedical Engineering/Biomedical Sciences

The programme offers MS degree to the students with different backgrounds and provides them education and training in different areas of Biomedical engineering and sciences. The curriculum of Biomedical Postgraduate programme is designed to match the needs of local and international industry, health organizations and institutes, research and development, as well as prevailing needs of higher education in the world. The typical pursuits of the programme include:

- » To translate discovery into treatments that transform the practice of medicine; determine the effectiveness and outcomes of primary, secondary and tertiary health interventions on patients and populations;
- » To provide leading-edge research that related to human health and disease
- » To support the academia, hospital and medical businesses, Government health service agencies
- » Research and development in regulatory affairs and medical devices standards
- » Development of biosensors.
- » Research and development in diagnosis and treatment of cancer
- » Indigenous production of pharmaceutical materials
- » Research and development in computational and experimental neuroscience
- » To provide cutting edge research in biomedical imaging
- » To provide support for Healthcare information and management system

The Master course consists of eight taught lecture modules plus a research project work. Each taught module is self-contained, and covers a complete topic. Out of eight taught courses, four courses are Core Courses. The core courses are common and compulsory for all students, while the remaining four courses may be selected from any field of specialty (i.e. Biomedical Engineering / Biomedical Sciences).

## MS/PhD in Biomedical Engineering

### Scheme of Studies

Programme Code: M744/M844

#### Core Courses

Course Code	Course Title	Credits
BMES-821	Human Physiology and Anatomy	3
BMES-813	Biomedical Instrumentation	3
BMES-811	Signals and Images in Medicine	3
BMES-812	Medical Devices Design and Standards	3
BMES-899	MS Thesis	6
BME-802	Applied Mathematics*	0

\* Introductory courses

#### Elective Courses (Engineering Stream) (Any four)

Course Code	Course Title	Credits
BME-831	Biofluid Mechanics	3
BMES-842	Advanced Biomaterials	3
BMES-814	Neural Engineering	3
BME-822	Selected Topics in Biomedical Engineering	3
BMES-862	Clinical Biostatistics	3
BMES-832	Biomechanics	3
BMES-823	Molecular Neuroscience	3
BME-833	Prosthetics and Rehabilitation	3
MATH-812	Advanced Engineering Mathematics	3

ME-820	Advanced Instrumentation and Experimental Methods	3
BME-843	Modeling Organs and Tissues	3
BME-844	Visual Perception	3
BMES-845	Rehabilitation Engineering	3

### Non Credit Courses

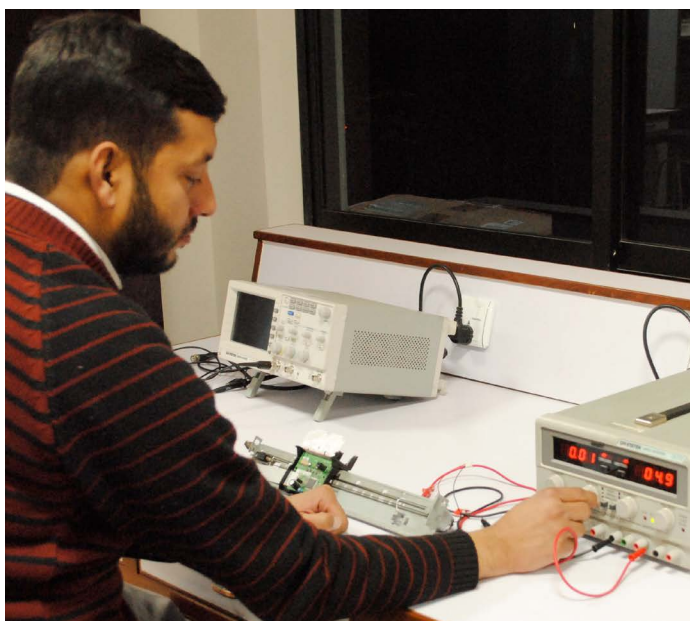
Course Code	Course Title	Credits
BMES-801	Biology for Engineers	0
BMES-802	Applied Mathematics	0

### Additional Courses MS

Course Code	Course Title	Credits
RM-898	Research Methodology	2
SEM/WKSP-897	Seminar / Workshop	1

### PhD Biomedical Engineering Courses

Course Code	Course Title	Credits
BMES-941	Advances in Biomedical Materials	3
BMES-942	Artificial Organs and Biomedical Applications	3
BMES-931	Advances in Biological Perception	3
BMES-932	Image and Vision Computing in Medicine	3
BMES-934	Advanced Bio-signal Processing	3
BMES-923	Advances in Neural Rehabilitation Engineering	3
BMES-999	PhD Thesis	30



### Core Courses

Course Code	Course Title	Credits
BMES-821	Human Physiology and Anatomy	3
BMES-813	Biomedical Instrumentation	3
BMES-811	Signals and Images in Medicine	3
BMES-842	Advanced Biomaterials	3
BMES-899	MS Thesis	6

### Elective Courses (Sciences Stream) (Any Three)

Course Code	Course Title	Credits
BMES-832	Biomechanics	3
BMES-814	Neural Engineering	3
BMS-822	Selected Topics in Biomedical Sciences	3
BMES-862	Clinical Biostatistics	3
BMES-812	Medical Devices Design and Standards	3
BMES-823	Molecular Neuroscience	3
MVI-851	Medical Genetics	3
BMES-825	Cancer Cytogenetic	3
BMES-815	Biosensors and Instrumentation	3
ME-820	Advanced Instrumentation and Experimental Methods	3
BMS-843	Systems Pharmacology and Therapeutics	3
BMS-844	Nano and Micro Drug Delivery Systems	3
BMES-845	Rehabilitation Engineering	3
BMES-814	Neural Engineering	3
BMES-832	Biomechanics	3
BMS-822	Selected Topics in Biomedical Sciences	3

### Non Credit Courses

BMES-801	Biology for Engineers* (Non Credit Course)	0
BMES-802	Applied Mathematics* (Non Credit Course)	0

### Additional Courses MS

RM-898	Research Methodology	2
SEM/WKSP-897	Seminar / Workshop	1

\* Introductory courses

### List of PhD Courses

Course Code	Course Title	Credits
BMES-950	Recent advances in Molecular Biology and Biomedicine	3
BMES-941	Advances in Biomedical Materials	3
BMES-923	Advances in Neural Rehabilitation Engineering	3
BMES-942	Artificial Organs and Biomedical Applications	3
BMES-952	Tissue Engineering	3
BMES-951	Bio-Nanotechnology	3
BMES-999	PhD Thesis	30

### Additional Course PhD

SEM/WKSP-997	Seminar / Workshop	1
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**RCMS**

Research Center for Modelling  
and Simulation, Islamabad

# Research Center for Modelling and Simulation (RCMS)

Parented by National University of Sciences and Technology, Islamabad, Research Centre for Modelling and Simulation is a top-notch research institute, one of its kind in the country. It was established in 2007 and is famous for its supercomputing facilities which provide technical studies with cutting-edge resources. RCMS NUST's supercomputer is one of the fastest in the country.

Facilitated by the enabling environment, the faculty and students at RCMS developed a multi-disciplinary approach to research and education. The result-oriented research by our faculty and students has made significant contributions in the socio-economic growth of the country. The education, training and research activities of RCMS have been divided into two main streams, namely: Computational Sciences; and Computational Engineering. At RCMS, students are encouraged and facilitated to involve themselves in specialized topics with faculty members who are on the forefront of innovation in their fields and the practitioners who bring real-world, real-time experience to the classroom. The RCMS community is driven by a shared purpose: to make a better world through education, research, and innovation. In 2020, RCMS has published 28 publications in research journals.

## RCMS Core Values

- Academic Integrity
- Innovation
- Teamwork

## Academics

RCMS has not only set new norms of excellence in teaching, research and innovation but has also developed conducive environment for creative activities that promote talent in all forms. RCMS programmes expose the graduates to a world's richness and complexity. Students will explore diverse scientific phenomenon from different point of views, diving deeply into their field of study. Graduates of RCMS gain broad range of critical thinking skills that allows them to confidently tackle any challenge.

## Research

Research is the key that unlocks new knowledge; and at RCMS, with our multidisciplinary postgraduate programmes, we strive to be the best! Whether, they are fundamental discoveries or practical applications, faculty and students are ready to push the boundaries of knowledge. As educators, we value research as a potent form of learn-by-doing and we put the power in students' hands, the moment they arrive. Most of the courses have a project-based assessment; from leading a study to performing lab work.

## Innovation

The role of RCMS is to bring innovation in the existing challenges and issues of national scale. The focus of bringing innovation in our existing solutions is aimed at the translation of benefits to industry by working closely with them through partnerships and collaborations. At RCMS we stake a claim with different industry partners and learn from those who challenge it. With about PKR 30 million funding coming from different sectors, we at RCMS ask complex questions and grow from the process of answering them. An advice to our prospective students; when you join RCMS you master the subjects you love, but never forget to explore the unfamiliar terrains that lies just beyond your comfort zone.



# Faculty

## Dr Muizzuddin Shami **Principal**

PhD (University of Birmingham), United Kingdom

**Discipline:** Manufacturing Engineering

**Specialisation:** Statistical Quality Control / Systems Engineering

## Department of Computational Engineering

### Dr Ammar Mushtaq, **HoD Research**

PhD (National University of Sciences & Technology), Pakistan

**Discipline:** Computational Science & Engineering

**Specialisation:** Computational Fluid Dynamics

### Dr Mian Ilyas Ahmad, **HoD Computational Engineering**

PhD (Imperial College London), United Kingdom

**Discipline:** Control Systems

**Specialisation:** Control Systems, Model order Reduction

### Dr Adnan Maqsood

PhD (Nanyang Technological University), Singapore

**Discipline:** Mechanical & Aerospace Engineering

**Specialisation:** Aerodynamic/ Flight Mechanics & Control

### Dr Absaar ul Jabbar

PhD (TU Dortmund University), Germany

**Discipline:** Mechanical Engineering

**Specialisation:** Computational Fluid Dynamics

### Dr Salma Sherbaz

PhD (Harbin Engineering University), China

**Discipline:** Fluid Mechanics

**Specialisation:** Computational Fluid Dynamics

### Dr Zartasha Mustansar

PhD (University of Manchester), United Kingdom

**Discipline:** Biomedical Engineering/Sciences

**Specialisation:** Image-Based Modelling

### Dr Shahzad Rasool

PhD (Nanyang Technological University), Singapore

**Discipline:** Computer Engineering

**Specialisation:** Haptics, Immersive Interaction

### Dr Junaid Ahmad Khan

PhD (National University of Sciences & Technology), Pakistan

**Discipline:** Computational Science & Engineering

**Specialisation:** Computational Fluid Dynamics

### Dr Israr Ud Din

PhD (Université de Picardie Jules-Verne), France

**Discipline:** Mechanical Engineering

**Specialisation:** Composites

### Engr Sikander Hayat Mirza

MS (Iowa State University), USA

**Discipline:** Avionics Engineering

**Specialisation:** Communication & Signal Processing

### Engr Fawad Khan

MS (National University of Sciences & Technology), Pakistan

**Discipline:** Computer Software Engineering

**Specialisation:** Optical Networks

## Department of Computational Science

### Dr Ishrat Jabeen, **HoD Computational Sciences**

PhD (University of Vienna), Austria

**Discipline:** Chemistry

**Specialisation:** Medicine Chemistry

### Dr Fouzia Malik

PhD (Quaid-e-Azam University), Pakistan

**Discipline:** Chemistry

**Specialisation:** Physical Chemistry

### Dr Uzma Habib

PhD (University of Heidelberg), Germany

**Discipline:** Chemistry

**Specialisation:** Computational Chemistry

### Dr Zamir Hussain

PhD (Bahauddin Zakariya University), Pakistan

**Discipline:** Statistics

**Specialisation:** Modelling of Extreme Events

### Dr Rehan Zafar Paracha

PhD (National University of Sciences & Technology), Pakistan

**Discipline:** Virology and Immunology

**Specialisation:** Drug Discovery & Development

### Dr Mehak Rafiq

PhD (University of Greenwich), United Kingdom

**Discipline:** Computational Biology

**Specialisation:** Health Informatics and Genetics

### Dr Tariq Saeed

PhD (National University of Sciences & Technology), Pakistan

**Discipline:** Computational Science & Engineering

**Specialisation:** Model Checking/Parallel Computing

## Classrooms

RCMS provides conducive learning environment through spacious and air-conditioned classrooms equipped with smart podiums, multimedia projector, high speed internet facility and smart tablets.

## Research Facilities

At the intersection of disciplines is where new ideas emerge, and innovative research happens. RCMS strives for a culture of collaboration by having ten independent labs which engage students in specific fields and can sit together and learn together. Within the RCMS lab's physical and virtual spaces, students can find comprehensive support, meet collaborators, connect with experts, and turn their ideas into action.

### Supercomputing Lab

In 2012, NUST established Supercomputing Research & Education Centre (ScREC) at RCMS. Supercomputer comprises of GPUs interconnected with QDR InfiniBand switch with following specifications:

- » 866 TERA FLOPS Theoretical Peak Performance
- » 1200 CPU Cores
- » 80,000 + GPU cores
- » 2 TB Ram
- » 60 TB SAN Storage

These computation resources are distributed into field-specific computing hubs.

- » Baltoro – General Purpose Cluster (132 TFlops)
- » Batura – Computational Fluid Dynamic Cluster (6 TFlops)
- » Karakoram – Computational Sciences Cluster (74 TFlops)
- » Baifo – Deep Learning Cluster (654 Tflops)

### Shared Graduate Workspace

At RCMS, we have travelled an extra-mile to provide our graduate students with dedicated workstations / cubicles. There are total of 100+ cubicles placed in these workspaces. We capitalize on interdisciplinarity by providing these spaces to students coming from other institutes. This co-location of graduate students spurs interdisciplinarity in the true sense and help students innovate and construct organic interdisciplinary teams.

### Computational Drug Design Lab

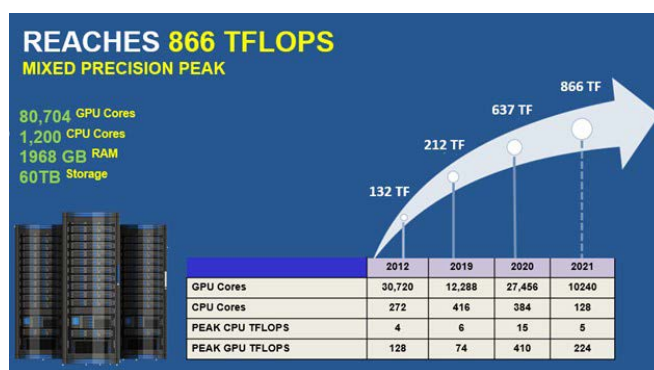
The Pharmaco-Informatics research, an emerging focus at RCMS is devoted to the development and application of computational methodologies in drug design and development. Today, computational methodologies are widely applied in many steps of the drug discovery and development, from the structural modelling of a pharmacological target to the prediction of the ligand binding affinity.

The group develops and applies computational methods to study molecular interaction in biological system and used this knowledge to design molecules which modulate targets of pharmaceutical relevance, in close multidisciplinary collaboration with experimental researchers. We benefit highly from our computational resources which include high-

performance computing, GPU clusters and state-of-the-art molecular modelling tools.

### Computational Aeronautics Lab

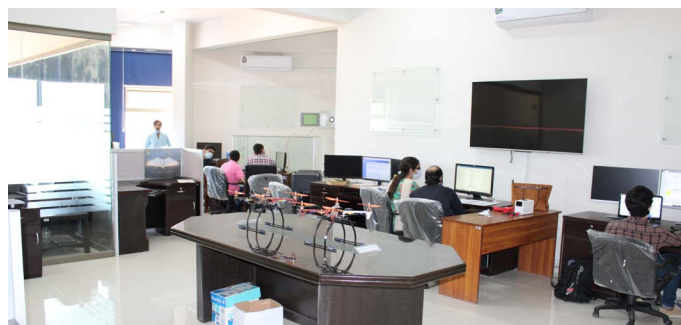
The Computational Aeronautics Lab (CAL) mission is the advancement and application of computational engineering for the design, optimization, and control of aerospace and other complex systems. CAL research addresses a comprehensive range of topics including advanced computational fluid dynamics, flight mechanics, structural dynamics, aerodynamics, trajectory optimization, and wind energy. Contemporary techniques developed in other disciplines such as Artificial Intelligence algorithms are frequently exploited for research in aerospace systems.



### Image Analysis Lab

This research lab aims to conduct research in the areas of applied machine (deep) learning to solve problems related to 2D/3D Computer Vision. Specifically, the application areas in computer vision include medical image analysis, intelligent visual surveillance, semantic understanding of visual data, remote sensing, and 3D point cloud processing. The lab continues to drive research and technology innovation to develop cutting-edge AI algorithms and methods with a special emphasis on designing deep learning architectures for solving various computer vision problems in academia and industry. The lab maintains close links with in-country as well as foreign collaborators working in similar domains.

Some of the focused areas are cancer image analytics, digital/computational pathology, diagnostic retinal image analysis, person and vehicle re-identification for visual surveillance, fine-grained object detection, semantic understanding, and natural language description of visual data (images





and videos), processing drone acquired aerial imagery and/or multispectral satellite imagery to perform land cover classification, forest monitoring, crop type classification and 2D /3D urban modelling.

### BRAIA Future Aerospace Systems Lab

Belt and Road Aerospace Innovation Alliance (BRAIA), established on April 23, 2017, in Xi'an, China, was initiated by Northwestern Polytechnical University (NPU), China. BRAIA is an international organization with 63 members from 21 countries including Algeria, Argentina, Australia, Bangladesh, Belgium, China, Egypt, France, Italy, Malaysia, Mexico, Nepal, Nigeria, Pakistan, Poland, Russia, Spain, Tunisia, Ukraine, and United Kingdom.

NUST is the founding member, standing council member, and Regional Development Centre (RDC) of South Asia of the alliance. In May 2021, RCMS took the lead to establish BRAIA Joint Laboratory of Future Aerospace Systems (FAS). The BRAIA FAS Lab will work in the field of aeronautics and astronautics. BRAIA Permanent Secretariat will provide mobility grants / fund joint research projects to researchers / students associated with the FAS lab. The lab works works in following areas:

- » Identify main challenges and opportunities for the future of air and space travel.
- » Explore innovative aircraft and spacecraft concepts to reduce environmental impact.
- » Develop technologies/solutions for autonomous flight vehicles.
- » Pursue computation-based design approaches.
- » Adopt existing methods/techniques used in other disciplines for aerospace solutions.

### Data Analytics Lab

Data Analytics Lab is an interdisciplinary research laboratory, that focuses on large-scale data analytics problems that arise in different application domains and discipline. The lab is especially interested in health informatics, machine learning, natural language processing and understanding, data mining and information retrieval. In all of these areas, the combination of well-informed theoretical models empowered by large-scale resources allows for exciting insights and applications. Our focus domains are social networks, healthcare, climate science, retail and business, and spatial data.

### Immersive Interaction Lab

The Immersive Interaction Lab primary focuses on fundamental and applied research in areas of Computer Science. The researchers at the lab are focused on the areas of computer vision, computer graphics, virtual/augmented reality and creative technologies, and their application in a wide range of fields.

More specifically, the long-term objectives are to create (a) virtual worlds which are indistinguishable [in all aspects] from the real-world areas they represent and, (b) visualizations employing these realistic virtual worlds for a wide range of applications.

### System Analysis and Control Lab

The information from System Analysis and Control is a major part of the systems engineering process database that forms the process output. The research activity provides the results of all analyses performed, identifies approaches considered and discarded, and the rationales used to reach conclusions. The substantial formulations of the labs, include



the problems of system identification, digital control systems design, signal processing and real-time implementation. It contains a variety of laboratory equipment used in design and experimentation of digital and analogue electromechanical feedback control systems.

### Computational Science and Engineering Lab

The Computational Science and Engineering lab provides students with a strong foundation in computational methods for the study, design, and operation of complex engineered and scientific systems. Within the Computational Science Laboratory, experts in high-performance computing, applied mathematics, and domain sciences work together to develop, adapt, and optimize advanced scalable algorithms to solve problems in computational physics, biology, chemistry, materials science, and energy and environmental sciences. CSE focuses on developing problem-solving methodologies and robust tools for numerical simulation.

### Collaborative Spaces

To foster cross-disciplinary connectivity between faculty and students from different fields and labs, RCMS has introduced designated interaction spaces. These include a faculty lounge, auditorium, Collaborative virtual Environment (COVE) meeting rooms, seminar halls and recreational area. Different spaces serve different purposes. The COVEs are small hubs where group meetings can be held, seminar halls and the auditorium allow for a more presentation focused interaction, whereas the faculty lounge and the recreational area is ideal for informal mixing of student and faculty members.

### Industrial Linkages

University-Industry linkage is critically important for the advancement of academia, growth of budding industries and development of national economies. This burgeoning alliance is driven, mainly by educational, social, economic, scientific, and technological forces. RCMS has been proactive in getting numerous diverse industries to collaborate with academics on various research projects. RCMS has collaborations with the following industrial partners.

- » Ciklum
  - » Biome
  - » Emumba
  - » Scotman
  - » Starci
  - » Drtech
  - » Sui Northern Gas Pipelines Limited
  - » Pakistan Aeronautical Complex
  - » National Electric Power Regulatory Authority
- and many more.

These linkages expose students to practical work experience in industry and familiarise them with opportunities that exist for their careers.

## RCMS Alumni

"RCMS provided me with a platform where I learned something new everyday and applied my knowledge to improve my skills. Here the bond between students and professors is a special one, as all the professors helped us to the best of their abilities. The challenging curriculum, extraordinary opportunities and innovative environment helped me succeed beyond expectations."

**Arosh Fatima (MS SE)**  
Class of 2018



"RCMS, where future lies...."

**Dr Imran Mir (PhD SE)**  
Class of 2018

"I am grateful to RCMS for shaping me into what I am today. I went in blind but came out realising the true meaning of life. Graduate school is not about education alone, the sense of maturity and responsibility it inculcates stands above everything. This school is going to carve out the hidden gem in you, provided you are willing to accept the challenge."

**M Asad Ullah (MS CSE)**  
Class of 2017



"RCMS, the house of wisdom which proved to be a turning point in my academic career, It helped me enhance my vision, molded my mental outlook and condense creativity to my thoughts with critical analysis"

**Quratulain (MS BI)**  
Class of 2019

# MS/PhD in Computational Science and Engineering (CS&E)

Computational Science & Engineering (CS&E) is an interdisciplinary field focusing on understanding and analysing complex systems, predicting their behaviour and eventually optimizing processes and designs. CS&E heavily relies on computer architecture and powerful algorithms. Currently, there are many open problems and challenges in healthcare. Validation and verification of computational models due to their approximate behaviour is important. To overcome this, RCMS offers powerful methods and techniques for assimilation of very large data sets, including techniques for visualization and animation.

## Why join this programme?

The MS programme is aligned to the guidelines of Recently, after a comprehensive review of the curriculum, the core courses of MS Computational Science & Engineering at RCMS have been aligned with the recommendations of SIAM (Society for Industrial and Applied Mathematics)' Working Group. RCMS has been a pioneer in the field of Computational Sciences and Engineering and keeps its electives updated to the best international practices.

## Associated Careers

The graduates are working in various national and international multinational firms as Computer System Analyst, Computer Network Architect, Computer User Support Specialist, Computer Programmer, Mechanical Engineer.

## Scheme of Studies

Programme Code: R727/R827

## Core Courses

Course Code	Course Title	Credits
CSE-880	Computational Linear Algebra & Optimization	3
CSE-882	Computing For Computational Science & Engineering	3
CSE-881	Applied Mathematics for Computational Science & Engineering	3
CSE-883	Data Analysis & Statistics	3
RM-898	Research Methodology	2
<b>CSE-899</b>	<b>MS Thesis</b>	<b>6</b>

## Specialisation Streams

### Communication Systems & Networks (CS&N)

Course Code	Course Title	Credits
CSE-843	Performance Analysis of Comm. Systems	3
CSE-844	Performance Analysis of Networks	3
CSE-864	Network Programming	
EE-851	Advanced Digital Comm. Systems	3
EE-831	Advanced Digital Signal Processing	3
IT-877	Advanced Computer Networks	3
CSE-842	Comm. Systems & Networks	3
SYSE-831	Introduction to Information Security	3
SYSE-832	Network and System Level Security	3
CSE-845	Applied Machine Learning	3
DME-811	Product Design and Development	3
EE-839	Adaptive Filters	3

### Computational Bio-medical Engineering (CBE)

CSE-885	Anatomy and Physiology For CSE	3
CSE-888	Computational Modeling of Physiological Systems	3
CSE-890	Analysis of Biomechanical Systems	3

BMES-832	Biomechanics	3
BMES-842	Advanced Biomaterials	3
BMES-931	Artificial Organs and Biomedical Applications	3
BMES-941	Advances in Biomedical Materials	3
BME-822	Selected Topics in Biomedical Engineering	3
CSE-831	Finite Element Methods	3
CSE-845	Applied Machine Learning	3
DME-811	Product Design and Development	3
CSE-847	Biomedical Engineering	3
BMES-813	Biomedical Instrumentation	3
BMES-812	Medical Devices Design and Standards	3
BMES-811	Signals and Images in Medicine	3
BMES-801	Biology for Engineers	3
RIME-814	Rehabilitation and Assistive Robotics	3
BMES-845	Rehabilitation Engineering	3
RIME-814	Neural Engineering	3
RIME-817	Bio Robotics	3
BME-833	Prosthetics and Rehabilitation	3
RIME-834	Artificial Intelligence for Robotics Systems	3

BME-843	Modeling organs and Tissues	3
RIME-823	Medical Devices and Robotics	3
RIME-811	Robot Mechanics and Control	3

**System Analysis & Control (SAC)**

DME-811	Product Design and Development	3
EE-829	System Identification	3
EE-871	Linear Control Systems	3
EE-872	Optimal Control	3
EE-873	Fuzzy Control	3
EE-874	Adaptive Control	3
EE-875	Discrete Time Control Systems	3
EE-976	Optimal & Multivariable Control Systems	3
EE-977	Nonlinear Control Systems	3
ME-837	Nonlinear Dynamics	3
RIME-953	Robust Control	3
CSE-879	Model Order Reduction	3
CSE-845	Applied Machine Learning	3

**Applied Mechanics (AM)**

CSE-801	Computational Fluid Dynamics	3
CSE-831	Finite Element Methods	3
CSE-872	Non-Newtonian Fluid Mechanics	3
CSE-901	Advanced Compressible Fluids	3
CSE-902	Advanced Incompressible Fluids	3
CSE-903	Advanced Heat Transfer	3
CSE-906	Boundary Layer Theory	3
CSE-911	Advanced Flight Mechanics	3
DME-811	Product Design and Development	3
ME-815	Advanced Modeling & Simulation	3
ME-833	Computational Fluid Dynamics-II	3
ME-837	Nonlinear Dynamics	3
SYSE-822	Applied Aerodynamics	3
CSE-845	Applied Machine Learning	3
CSE-894	Ship Hydrodynamics	3
CSE-931	Advanced Numerical Methods	3

**Computational Chemistry (CC)**

DME-811	Product Design and Development	3
SYSE-804	Modeling, Simulation & Optimization	3
CH-807	Coordination Chemistry	3
CSE-878	Computational Chemistry	3
CSE-871	Chemical Kinetics and Reaction Dynamics	3
CSE-916	Metals In Biological Systems	3
CSE-914	Computational Enzymology	3
CSE-917	Concepts In Supramolecular Chemistry	3
CSE-913	Modeling of Cluster Compounds	3
CSE-918	Modeling Polymeric Materials	3
CSE-892	Organometallic Chemistry	3
CSE-845	Applied Machine Learning	3
CSE-876	Biochemistry	3

CSE-884	Quantum Chemistry	3
CSE-915	Modeling of Molecular Properties	3
CSE-893	Bimolecular Simulations	3

**Applied Computer Science**

CSE-869	Real Time Systems	3
CSE-870	Petri Nets	3
CSE-952	Advanced Model Checking	3
DME-811	Product Design and Development	3
CSE-815	Graph Theory and Algorithms	3
CSE-811	Parallel Computing for Heterogeneous Platforms	3
CSE-867	Virtual Reality	3
CSE-868	Human Computer Interaction	3
CSE-865	3D Geometric Modeling and Reconstruction	3
CSE-845	Applied Machine Learning	3

**Bioinformatics (BI) for PhD only**

CSE-870	Petri Nets	3
CSE-873	Computational Drug Design	3
CSE-874	Molecular Modeling and Drug Design	3
CSE-877	Statistics in Bioinformatics	3
CSE-952	Advanced Model Checking	3
CSE-953	Advanced Computational Biology	3
CSE-896	Translational Bioinformatics Applications	3
CSE-895	Microarray and RNA Sequencing	3
CSE-920	Computational Biopharmaceuticals and pharmacokinetics	3
BI-831	Microarray Analysis	3
BI-832	Next Generation Sequencing Analysis	3
BI-851	Computational Immunology	3
BI-852	Computational Vaccinology	3
CSE-919	Modeling of Biological Regulatory Networks	3
CSE-876	Biochemistry	3

**For PhD CS&E Programme**

- Core courses
  - Minimum 18 credit hours of specialisation courses as specified by the Guidance and Examination Committee (GEC).
  - Pre-requisite courses to study specialisation courses, if any.
  - Any other additional course(s) specified by the GEC.
- Note: Selection/Allotment/Choice/Offering for specialisation stream depends on:
- Student's/applicant's background
  - Sufficient number of students opting for a particular stream.
  - Availability of faculty

# MS in Systems Engineering

Systems Engineering is an interdisciplinary field of engineering focusing on how complex engineering projects and products should be designed and managed over their entire life cycles. The aim of education in Systems Engineering is to simply formalize the approach and in doing so, identify new methods and research opportunities similar to the way it occurs in other fields of engineering. As an approach, Systems Engineering is holistic and interdisciplinary.

Its focus is on integration and overall system optimization to ensure that all likely aspects of a project, product or system are taken into consideration and embedded into design and management planning. It is a considered opinion that Systems Engineering will play an important role for the future of the scientific discovery process and engineering design.

## Why join this programme?

- » MS in Systems Engineering at RCMS comprises of 05 core courses followed by 03 courses of specialisation domain. The core courses are based on the recommendations of INCOSE Reference Curriculum Group. The specialisation courses focus the holistic nature of the programme and are taught from the system's perspective by treating various constituents / parts within a system as sub-systems, rather than at the physical component / part level.

## Associated Careers

- » The graduates are working in various national and international multinational firms as Industrial Systems Engineer, Software Systems Engineer, Project Manager, Quality Control Engineer, Sales Engineer, Operations Analyst, Application Developer and Analyst.

## Scheme of Studies

Programme Code: R751

Core Courses		
Course Code	Course Title	Credits
SYSE-801	System Engineering Principles	3
SYSE-803	System Integration & Validation	3
SYSE-804	Modeling Simulation and Optimization	3
SYSE-805	System Engineering Project Management	3
RM-898	Research Methodology	2
SYSE-899	MS Thesis	6
Communication Systems & Networks (CS&N)		
Course Code	Course Title	Credits
CSE-843	Performance Analysis of Comm. Systems	3
CSE-844	Performance Analysis of Networks	3
CSE-864	Network Programming	3
EE-851	Advanced Digital Comm. Systems	3
EE-831	Advanced Digital Signal Processing	3
IT-877	Advanced Computer Networks	3
CSE-842	Comm. Systems & Networks	3
SYSE-831	Introduction to Information Security	3
SYSE-832	Network and System Level Security	3
CSE-845	Applied Machine Learning	3
DME-811	Product Design and Development	3
EE-839	Adaptive Filters	3
Cognitive Systems		
CSE-870	Petri Nets	3
DME-811	Product Design and Development	3
SYSE-812	Human Factors Engineering	3
SYSE-813	Interaction Design	3
SYSE-814	Human Supervisory Control	3
SYSE-817	Design and Analysis of Experiments	3
CSE-867	Virtual Reality	3
CSE-868	Human Computer Interaction	3
CSE-865	3D Geometric Modeling and Reconstruction	3
CSE-845	Applied Machine Learning	3
Applied Computer Science		
CSE-869	Real Time Systems	3
CSE-870	Petri Nets	3
CSE-952	Advanced Model Checking	3
DME-811	Product Design and Development	3
CSE-815	Graph Theory and Algorithms	3
CSE-867	Virtual Reality	3
CSE-868	Human Computer Interaction	3
CSE-865	3D Geometric Modeling and Reconstruction	3
CSE-845	Applied Machine Learning	3
Autonomous Aerospace Systems		
CS-871	Machine Learning	3
DME-811	Product Design and Development	3
EE-829	System Identification	3
SYSE-812	Human Factors Engineering	3
SYSE-821	Unmanned Aircraft Systems	3
SYSE-822	Applied Aerodynamics	3
SYSE-823	Performance Analysis of Fixed and Rotary Wing Aircraft	3
CSE-845	Applied Machine Learning	3

**Note:** Selection/Allotment/Choice/Offering for specialisation stream depends on:

- Student's/applicant's background
- Sufficient number of students opting for a particular stream.
- Availability of faculty

## MS Bioinformatics

Bioinformatics is the interdisciplinary field of science which primarily focuses on the convergence of computer science, mathematics and biology in one big-picture. The goal of this field is to apply statistical and informatics methodologies to the growing amount of biomedical and genomic data in order to bring meaning to the data and build tools, which can be utilized by scientists, clinicians, and patients.

Bioinformatics is nowadays a pre-requisite for an accurate understanding of clinical knowledge which includes finding similarities in patient populations, interpreting underlying biological processes and identifying therapeutic treatments and health consequences that cannot otherwise be completely understood with the help of experiments.

### Why join this programme?

Today's job industry is full of vacancies for people with skills in bioinformatics. Major pharmaceutical, biotech and software companies are seeking to hire professionals with experience in bioinformatics where they will be working with huge amounts of biological and health care information. MS in Bioinformatics at RCMS comprises of 06 core courses followed by 02 courses of specialisation domain. A systematic methodology pipeline was used to develop curriculum for MS in Bioinformatics.

### Associated Careers

The graduates are working in various national and international multinational firms Bioinformatics, scientist, Research Scientist, Biostatistician, Bioinformatician, Molecular Biologist, Academics, Data Analyst, Forensic computer Analyst.

### Scheme of Studies

Programme Code: R765

#### Core Courses

Course Code	Course Title	Credits
BI 801	Computing for Bioinformatics	3
BI 802	Mathematics for Bioinformatics	3
CSE 883	Data Analysis and Statistics	3
RM 898	Research Methodology	2
CSE 899	MS Thesis	6

#### Specialisation Streams

##### Computational Drug Design

Course Code	Course Title	Credits
CSE 873	Computational Drug Design	3
CSE 874	Molecular Modeling and Drug Design	3
BI 811	Machine Learning in Drug Design	3

##### Translational Bioinformatics

BI 831	Microarray Analysis	3
BI 832	Next Generation Sequencing Analysis	3
CSE 895	Microarray and RNA Sequencing	3
CSE 896	Translational Bioinformatics	3

##### Common Electives

BI 851	Computational Immunology	3
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BI 852	Computational Vaccinology	3
CSE 876	Biochemistry	3
HCB 811	Cancer Genetics	3
ABS 839	Proteomics	3
HCB 841	Molecular Medicine	3
ABS 933	Principles of Molecular Biology	3
HCB 813	General & Molecular Immunology	3
CSE 845	Applied Machine Learning	3
CSE 953	Advanced Computational Biology	3
CSE 877	Statistics in Bioinformatics	3
CSE 880	Computational Linear Algebra and Optimization	3
CSE 870	Petri-Nets	3
CSE 952	Advanced Model Checking	3

##### Additional Courses

SEM/WKSP 897	Seminar / Workshop	1
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**Note:** Selection/Allotment/Choice/Offering for specialisation stream depends on:

1. Student's/applicant's background
2. Sufficient number of students opting for a particular stream.
3. Availability of faculty



**USPCAS-E**

United States Pakistan Center for  
Advanced Studies in Energy

# United States Pakistan Center for Advanced Studies in Energy (USPCAS-E)

## Introduction

The core mission of the Centre is to efficiently address and implement the E3 criteria (Energy, Environment and Economy) for sustainable societal development. The Centre is going to create an ecosystem for addressing energy requirements by influencing policy makers, developing technologies, human resources and mobilizing communities for energy conservation. The Centre for Energy Systems lately titled as U.S.-Pakistan Centre for Advanced Studies in Energy (USPCAS-E) was launched in June 2011 to provide impetus to energy sector programmes and support and consolidate related activities/ projects with a view to contributing to national economy in times of energy crisis. It was inaugurated on January 9, 2012. Collaborating partners from Canada, USA, UK, RSA and KSA warmly participated in the event. The Centre aims at providing sustainable supply of energy at affordable rates with greater share of renewable in the energy mix to reduce environmental footprint. The centre's vision resides in setting up pilot plants to demonstrate the feasibility of specific programmes in the various energy sectors.

## Overview

The U.S. Pakistan Centre for Advanced Studies in Energy (USPCAS-E) aims to focus on applied research relevant to Pakistan's energy needs and serve as a bridge between the government, industry, and academia and undertake sustainable policy formulation. USPCAS-E is a partnership between the National University of Science and Technology (NUST), Islamabad; University of Engineering and Technology, Peshawar (UET); and U.S. partner Arizona State University (ASU). The Center is well prepared to meet the future challenges in Energy, Environment and Economy (3E) nexus, and gives an ideal platform for students to fulfill the Pakistan's need for next generation of experts in energy sciences and technology.

## Objectives

- » Help Pakistan unleash its enormous potential for economic growth
- » Become Pakistan's premier energy think-tank and engage stakeholders in both industry and government
- » Improve relevance and quality of curricula, strengthen use of effective teaching methods, and upgrade graduate programmes
- » Enhance responsiveness of university research and graduates' skills to public and private sector needs;
- » Focus on cutting-edge applied research & finding indigenous solutions to challenges;
- » Build a nationwide network for energy professionals by establishing and facilitating channels for interaction including networking sessions, workshops, and exchange programmes
- » Increase access to higher education in energy-related professions for women and economically disadvantaged students
- » Establish channels to facilitate local and international networking in the energy sector;
- » Emerge as financially self-sustained national hub for energy issues;

## Research Agenda

Provide leadership, research, support, and policy development for conventional and renewable energy, and emerging technologies from a variety of platforms, such as

- » State of the art methods to enhance existing energy and power system utilization
- » Emerging solar, energy storage and fuel cell technologies
- » Advance the usage of biomass/biofuels for power generation
- » Efficient thermal power plants with carbon mitigation and nuclear energy research.
- » Energy efficient and green building research
- » Wind resource assessment and power generation through advance tools and technology
- » Advance turbomachinery design and development for various energy conversion systems





- » Energy policies leading to cost-conscious, responsible development of Pakistan's energy resources and commitment to environmental quality.
- » Energy efficient transport technologies
- » Emphasis on SMART Grid Research, FACTS devices and Hardware in the loop for grid
- » Explore instrumentation and measurement issues for modern power systems
- » In 2020, USPCASE has published 107 publications in research journals and 10 conference papers in proceedings of international conferences

## Postgraduate Degree Programmes

The Postgraduate programme at USPCAS-E aims to provide access to higher education in energy-related professions for women and economically disadvantaged students across Pakistan; by internationally competitive multi-disciplinary graduate training, with improved relevance and quality curricula and by use of effective teaching methods. The Centre builds a nationwide network for energy professionals by establishing and facilitating channels for interaction including world class research laboratories, library, networking sessions, seminars, workshops, and international exchange programmes.

### International and National Partnerships

- » NRG Biofuels Inc., Canada
- » Fauji Fertilizer Company Limited (FFC), Pakistan
- » Sustainable Production Centre (SPC), Pakistan
- » Imperial Chemical Industries (ICI), Pakistan
- » Attock Refinery Limited, Attock Gen Limited, Pakistan
- » DICE Foundation Inc. Michigan, USA
- » Pakistan State Oil (PSO), Pakistan
- » Step Robotics Pvt. Ltd., Pakistan
- » Golden Dynamics (Pvt.) Ltd., Pakistan
- » Pakistan Council of Renewable Energy Technology (PCRET)
- » FFC Energy Limited (FFCEL), Pakistan
- » College of Mechatronics and Control Engineering (CMCE-SZU) Shenzhen University, China
- » The Arizona Board for the Regents for and on behalf of Arizona State University (ASU), USA
- » Central Power Purchasing Agency (CPPA), Pakistan
- » JOLTA Electric, Pakistan
- » Carbon, Hydrogen, Nitrogen and Sulphur Analyzer
- » Tabular Fluidized Bed Reactor
- » FPGA Based Rapid Control Prototyping
- » NI phasor Measurement Unit (PMU) development system
- » NI phasor Data Concentrators (PDC)/Synchro phasor Development System
- » Programmable Electronic Load, High Voltage Programmable DC power Supplies
- » Smart Grid automation along with SCADA and DCS System)
- » Power Grid Simulator
- » Bomb Calorimeter
- » Gas Chromatography Mass Spectrophotometer
- » Thermal Conductivity Meter
- » Differential Scanning Calorimetry
- » High Speed Camera
- » Temperature and Humidity Test Chamber
- » Hail Impact Testing Machine
- » Chroma Programmable DC Power supply with Solar Array Simulation
- » ZX 300 Wind On-shore wind Lidar
- » 3D Printer
- » Atmospheric Plasma Spraying (APS) System
- » High Velocity Oxygen Fuel (HVOF) Spraying System
- » Wire Arc Spray System
- » Combustion Powder Spray System
- » Semi-continuous stirring tank reactor

### Equipment and Software Facility

- » Scanning electron microscope with energy dispersive X-ray spectroscope
- » X-ray diffractometer
- » Atomic Force Microscope
- » Thermal dilatometer
- » Simultaneous Thermogravimetric/Differential Thermal Analyzer (TG/DTA)
- » UV-Vis-NIR Spectrophotometer
- » Hall Effect Measurement System
- » FTIR Spectrometer
- » Surface Area and Pore Size Analyzer
- » Microhardness Tester
- » High-pressure liquid Chromatography (HPLC)
- » Gas Chromatography (GC)
- » Supercritical Fluid Extractor
- » Polymerase Chain Reaction (PCR)
- » Anaerobic Glove Box
- » COD Analyzer
- » Incubators
- » Coin Cell Battery Fabrication & Battery Analyzer
- » PEM Fuel Cell Test Station
- » Electrochemical Workstation
- » Sorption Analyzer
- » Quantum Efficiency Measurement System
- » Solar Panel Laminator
- » Power Quality Analyzer
- » Thermal Imager
- » Thermal Gravimetric Analysis (TGA)
- » Ash Fusion Determinator

### Research Facilities

- » Fossil fuel Laboratory
- » Solar Energy Laboratory
- » Advance Energy Materials & Systems Laboratory
- » Energy Storage and Conservation Laboratory
- » Biofuel Laboratory
- » Thermal Energy Engineering Research Laboratory
- » Smart Grid & Power Systems Laboratory
- » High Performance Computational Laboratory
- » Emerging Technologies Laboratory
- » Thermal Spray Facility

### Library

The library is designed to meet the requirements of degree programmes currently being offered at USPCAS-E. A large number of books are there to cover the domains of energy systems, thermal engineering, wind, solar, nuclear, photovoltaics, energy policy and economics. The library is digitally subscribed with HEC which gives access to online energy related journals. Two magazines namely national geographic and reader's digest are also in library's subscription list.

# Faculty

## Dr Adeel Waqas, Principal

PhD (Asian Institute of Technology, Thailand)

**Specialisation:** Solar Thermal, Passive heating and cooling of Buildings

## Dr Adeel Javed, HoD Thermal Energy Engineering

PhD Gas Turbine and Turbomachinery (TU Delft, Netherlands)

**Specialisation:** Gas turbine performance, Aero-Thermal aspects of Turbomachinery, Computational Fluid Dynamics, Experimentation

## Dr Kashif Imran, HoD Electrical Power Engineering

PhD Electrical Power Engineering (University of Strathclyde, UK)

**Specialisation:** Electrical Power Systems Engineering

## Dr Naseem Iqbal, HoD Energy Systems Engineering

PhD Chemistry (TU Vienna, Austria)

**Specialisation:** Catalysis, PEMFCs, Energy Storage, Gas Adsorption

## Dr Zuhair S. Khan

PhD Energy Science & Technology (Kyoto University, Japan)

**Specialisation:** Advanced Energy Materials, Thin Films & Surface/Coatings Technology, Advanced generation photovoltaics, High temperature fuel cells, Nanomaterials and Nanotechnology, Development of thermal and environmental barrier coatings, Hot-corrosion

## Dr Nadia Shahzad

PhD Material Sciences (Politecnico di Torino, Italy)

**Specialisation:** Nanostructured and Photoactive Materials for Solar Energy Application

## Dr Rabia Liaquat

PhD Environmental Biotechnology/Microbiology (QAU, Islamabad & The University of Queensland, Australia)

**Specialisation:** Bio Energy

## Dr Muhammad Hassan

PhD Bio-environmental & Energy Engineering (Nanjing Agricultural University, China)

**Specialisation:** Methane Enhancement Technologies, Bioenergy Production from Agricultural

## Dr Majid Ali

PhD Nuclear Energy Science and Technology (Harbin Engineering University, China)

**Specialisation:** Nuclear Energy Science and Engineering

## Dr Muhammad Bilal Sajid

PhD Mechanical Engineering (KAUST, KSA)

**Specialisation:** Thermal Energy Engineering

## Dr Hassan Abdullah Khalid

PhD Electrical Engineering (University of Laquila, Italy)

**Specialisation:** Power quality, Grid connected Converters

## Dr Syed Ali Abbas Kazmi

PhD in Electrical (Power) Engineering (SungKyunKwan University, South Korea)

**Specialisation:** Smart Distribution Network Planning

## Dr Kafaitullah

PhD Energy Economics and Management (TU Twente, Netherlands)

**Specialisation:** Energy Policy

## Dr Abraiz Khattak

PhD Electrical (Power) Engineering (COMSATS Institute of Information Technology, Pakistan)

**Specialisation:** Power Engineering

## Dr Sahar Shakir

PhD Experimental Physics (University of Malaya, Malaysia)

**Specialisation:** Materials/Photovoltaics (PV)

## Dr Mariam Mahmood

PhD Machine and Systems Engineering for Energy, Environment and Transport (University of Genova, Italy)

**Specialisation:** Solar Thermal Energy Applications, Thermal Storage Systems, Gas Turbine Modelling and Diagnostics

## Dr Abasin Ulasyar

PhD Electrical and Electronics Engineering. (Koç University, Turkey).

**Specialisation:** Power Electronics, Robust and Adaptive Control, Real Time Operation and Control of Power Systems, Optimization of Magnetic Circuits for Different Real Time Applications, Design of Motors and Linear Actuators, Vibration Suppression Mechanisms, Mechatronics

## Dr Akif Zia Khan

PhD Electrical Engineering (Hong Kong Polytechnic University, Hong Kong SAR)

**Specialisation:** SMART Power Generation, Power Electronics, Renewables integration

## Dr Warda Ajaz

PhD Public Policy (Oregon State University, USA)

**Specialisation:** Energy and Environmental Policy

## Dr Asif Hussain Khoja

PhD Chemical and Energy Engineering (University of Technology, Malaysia)

**Specialisation:** Green Fuels, Catalysis and Reaction Engineering

## Dr Mustafa Anwar

PhD (Universiti Kebangsaan Malaysia, Malaysia)

**Specialisation:** Fuel Cell Engineering

## Dr Abeera Ayaz Ansari

PhD Civil Engineering (University of Massachusetts, Amherst, USA)

**Specialisation:** Algal-based wastewater treatment and Biofuels

## Dr Naveed Ahmed

PhD Power Engineering and Engineering Thermophysics (Xi'an Jiaotong University, China)

**Specialisation:** Thermal energy storage systems, Heat enhancement, Solar thermal, Solar PV

## Dr Ghulam Ali

PhD Energy and Environmental Engineering (University of

Science and Technology, Korea)  
 Post-Doc (Korea Institute of Science and Technology, Korea)  
**Specialisation:** Lithium-ion batteries, supercapacitors, catalysts for water splitting and fuel cell, in-situ XRD and XAS techniques

**Dr Muhammad Numan**  
 PhD Electrical Engineering (Shanghai Jiao Tong University, China)  
**Specialisation:** Power System

**Dr Muhammad Yousif**  
 PhD Electrical Engineering (Shanghai Jiao Tong University, China)  
**Specialisation:** Power System

## Recent projects

USPCAS-E is working with multiple public and private and donor bodies on different R&D projects in the field of energy. Details of some of the recent projects are given below:

1. Designing and Fabrication of Semi-Continuous Stirring Tank Reactors to Evaluate and Optimize the Anaerobic Co-Digestion of Poultry Manure (2018)
2. Sustainable Production of Bioenergy and Soil Conditioners from Bio-Residues in Pakistan for Energy & Food Supply Security (2018)
3. Energy Efficiency Improvements in Building Sector of Pakistan (2018)
4. Solar space Heating Systems Integrated with Thermal Energy Storage (2018)
5. Non-contact predictive fault analysis method for a utility transformer at DESCOS (2018)
6. Pseudo-Noise based Impedance Spectroscopy for Battery Health Monitoring (2018)
7. LV multi micro grid (MMG) setup for modification and performance evaluation under smart grid paradigm (2018)
8. A Novel Solar Powered CCHP System Based On Evacuated Flat Plate Pv/T Collectors And Organic Rankine Cycle (2018)
9. Autonomous 11kV Distribution Line Fault Localization System (2018)
10. Retrofitting of Brick Kilns to Improve Energy Efficiency and Environmental Impact (2018)
11. Development of Accelerated Weathering Standard for Pakistan (2019)
12. Introducing an automatic and economic surface-cleaning set-up to optimize the electricity production of PV panels based on the study of dusty/polluted atmosphere impact on the electricity production (2020)
13. Development of high voltage phosphate-based cathodes for Li-ion batteries (2020)



# MS/PhD in Energy Systems Engineering (ESE)

The MS Energy Systems degree programme offers excellent opportunities to the graduates to serve in national and international institutions, research, planning and development departments of the energy ministries, energy companies, industries, and education and research institutions. It will impart baseline knowledge and train professionals to become entrepreneurs and start up their own small to medium scale enterprises in the diverse energy fields, apart from opportunities in the diverse renewable energy sector.

The Ph.D. in Energy Systems Engineering programme is being started for academic research and development in public and private sector commensurate with the needs of allied industries. It is essential to produce scientists who will make significant contributions in the productive research and development in the vast domains of science and engineering especially in the field of energy production. The courses have been designed keeping in view the latest market demand and encompasses a broad area covering advanced requirements for the development of energy generation and conversion materials.

## Scheme of Studies

Programme Code: U743/843

### Core Courses

Course Code	Course Title	Credits
ESE 804	Applied Solar Energy	3
ESE 809	Modeling of Energy Systems	3
ESE 820	Energy and Environment	3
ESE 821	Energy Resources and Technologies	3
<b>ESE 899</b>	<b>MS Thesis</b>	<b>6</b>
Elective Courses		
ESE 800	Clean Coal Technologies	3
ESE 801	Biofuel Engineering	3
ESE 802	Photobioreactor Engineering & Bio-Processing	3
ESE 803	Photovoltaic Devices	3
ESE 810	Computer Applications in Energy Systems	3
ESE 811	Solar Energy	3
ESE 812	Energy Management in Buildings	3
ESE 814	Fuel Cells	3
ESE 815	Thin Films	3
ESE 817	Wind Energy	3
ESE 818	Power Distribution Systems	3
ESE 839	Geothermal Engineering	3
ESE 823	Thermal Hydraulics	3
ESE 824	Nuclear Energy Engineering	3
ESE 825	Hydropower Engineering	3
ESE 826	Industrial Catalysis for Energy Systems	3
ESE 827	Energy from Biomass: Thermochemical Processes	3
ESE 829	Functional Nanomaterials for Renewable Energy	3
ESE 830	Next-generation Photovoltaics	3
ESE 831	Energy Policy Analysis and Planning	3
ESE 832	Energy and Climate Change	3
ESE 833	Industrial Energy Management	3
ESE 834	Sustainable Buildings	3
ESE 835	Materials Science and Engineering	3

ESE	836	Li-ion and Next Generation Batteries	3
ESE	837	Electrochemical Energy Storage and Conversion	3
ESE	838	Development and Evaluation of Energy Projects	3
ECO	932	Development Policy and Planning	3
CE	886	Water Resources, Economics, Planning and Management	3
CSE	801	Computational Fluid Dynamics	3
EEE	812	Advanced Power System Protection	3
EEE	801	Clean Energy Generation, Integration and Storage	3
EEE	811	Electric Power Quality	3
EEE	814	Advanced Power Electronics	3
TEE	801	Advanced Thermodynamics	3
TEE	803	Conventional and Renewable Energy Power Plants	3
TEE	814	Environmental Issues of Fossil Fuel Power Plants	3
TEE	815	Advanced Heat and Mass Transfer	3
TEE	816	Fuels and Combustion	3
TEE	820	Process Intensification	3
Elective Courses Pool on Energy Policy and Management			
Energy Policy & Economics Pool			
ESE	813	Energy Economics and Policy	3+0
ESE	831	Energy Policy Analysis and Planning	3+0
ESE	838	Development and Evaluation of Energy Projects	3+0
ESE	819	Environmental Impact Assessment	3+0
ECO	932	Development Policy and Planning	3+0
CE	886	Water Resources, Economics, Planning and Management	3+0

Energy Management Pool			
ESE	819	Environmental Impact Assessment	3
ESE	820	Energy and Environment	3
ESE	832	Energy and Climate Change	3
ESE	833	Industrial Energy Management	3
ESE	834	Sustainable Buildings	3

Additional Courses MS			
RM	898	Research Methodology	2
SEM/ WKSP	897	Seminar / Workshop	1

## PhD Courses

### Core Courses

Course Code	Course Title	Credits	
ESE	901	Recent Trends in Energy Systems Engineering	3
ESE	902	Socio-Economic Aspects of Energy Systems	3
ESE	999	PhD Thesis	30

### Elective Courses

ESE	903	Contemporary Materials for Advanced Energy	3
ESE	904	Advanced Energy Materials: Synthesis & Characterization	3
ESE	905	Advanced Heat and Mass Transfer	3
ESE	906	Biomass/Coal Gasification	3
ESE	907	Photocatalysis-Advancement and Applications	3
ESE	908	Nuclear Thermal Hydraulics	3
ESE	909	Smart Grid Architecture	3
ESE	910	Smart Power Systems	3
ESE	911	Carbon Capture and Utilization	3
RM	899	Research Methodology	3
CHE	848	Gasification Processes	3
EME	803	Combustion and Propulsion	3
EME	981	Advanced Fuel Technology	3
NSE	842	Nano Materials for Energy Applications	3
MSE	901	Advanced Characterization of Materials	3
NSE	931	Advanced Synthesis and Fabrication Techniques	3
EME	901	Advanced Engineering Mathematics	3
ME	935	Renewable Energy	3
ME	936	Solar Technologies	3

CSE	931	Advanced Numerical Methods	3
PHY	921	Plasma Physics	3
PHY	924	Experimental Techniques of Physics	3

Additional Course PhD			
SEM/ WKSP	997	Seminar / Workshop	1

# MS/PhD in Thermal Energy Engineering

The degree programme offers excellent opportunities to the graduates to serve in national and international institutions, research, and planning and development departments of the energy ministries, energy companies, industries, and education and research institutions. It will impart baseline knowledge and train professionals to become entrepreneurs and start up their own small to medium scale enterprises in the diverse energy fields, apart from serving in the predominant thermal energy mix sector.

PhD Thermal Energy Engineering programme at USPCAS-E is being started for academic research and development in public and private sector commensurate with the needs of allied industries. This programme will address needs for academic and industry related research in thermal energy systems. The programme signifies a combined approach of theoretical analysis, numerical techniques and experimental investigations in thermal energy applications. It will create new technical knowledge and skills required for achieving the better management of thermal energy systems, designing of efficient thermal energy systems and processes, utilization of renewable energy sources for thermal power generation and mitigation strategies for the effective reduction and control of environmental pollution due to thermal power generation.

## Scheme of Studies

Programme Code: U763/863

### Core Courses

Course Code	Course Title	Credits
TEE 801	Advanced Thermodynamics	3
TEE 802	Design and Modeling of Thermal Energy Systems	3
TEE 815	Advanced Heat and Mass Transfer	3
TEE 816	Fuels and Combustion	3
TEE 899	MS Thesis	6

### Elective Courses

CSE 801	Computational Fluid Dynamics	3
CE 886	Water Resources, Economics, Planning and Management	3
ECO 932	Development Policy and Planning	3
ESE 800	Clean Coal Technology	3
ESE 811	Solar Thermal Energy	3
ESE 814	Fuel cells	3
ESE 816	Economic Evaluation of Thermal Energy Projects	3
ESE 839	Geothermal Engineering	3
ESE 823	Thermal Hydraulics	3
ESE 824	Nuclear Energy Engineering	3
ESE 827	Energy from Biomass: Thermochemical Processes	3

ESE 831	Energy Policy Analysis and Planning	3
ESE 832	Energy and Climate Change	3
ESE 833	Industrial Energy Management	3
ESE 834	Sustainable Buildings	3
ESE 835	Materials Science and Engineering	3
ESE 836	Li-ion and Next Generation Batteries	3
ESE 837	Electrochemical Energy Storage and Conversion	3
ESE 838	Development and Evaluation of Energy Projects	3
ME 831	Computational Fluid Dynamics - I	3
TEE 803	Conventional and Renewable Energy Power Plants	3
TEE 810	Advanced Process Energy Analysis & Optimization	3
TEE 812	Advanced Fluid Dynamics	3
TEE 813	Turbomachinery	3
TEE 814	Environmental Issues of Fossil Fuel Power Plants	3
TEE 817	Computational Fluid Dynamics for Thermal Energy Systems	3
TEE 818	Advanced Heating, Ventilation and Air Conditioning System (HVAC)	3



TEE	820	Process Intensification	3
TEE	821	Advanced Thermal Energy Storage Systems	3
TEE	822	Gas Turbine Performance	3
TEE	823	Solar Thermal Power Systems	3

#### Elective Courses Pool on Energy Policy and Management

##### Energy Policy & Economics Pool

ESE	813	Energy Economics and Policy	3+0
ESE	831	Energy Policy Analysis and Planning	3+0
ESE	838	Development and Evaluation of Energy Projects	3+0
ESE	819	Environmental Impact Assessment	3+0
ECO	932	Development Policy and Planning	3+0
CE	886	Water Resources, Economics, Planning and Management	3+0

##### Energy Management Pool

ESE	819	Environmental Impact Assessment	3
ESE	820	Energy and Environment	3
ESE	832	Energy and Climate Change	3
ESE	833	Industrial Energy Management	3
ESE	834	Sustainable Buildings	3

##### Additional Courses

RM	898	Research Methodology	2
SEM/ WKSP	897	Seminar / Workshop	1

## PhD Courses

Course Code	Course Title	Credits	
TEE	901	Emerging Trends in Thermal Technologies (Mandatory Courses)	3
TEE	902	Sustainability in Thermal Energy Systems (Mandatory Courses)	3
TEE	903	Phase Change Thermal Process	3
TEE	904	Laser Diagnostics for Thermal Engineering Applications	3
TEE	906	Advanced Combustion Kinetics	3
TEE	907	Technologies for Enhanced Heat Transfer	3
TEE	908	Advanced Turbomachinery Application	3
ESE	904	Synthesis and Analytical Characterization of Advanced Energy Materials	3
ESE	905	Analytical and Numerical Techniques in Heat Transfer	3
ESE	906	Biomass Gasification	3

ESE	908	Nuclear Thermal Hydraulics	3
ESE	913	CO2 Capture, Utilization and Sequestration	3
MATH	901	Advanced Engineering Mathematics	3
ME	931	Internal Combustion Engine Technology	3
ME	884	Convection Heat Transfer	3
CSE	803	Data Analysis and Statistics	3
TEE	999	PhD Thesis	30

##### Additional Course

SEM/ WKSP	997	Seminar / Workshop	1
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## MS/PhD in Electrical Engineering (Power)

The power sector of Pakistan is in doldrums for last couple of decades and is in dire need of reforms, good governance and qualified human resource. The country lacks competent and energetic workforce in this important sector in the industry as well as academia. Although many higher education institutes are offering degree programmes in electrical engineering but power centric curriculum meeting the indigenous demands are offered at a few universities in Pakistan. The start of degree programme at USPCAS-E is an attempt to fulfil this national requirement through human resource development and indigenous research. The significance of this degree programme is to train the students with contemporary curricula about clean power production, economic dispatch and distribution of power, computational power flow, transient studies and studies pertaining to monitoring, control, and protection of power system and integration of renewable energy systems with convention power grid. In addition to that the students will also be exposed to state of the art Smart Grid and Electrical power engineering labs at the Centre during their research phase.

Electrical Engineering (Power) programme is tailored to meet the indigenous needs of the ailing power sector of the country by nurturing the human resource in this field. The programme is designed to equip the students with advanced and contemporary technical knowledge of electrical power systems and will enable them to better manage and govern the national power system. Primarily focus will be on electrical power and energy systems, and it covers advanced aspects of power system modelling, computational power flow analysis, high voltage engineering and dielectric studies, online monitoring and protection of electrical equipment with digital relays, transients, and energy measurement with smart meters and PMU.

### Scheme of Studies

Programme Code: U764/864

#### Core Courses

Course Code	Course Title	Credits
EE 801	Semiconductor Device Physics	3
EE 802	Quantum Mechanics	3
EE 803	Physical Electronics	3
EE 826	Advanced VLSI Design	3
EE 847	Microwave Networks & Passive Components	3
EE 849	Electromagnetic Field Analysis	3
EE 851	Advanced Digital Communication Systems	3
EE 852	Information & Coding Theory	3
EE 863	Power System Analysis	3
EE 871	Linear Control Systems	3
EE 891	Stochastic Systems	3
EE 862	Power System Operation & Control	3
EEE 800	OR Power System Operation, Control and Optimization	
"EE CE" 823 825"	Advanced Digital System Design	3
"EE CE" 831 866"	Advanced Digital Signal Processing	3
EEE 801	Clean Energy Generation, Integration and Storage	3
EEE 802	Advanced Power System Stability and Transient Studies	3
EE 877	Mobile Robotics	3
SE 807	Machine Learning	3

#### Solid State Electronics and Circuits

MATH 816	Applied Linear Algebra	3
EE 804	Photonic Devices	3
EE 805	Semiconductor Processing	3
EE 806	Thin Film Processing	3
EE 807	Thin Film Characterization	3
EE 808	Digital Integrated Circuit Design	3
EE 809	Analog Integrated Circuit Design	3
EE 900	Optoelectronic Devices & Materials	3
EE 901	Power Electronics & Electric Drives	3
EE 902	Nano-Electronics	3
EE 903	Advanced Semiconductor Device Theory	3
EE 904	Microchip Fabrication Technology	3
EE 905	Advanced Power Electronics	3
EE 906	Solid State Electronics	3
EE 907	Micro & Nano Fabrication	3
EE 908	Ultra High Speed Nanoelectronic Devices	3
EE 909	Selected Topics in Electronics	3
EE 898	Nanotechnology	3
EE 818	Micro-Electro-Mechanical Systems	3
EE 893	Data Acquisition & Mixed Signal Design	3
NSE 821	Nano Fabrication by Self Assembly	3
NSE 845	Nano Lithography and Device Fabrication	3

#### Electro - Medical Stream



MATH	816	Applied Linear Algebra	3
EE	811	Biomedical Imaging	3
EE	812	Medical Image Processing & Analysis	3
EE	813	Computational Pathology	3
EE	814	Cardiac Signal Processing	3
EE	815	Computational Molecular Biology	3
EE	816	Telemedicine Systems	3
EE	817	Tissue & Cell Engineering	3
EE	819	Biomedical Electro Mechanical Systems	3
EE	910	Biomaterials & Drug Delivery	3
EE	919	Selected Topics in Biomedical Engineering	3
CSE	888	Computational Modeling of Physiological Systems	3
MM	895	Bio-Informatics	3
BMES	811	Signals & Images in Medicine	3
BMES	812	Medical Devices Design & Standards	3
BMES	813	Biomedical Instrumentation	3
BMES	815	Biosensors and Instrumentation	3
BMES	821	Human Physiology and Anatomy	3
BMES	833	Prosthetics and Rehabilitation	3
BMES	842	Advanced Biomaterials	3
BME	822	Selected Topics in Biomedical Engineering	3
BME	831	Bio Fluid Mechanics	3
<b>Digital Systems</b>			
MATH	816	Applied Linear Algebra	3
"EE MTS"	821 841	Advanced Embedded System Design Advanced Embedded Systems	3 3
EE	822	ASIC Design Methodology	3
EE	824	Real Time Systems	3
EE	825	System Level Packaging	3
EE	827	Mixed Signal IC Design	3
EE	828	Computerized Tomography Systems	3
EE	829	Digital Data Acquisition & Control	3
EE	920	System Validation	3
EE	921	System on Chip Architecture	3
EE	922	Design of Fault-Tolerant Systems	3
EE	929	Selected Topics in Digital Systems	3
CSE	811	Advanced Computer Architecture	3
CE	820		
<b>Signal Processing</b>			
MATH	816	Applied Linear Algebra	3
EE	832	Pattern Recognition	3
EE	833	DSP Hardware System Design	3
EE	834	Applied Signal Processing	3

EE	835	Multirate Systems & Filter Banks	3
EE	836	Advanced Digital Image Processing	3
EE	837	Advanced Topics in Computer Vision & Image Processing	3
EE	838	Filtering & Tracking	3
EE	839	Adaptive Filters	3
EE	930	Spatial Array Processing	3
EE	931	DSP Software System Design	3
EE	932	Speech Processing	3
EE	933	Time Frequency Analysis	3
EE	939	Selected Topics in Signal Processing	3
CS	867	Computer Vision	3
CE	803		

**RF & Microwave**

MATH	816	Applied Linear Algebra	3
EE	840	RF MEMS: Theory and Applications	3
EE	841	Electromagnetic Theory	3
EE	842	Microwave Communication System Design	3
EE	843	Microwave Transmission Lines & Waveguides	3
EE	844	Antennas & Wave Propagation	3
EE	845	EMC/EMI	3
EE	846	Microwave Photonics	3
EE	848	Radiating Systems & Antennas	3
EE	940	Advanced RF Measurements	3
EE	941	RF Transceiver Design	3
EE	942	Microwave Integrated Circuit Design	3
EE	943	Microwave Devices I	3
EE	944	Microwave Devices II	3
EE	945	Computational Electromagnetics	3
EE	946	Advanced Antenna Theory and Design	3
EE	947	Microwave Devices & Systems	3
EE	948	Advance Electromagnetic Fields	3
EE	949	Selected Topics in Microwave Engineering	3
EE	896	Electrodynamics of Plasmas	3
EE	895	Analysis of Measurement Environment	3

**Telecommunication / Communication Systems**

MATH	816	Applied Linear Algebra	3
EE	853	Advanced Wireless Communication	3
EE	854	Optical Communication Systems	3
EE	855	Error Control Coding	3
EE	856	Software Defined Radio	3
EE	857	Advanced Satellite Communication Systems	3

EE	858	Communication Project Management	3
EE	859	Performance Analysis of Communication Networks	3
EE	950	Advanced Data Communication Systems	3
EE	951	Radar Systems	3
EE	959	Selected Topics in Communication Systems	3
EE	897	Detection & Estimation	3
CSE	812	RF Communication System Design	3
EE	881	Advanced Communication Networks	3
EE	882	Cognitive Radio Networks	3
EE	883	Wireless Sensor & Mesh Networks	3
EE	884	Photonic Networks	3
EE	885	Broadband Networks	3
EE	886	Advanced Wireless Networks	3
EE	887	Network Switching & Routing	3
EE	888	Advanced Computer Network Design & System Security	3
EE	889	Network and Service Management and Control	3
EE	989	Selected Topics in Networks	3
CSE	820	Advanced Computer Networks	3
CSE	879	Network Performance Analysis	3
<b>Power</b>			
MATH	816	Applied Linear Algebra	3
EEE	811	Electric Power Quality	3
EEE	812	Advanced Power System Protection	3
EEE	813	Computer Modelling of Electrical Power Systems	3
EEE	814	Advanced Power Electronics	3
EEE	815	Electric Power Generation Transmission and Distribution	3
EEE	816	Electric Power Markets	3
EEE	817	High Voltage Engineering	3
EE	861	Alternating Current Electrical Machines and Drives	3
ESE	803	Photovoltaic Devices	3
ESE	813	Energy Economics and Policy	3
ESE	814	Fuel Cells	3
ESE	817	Wind Energy	3
ESE	820	Energy and Environment	3
ESE	824	Nuclear Energy Engineering	3
ESE	835	Materials Science and Engineering	3
ESE	836	Li-ion and Next Generation Batteries	3
ESE	837	Electrochemical Energy Storage and Conversion	3

ESE	838	Development and Evaluation of Energy Projects	3
ESE	909	Smart Grid Architecture	3
EE	861	Alternating Current Electrical Machines and Drives	3
EE	864	Advanced Machines	3
EE	865	Power Generation Operation & Control	3
EE	969	Selected Topics in Power Systems	3
<b>Control Systems</b>			
MATH	816	Applied Linear Algebra	3
EE	872	Optimal Control	3
EE	873	Fuzzy Control	3
EE	874	Adaptive Control	3
EE	875	Discrete Time Control Systems	3
EE	876	Probabilistic Robotics	3
EE	877	Mobile Robotics	3
EE	878	System Identification	3
EE	879	Robust Control	3
EE	970	Advanced Robotics	3
EE	971	Modeling & Simulation of Dynamic Systems	3
ME	816	Modeling and Simulation of Dynamic Systems	3
EE	972	Advanced Digital Control Systems	3
EE	973	Control System Optimization	3
EE	974	Networked & Embedded Control Systems	3
EE	975	Robust & Multivariable Control	3
EE	976	Optimal & Multivariable Control	3
EE	977	Nonlinear Control Systems	3
EE	978	Convex Optimization	3
EE	979	Selected Topics in Control Systems	3
EE	894	Cognitive Robotics	3
EE	892	Instrumentation & Systems	3
EM	800	Robotics - 1	3
EM	805	Robotics - 2	3
MTS	800	Advanced Robotics I	3
MTS	801	Advanced Robotics II	3
MTS	840	Data Acquisition and Control	3
ME	837	Nonlinear Dynamics	3
ME	812	Advanced Control Systems-I	3
<b>AI Autonomous Systems</b>			
EE	836	Advanced Digital Image Processing	3
EE	876	Probabilistic Robotics	3
EE	837	Advanced Topics in Computer Vision & Image Processing	3
EE	897	Detection & Estimation	3
EE	970	Advanced Robotics	3
EE	839	Adaptive Filters	3
EE	832	Pattern Recognition	3

EE	871	Linear Control Systems	3
EE	821	Advanced Embedded System Design	3
EE	878	System Identification	3
SE	801	Artificial Neural Networks	3
CS	867	Computer Vision	3
SYSE	804	Modeling, Simulation & Optimization	3
MATH	816	Applied Linear Algebra	3

#### Elective Courses Pool on Energy Policy and Management

##### Energy Policy & Economics Pool

ESE	813	Energy Economics and Policy	3+0
ESE	831	Energy Policy Analysis and Planning	3+0
ESE	838	Development and Evaluation of Energy Projects	3+0
ESE	819	Environmental Impact Assessment	3+0
ECO	932	Development Policy and Planning	3+0
CE	886	Water Resources, Economics, Planning and Management	3+0

##### Energy Management Pool

ESE	819	Environmental Impact Assessment	3
ESE	820	Energy and Environment	3
ESE	832	Energy and Climate Change	3
ESE	833	Industrial Energy Management	3
ESE	834	Sustainable Buildings	3
		Thesis / Research	
EE	899	MS Thesis	6
EEE	899	MS Thesis (MS EEP)	6
EE	999	PhD Thesis	30
RM	898	Research Methodology	2
SEM/ WKSP	897	Seminar / Workshop	1
SEM/ WKSP	997	Seminar / Workshop	1

#### Courses of other Departments (Information / Systems / Computational & Software Engineering) approved for MS/ PhD Electrical Engineering

MATH	812	Advanced Engineering Mathematics	3
MATH	816	Applied Linear Algebra	3
MATH	850	Advanced Numerical Analysis	3
IS	820	Computer Security	3
IS	822	Wireless Network Security	3
IS	827	Electronic Warfare – Principles and Techniques	3
IS	851	Secure Communications	3
IS	852	Data Communication Networks & Security	3
IS	855	Information Hiding	3
IS	863	Cellular and Mobile Network Security	3

IS	893	Micro & Nano Fabrication	3
SYSE	804	Modeling, Simulation & Optimization	3
SYSE	844	Communication System Engineering	3
SYSE	845	Advanced Communication System and Network Security	3
SYSE	861	Introduction to C4I2SR System Engineering	3
SYSE	862	Architecting C4I System of Systems	3
CS	882	Advanced Information Security	3
CSE	812	Distributed Systems and Resource Optimization	3
CSE	842	Communication Systems & Networks	3
CSE	843	Performance Analysis of Communication Systems	3
CSE	844	Performance Analysis of Networks	3
SE	801	Artificial Neural Networks	3
SE	807	Machine Learning	3
SE	808	Bio Informatics Systems	3
SE	826	Advanced Computer Network Design and System Security	3
SE	828	Network Security	3
SE	851	Wavelet Compression	3
SE	865	Human computer Interface	3
SE	898	Research Methodologies	3

## Core Courses

Course Code	Course Title	Credits
EEE-900	Signal Processing for Modern Power Systems	3
EEE-901	Advanced Converter Control Techniques	3
EEE-902	Technologies for Smart Transmission Systems	3
ESE-909	Smart Grid Architecture	3
ESE-910	Smart Power Systems	3
ESE-811	Solar Energy	3
ESE-817	Wind Energy	3
EE-861	Alternating Current Electrical Machines and Drives	3
EE-863	Power System Analysis	3
EEE-800	Power System Operation, Control and Optimization	3
EEE-801	Clean Energy Generation, Integration and Storage	3
EEE-802	Advanced Power System Stability and Transient Studies	3
EEE-811	Electric Power Quality	3
EEE-812	Advanced Power System Protection	3
EEE-814	Advanced Power Electronics	3
EE-920	System Validation	3
EE-977	Nonlinear Control Systems	3
EE-871	Linear Control Systems	3
EE-891	Stochastic Systems	3
IS-838	Advanced Simulation & Modeling	3
CS-877	Artificial Intelligence & Machine Learning	3
Math-901	Advanced Engineering Mathematics	3
Math-850	Advanced Numerical Analysis	3
EEE-816	Electric Power Markets	3+0
EEE-817	High Voltage Engineering	3+0
<b>EEE-999</b>	<b>PhD Thesis</b>	<b>30</b>
<b>Additional Courses</b>		
RM-898	Research Methodology (Required for those who haven't taken it in MS)	2
SEM/WKSP-997	Seminar / Workshop	1





**NBC**

NUST Balochistan Campus,  
Quetta

# NUST Balochistan Campus, Quetta

NUST Balochistan campus (NBC) was inaugurated in an impressive ceremony by Chief of Army Staff and Chairman NUST Board of Governors – Gen. Qamar Javed Bajwa NI (M), HI(M), in the presence of Chief Minister Balochistan – Abdul Quddus Bizenjo, Speaker Balochistan Assembly Rahila Durrani, Balochistan Assembly’s Leader of Opposition Abdul Rahim Ziaratwal, Vice Chancellors and students of different universities and other notables in 2019. Through this campus, NUST aims to take quality education to the youth of Balochistan, enabling them to graduate from Pakistan’s No. 1 Science & Technology university, and be at par with the best engineers and scientists not only in Pakistan but also internationally.

## NBC Vision

To contribute towards the educational and economic development of Balochistan in specific and the nation in general, by delivering international recognized educational programmes that fosters learning, discovery, innovation and ethics to produce highly effective human resource.

## NBC Mission

- Provide a high-quality learning environment to produce exceptionally competent scholars, academic leaders, professionals, innovators and entrepreneurs, who are the agents of change and can impact the world.
- Promote forward-looking research both applied and theoretical that will positively impact and improve our profession and society.
- Assimilate interpersonal and social skills to help our graduates operate ethically, professionally and effectively in the real-world.

## NUST Baluchistan Campus Timeline

- PC-1 for establishment of NUST Baluchistan Campus (NBC) approved in July 2018-19.
- NBC inaugurated by Gen. Qamar Javed Bajwa NI (M), HI(M) in Sep 2019.
- First batch of 99 students inducted in Aug 2019.
- Second batch of 74 students inducted in Aug 2020
- Total No of Student Enrolled Students: Total 161
- Civil Engineering Department
  - Batch 2019: 48
  - Batch 2020: 46
  - Total: 94
- Computer Science Department
  - Batch 2019: 39
  - Batch 2020: 28



# Faculty

## Department of Civil Engineering

### **Brig. Dr. Kamran Akhtar**

Dean/Director

Ph.D. USA

**Discipline:** Civil Engineering

**Specialisation:** Geotech

### **Dr. Salah Uddin, HoD**

Ph.D. UK

**Discipline:** Civil Engineering

**Specialisation:** Geotech

### **Hamza Subhani**

MS (NEDUET Karachi)

**Discipline:** Civil Engineering

**Specialisation:** Geotechnical Engineering

### **Atif Rasheed**

MS NUST, Islamabad

**Discipline:** Civil Engineering

**Specialisation:** Structural Engineering

### **Asfandiyar Saif**

MS NUST, Islamabad

**Discipline:** Civil Engineering

**Specialisation:** Transportation Engineering

### **Mahmood Ul Hassan**

MS UET, Peshawar

**Discipline:** Civil Engineering

**Specialisation:** Structural Engineering

### **Abdul Khalique**

BE NUST, Islamabad

**Discipline:** Civil Engineering

**Specialisation:** Transportation Engineering

### **Dr. Salah Uddin, HoD**

Ph.D. UK

**Discipline:** Civil Engineering

**Specialisation:** Geotech

### **Jahangir Ghilzai**

MS (NEDUET Karachi)

**Discipline:** Civil Engineering

**Specialisation:** Transportation Engineering

### **Taimoor Shehzad**

MS NUST, Islamabad

**Discipline:** Civil Engineering

**Specialisation:** Structural Engineering

### **Ayesha Aftab**

BE BUITMS, Quetta

**Discipline:** Civil Engineering

**Specialisation:** Fluid Mechanics

### **Abdul Qahir**

BE BUITMS, Quetta

**Discipline:** Civil Engineering

**Specialisation:** Construction Management

## Department of Computer Science

### **Dr Alamgir Naushad, HoD**

Ph.D. GIK Pakistan

**Discipline:** Computer System Engineering

**Specialisation:** Proactive Strategies to improve Link Stability under Topology

### **Dr. Mohsin Raza Jafri**

Ph.D Ca'Foscari University of Venice, Italy

**Discipline:** Computer Science

**Specialisation:** Under Water Sensor Networks

### **Dr. Ayesha Maqbool**

Ph.D. University of Sheffield, UK

**Discipline:** System Engineering

**Specialisation:** Co-operative Mission Planning for Multiple Unmanned Autonomous Vehicles

### **Saad Qaiser Alvi**

MS NUST, Islamabad

**Discipline:** Information Technology

**Specialisation:** Simulation & Modeling

### **Najeeb Ullah**

MS FAST, Pakistan

**Discipline:** Computer Science

**Specialisation:** Design of Digital Transmission System for seismic monitoring

### **Mahe Mobeen**

MS NUST, Islamabad

**Discipline:** Electrical Engineering

**Specialisation:** Simulation & Modeling

### **Rozi Khan**

BS BUITMS, Quetta

**Discipline:** Computer Science

**Specialisation:** Machine Learning

### **Waqas Khan**

BE BUITMS, Quetta

**Discipline:** Software Engineering

**Specialisation:** Mobile App development, Deep Learning and Data Analysis.

## Description

The Civil Engineering Department at NUST Balochistan Campus (NBC) University offers a four-year Bachelor's Degree in Civil Engineering and has foreign qualified faculty members with experience and expertise of wide range. The programme has been prepared in accordance with the Pakistan Engineering Council (PEC) guidelines. The educational process of Civil Engineering Department at NBC is aligned with Outcome Based Education (OBE) system, which is focused at achieving specified outcomes in terms of student learning. Courses of Civil Engineering like Construction Management, Structures, Geo-technical, Transportation and Water Resources have been impeccably incorporated in the curricula of the programme. The department has laboratories equipped with latest equipment and well-furnished air-conditioned classrooms that promote active learning and research in a conducive environment. Internship opportunities are also provided to jumpstart student careers that offer exposure in planning, design, engineering, consulting, and management domains.

## Programme Education Objective

Department of Civil Engineering at NUST Balochistan Campus (NBC), offers a bachelor's degree programme in Civil Engineering (BECE). The programme was started in 2019. It is a four-year programme with a total of 139+X credit hours requirement for award of the degree.

Programme's Educational Objectives and Outcomes

Following are the objectives of the undergraduate programme in Civil Engineering.

- PEO 01: Graduates will be knowledgeable and competent, capable of providing innovative and comprehensive solutions to meet the industry needs.
- PEO 02: Graduates will possess effective communication and managerial skills imbued with teamwork abilities.
- PEO 03: Graduates will discharge their professional and societal obligations displaying high moral and ethical standards.
- PEO 04: Graduates will pursue lifelong learning through postgraduate studies and continued development of technical and managerial skills.

## Programme Learning Objective

The graduates of NBC Civil engineering graduate will demonstrate the following attributes for their professional career;

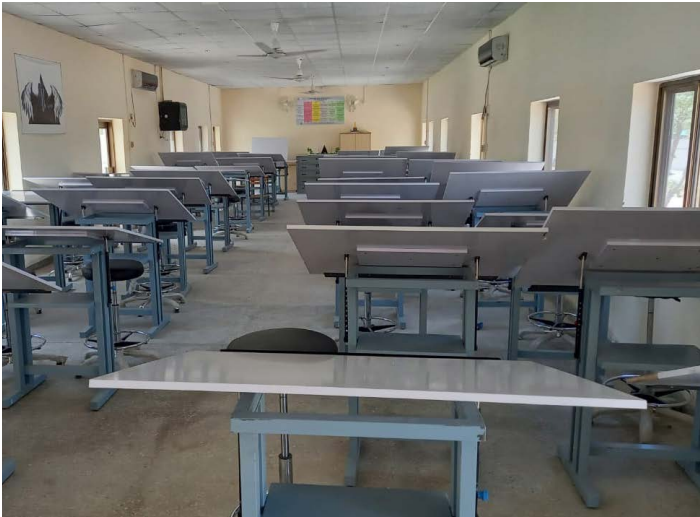
- Engineering Knowledge: An ability to apply knowledge of mathematics, science, engineering fundamentals and an engineering specialisation to the solution of complex engineering problems.
- Problem Analysis: An ability to identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
- Design/Development of Solutions: An ability to design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
- Investigation: An ability to investigate complex engineering problems in a methodical way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data, and synthesis of information to derive valid conclusions.
- Modern Tool Usage: An ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering activities, with an understanding of the limitations.
- The Engineer and Society: An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solution to complex engineering problems.
- Environment and Sustainability: An ability to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
- Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
- Individual and Team Work: An ability to work effectively, as an individual or in a team, on multifaceted and /or multidisciplinary settings.
- Communication: An ability to communicate effectively, orally as well as in writing, on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- Project Management: An ability to demonstrate management skills and apply engineering principles to one's own work, as a member and/or leader in a team, to manage projects in a multidisciplinary environment.
- Lifelong Learning: An ability to recognize the importance of, and pursue lifelong learning in the broader context of innovation and technological developments.



# Laboratories

The campus is equipped with the most state of the art laboratory equipment for civil engineering. The main laboratories are:

- Structure Laboratory
- Geotechnical Engineering Laboratory
- Transportation Laboratory
- Mechanics Laboratory
- Hydraulics Laboratory
- Surveying Laboratory
- Workshop Practice Laboratory
- Civil Engineering Drawing Hall



# Bachelors in Civil Engineering

## Scheme of Studies

Programme Code-Q601

NBC

### Semester-I

Course Code	Course Title	Credits
HU-100	English	2-0
CS-114	Fundamentals of Programming	2-1
HU-107	Pakistan Studies	2-0
MATH-101	Calculus and Analytical Geometry	3-0
PHY-102	Applied Physics	2-1
ME-105	Workshop Practice	0-1
CE-102	Civil Engineering Materials	3-0
	<b>Total</b>	<b>14-3</b>

### Semester-II

Course Code	Course Title	Credits
HU-101	Islamic Studies	2-0
MATH-121	Linear Algebra & ODE	3-0
ME-109	Engineering Drawing	0-2
HU-109	Communication Skills	2-0
CE-121	Engineering Geology	3-0
ME-107	Engineering Mechanics	2-1
	<b>Total</b>	<b>12-3</b>

### Semester-III

Course Code	Course Title	Credits
MATH-355	Numerical Methods	3-1
CE-103	Mechanics of Solids-I	2-1
CE-251	Fluid Mechanics-I	2-1
CE-182	Surveying-I	2-1
CE-222	Soil Mechanics -I	2-1
CE-241	Transportation Engineering-I	3-0
	<b>Total</b>	<b>14-5</b>

### Semester-IV

Course Code	Course Title	Credits
CE-252	Fluid Mechanics - II	2-1
CE-206	Structural Analysis-I	3-0
CE-286	Surveying-II	1-2
CE-324	Soil Mechanics - II	2-1
CE-205	Mechanics of Solids-II	2-1
CE-342	Transportation Engineering - II	2-1
	<b>Total</b>	<b>12-6</b>

### Semester-V

Course Code	Course Title	Credits
HU-212	Technical and Business Writing	2-0
CE-306	Structural Analysis-II	3-0
CE-308	Plain & Reinforced Concrete-I	3-1
CE-358	Engineering Hydrology	2-1
CE-371	Construction Project Management	2-1
CE-388	Computer Aided Civil Engineering Design and Graphics	1-2
	<b>TOTAL</b>	<b>13-5</b>

### Semester-VI

Course Code	Course Title	Credits
CE-310	Plain & Reinforced Concrete-II	3-1
CE-309	Structural Analysis-III	3-0
CE-372	Quantity Surveying and Cost Estimation	3-0
CE-339	Environmental Engineering - I	2-0
MATH-361	Probability & Statistics	3-0
CE-00	Elective - I	3-0
	<b>Total</b>	<b>17-1</b>

## Semester-VII

Course Code	Course Title	Credits
ARCH-305	Architecture & Town Planning	2-0
CE-341	Environmental Engineering-II	2-1
CE-411	Steel Structures	3-0
CE-375	Construction Engineering	3-0
HU-222	Professional Ethics	2-0
CE-499	Project-I	0-3
CE-00	Elective-II	3-0
	<b>Total</b>	<b>15-4</b>

## Semester-VIII

Course Code	Course Title	Credits
MGT-271	Entrepreneurship	2-0
ECO-130	Engineering Economics	2-0
CE-463	Irrigation Engineering	2-1
CE-288	Geoinformatics	1-1
CE-499	Project-II	0-3
CE-00	Elective-III	3-0
	<b>Total</b>	<b>10-5</b>
	<b>Grand Total</b>	<b>139</b>

## Elective Courses

### Structures

CE-412	Design of Concrete Structures	3-0
CE-413	Design of Steel Structures	3-0
CE-414	Bridge Engineering	3-0
CE-415	Special Application Structures	3-0
CE-416	Earthquake Engineering	3-0
CE-410	Structural Fire Engineering	

### Geotech

CE-425	Introduction to Rock Mechanics	3-0
CE-426	Slope Stability	3-0
CE-427	Soil and Site Improvement	3-0
CE-428	Design & Construction of Earthen Dams	3-0
CE-429	Introduction to Geotechnical Earthquake Engineering	3-0
CE-430	Applied Soil Mechanics	2-1
CE-431	Investigation and Instrumentation in Geotechnical Engineering	2-1
CE-440	Design of Tunnels and Underground Structures	3-0

### Water Resources

CE-459	Hydraulic Engineering	3-0
CE-460	Computational Hydraulics	3-0
CE-461	Open Channel Flow	3-0
CE-462	River Engineering	3-0

### Construction Management

ENE-433	Environment Management & Impact Assessment	3-0
CE-474	Construction Project Scheduling	3-0
HRM-443	Human Resource Management in Construction	3-0
CE-476	Construction Contract Management	3-0

### Transportation

CE-443	Pavement Design & Rehabilitation	3-0
CE-444	Traffic Engineering & Safety	2.5-0.5
CE-445	Road Construction, Materials & Practices	2.5-0.5
CE-446	Geometric Design of Highway	2.5-0.5

# Department of Computer Science

## Vision

- To be a center of excellence in the field of Computer Science and Information Technology to empower the lives of individuals to fulfil their academic excellence, professional passions, and partnership for community development.

## Mission

- To impart knowledge through state-of-the-art concepts and technologies in Computer Science.
- To inculcate values of professional ethics, leadership qualities and lifelong learning.
- To prepare professionals for employment in industry, research, higher education, community partnerships, and entrepreneurship to benefit the society.

## Programme Education Objective

Department of Computer Science at NUST Balochistan Campus (NBC), offers a bachelor's degree programme in Computer Science (BSCS). The programme was started in 2019. It is a four-year programme with a total of 131+X credit hours requirement for award of the degree.

## Programme's Educational Objectives and Outcomes

Following are the objectives of the undergraduate programme in Computer Science.

- **PEO1:** Graduates will establish themselves as effective professionals by solving real world problems using investigate and analytical skills along with the knowledge acquired in the field of CS.
- **PEO2:** Graduates will demonstrate to adapt to rapidly changing environment in advanced areas of CS and scale new height in their profession through lifelong learning.
- **PEO3:** Graduates will prove their efficiency in work force diversity.
- **PEO4:** Graduates will embrace professional code of ethics in the profession while deliberately being part of projects which contributes to the society at large without disturbing the ecological balance.
- **Awareness of Core Concepts:** To inculcate a sound knowledge of fundamentals of computing and mathematics appropriate to Computer Science discipline.
- **Practical Skills:** To develop the skills for applying the concepts, principles, and practices in computer science for analyzing and solving real world problems to support users and meeting their organizational needs.
- **Professional Development and Teamwork Skills:** To provide effective personal development as an entrepreneur, team-work skills for continuing professional progress/growth, and life-long learning and awareness of one's social, professional, and ethical responsibilities.

## Labs and Other Facilities

Following teaching labs have been established that play a vital role in training undergraduate students with the state-of-the art electrical and computer design and analysis techniques.

- Digital Logic Design (DLD) Lab
- Applied Physics Lab
- Computing Lab 1
- Computing Lab 2
- Multimedia & Graphics (M&G) Lab
- Final Year Project (FYP) Lab
- General Purpose Lab
- Open Research Lab



## Co-Curricular Activities

The students of first batch both BS Civil and BS Computer were warmly welcomed by the university staffs and faculties and one-night function was organized by students. One day tour was arranged by the adventure club of students to Historical Place of Baluchistan where our great Leader Quaid Azam Muhammad Ali Jinnah took his last breaths.



### Student Sports Facilities

#### Outdoor and Indoor Sports

Indoor facilities are available which included; table tennis, badminton, basketball, and other indoor games like ludo, chess and carom. Outdoor facilities are also available for students; Cricket, Football and volleyballs grounds are provided by the campus.



# Bachelors of Computer Science

## Scheme of Studies

Programme Code-Q642

### Semester I

Course Code	Course Title	Credits
CS-100	Fundamentals of ICT	2-1
CS-110	Fundamentals of Computer Programming	3-1
HU-101	Islamic Studies	2-0
HU-109	Communication and Interpersonal Skills	3-0
MATH-111	Calculus-I	3-0
MATH-161	Discrete Mathematics	3-0
	<b>Total</b>	<b>18</b>

### Semester II

Course Code	Course Title	Credits
CS-212	Object Oriented Programming	3-1
EE-221	Digital Logic Design	3-1
HU-107	Pakistan Studies	2-0
	CS Computing Elective-I	3-0
XX-XXX	Applied Physics	2-X or 3-X
XX-XXX	University Elective-I	2-X
	<b>Total</b>	<b>18-X</b>

### Semester III

Course Code	Course Title	Credits
CS-220	Database Systems	3-1
CS-235	Computer Organisation and Assembly Language	3-1
CS-250	Data Structures & Algorithms	3-1
HU-210	Technical Writing	3-0
MATH-222	Linear Algebra	3-0
	<b>Total</b>	<b>18</b>

### Semester IV

Course Code	Course Title	Credits
CS-251	Design and Analysis of Algorithms	3-0
CS-330	Operating Systems	3-1
	CS Computing Elective-II	3-0
MATH-361	Probability and Statistics	3-0
XX-XXX	CS Elective-I	3-X
	<b>Total</b>	<b>16-X</b>

### Semester V

Course Code	Course Title	Credits
	University Elective-II	3-X
SE-200	Software Engineering	3-0
EE-353	Computer Networks	3-1
CS-370	Artificial Intelligence	3-1
XX-xxx	CS Elective – II	3-X
	<b>Total</b>	<b>17-X</b>

### Semester VI

Course Code	Course Title	Credits
HU-223	Professional Ethics	3-0
	CS Supporting Elective - III	3-X
	CS Elective – III	3-X
CS-431	Parallel and Distributed Computing	3-0
CS-484	Information Security	3-0
	<b>Total</b>	<b>15-X</b>

### Semester VII

Course Code	Course Title	Credits
CS-352	Theory of Automata and Formal Languages	3-0
CS-499	Senior Project	0-3
MGT-272	Entrepreneurship	3-0
	University Elective -III	3-X
	<b>Total</b>	<b>9-3+X</b>

### Semester VIII

Course Code	Course Title	Credits
	University Elective – IV	3-0
	University Elective – V	2+X-0
	CS Elective – VI	2+X-1
CS-354 XX-XXX	Compiler Construction	"3-1 2-1"
CSL-401	Community Service Learning	0-2
CS-499	Senior Project	0-3
	<b>Total</b>	<b>10+X-5</b>
	<b>Grand Total</b>	<b>129-X</b>

## Elective Courses

Course Code	Course Title	Credits
<b>Data and Knowledge Management System</b>		
CS-423	Data Warehousing and Data Mining	4(3-1)
CS-321	Advanced Database Systems	3(3-0)
CS-340	Web Technologies-I	3(2-1)
CS-443	E-Commerce and Solutions	3(3-0)
CS-424	Information Retrieval	3(3-0)
CS-322	RDBMS Using Oracle	3(2-1)
CS-441	Web Technologies-II	4(3-1)
CS-425	Management Information Systems	3(3-0)
CS-404	Big Data Analytics	3(2-1)
<b>Intelligent Systems</b>		
CS-471	Machine Learning	4(3-1)
CS-472	Natural Language Processing	3(3-0)
CS-473	Theory of Intelligent Systems	4(3-1)
CS-476	Speech and Image Processing	4(3-1)
CS-474	Computer Vision	3(2-1)
BIO-317	Computational Biology	3(3-0)
BIO-215	Bioinformatics	3(3-0)
CS-405	Deep Learning	4(3-1)
<b>Computer Graphics and Multimedia Systems</b>		
CS-361	Computer Graphics	4(3-1)
EE-433	Digital Image Processing	4(3-1)
CS-362	Multimedia Systems and Design	3(2-1)
CS-363	Visualization	3(2-1)
CS-364	Game Programming	3(2-1)
<b>Parallel and Distributed Systems</b>		
CS-332	Distributed Computing	4(3-1)
CS-342	Mobile Computing	3(3-0)
CS-433	Applied Parallel Computing	3(2-1)
CS-334	Open Source Systems	4(3-1)
CS-331	System Programming	3(2-1)
<b>Software Engineering</b>		
SE-440	Business Process Automation	3(3-0)
SE-313	Design Patterns	3(2-1)
SE-423	Software Metrics	3(3-0)
SE-422	Software Testing	3(3-0)
SE-431	Software Engineering Economics	3(3-0)
SE-430	Software Project Management	3(3-0)
SE-320	Formal Methods	3(3-0)
SE-301	Object-oriented Software Engineering	3(3-0)
SE-210	Software Design and Architecture	4(3-1)
SE-321	Software Quality Engineering	3(3-0)
SE-311	Software Requirements Engineering	3(3-0)
CS-335	Internet of Things	3(3-0)
CS-344	Web Engineering	4(3-1)
<b>Computer Security</b>		
CS-381	Network Security	4(3-1)
CS-380	Introduction to Computer Security	3(3-0)
CS-481	Computer Forensics	4(3-1)
CS-482	System Incident Handling	3(3-0)
EE-322	Wireless Networks	3(3-0)
<b>Miscellaneous</b>		
EE-430	Telecommunication Systems	3(3-0)
EE-232	Signals and Systems	4(3-1)
EE-330	Digital Signal Processing	4(3-1)
EE-350	Data Communication	3(3-0)
CS-213	Advanced Programming	4(3-1)
EC-303	Mobile Application Development for SME's	3(2-1)
CS-414	Advanced Java with emphasis on Internet Applications	4(3-1)
CS-453	Programming Languages	3(3-0)
CS-260	Human Computer Interaction	3(3-0)
CS-490	Advanced Topics in Computing	3(3-0)
SE-410	System Modeling and Simulation	4(3-1)
<b>University Elective</b>		
HRM-441	Human Resource Management	2(2-0)
MGT-175	Intellectual Property Rights	3(3-0)
HU-115	Principles of Sociology	3(3-0)
HU-102	Psychology	3(3-0)
HU-104	English Literature	3(3-0)
FIN-100	Principles of Accounting	3(3-0)
CS-309	Computing and Society	3(3-0)
MGT-164	Introduction to Management	2(2-0)
HRM-240	Organizational Behavior	2(2-0)
ECO-130	Engineering Economics	2(2-0)
MKT-102	Principles of Business and Marketing	2(2-0)
FIN-204	Financial Management for IT Professional	2(2-0)
MGT-452	New Business Ventures	2(2-0)
EE-212	Basic Electronics	3(2-1)
CS-271	Computational Logic	3(3-0)
CH-101	Applied Chemistry	3(2-1)
PHY-401	Advanced Physics	3(2-1)
MATH-232	Complex Variables and Transforms	3(3-0)
OTM-455	Engineering Project Management	2(2-0)
CEM-300	Procurement Management	3(3-0)



# Applying to NUST



#### Online Registration

**Selection of Candidates:** August 2021

**Commencement of Courses:**  
All institutions less CAE November 15, 2021  
CAE October 18, 2021

**Submission of SAT Results:** July 15, 2021

### Salients of NUST Entry Test-2020

#### Mode of Test

##### Computer Based Test

Computer Based Entry tests for all disciplines will be held in multiple sessions at NUST Campus Islamabad according to the following schedule:

NET-2021 (Series-1)	January 2021
NET-2021 (Series-2)	March 2021
NET-2021 (Series-3)	June 2021
NET-2021 (Series-4)	July / Aug 2021

- » During an admission cycle, candidates can appear in Entry test more than once to improve their score with their best score considered for admissions.
- » The result of NET will remain valid for the current admission cycle only which will culminate in Fall 2021.

##### Paper Based Test

Karachi and Quetta in March and July / Aug 2021.

- » Candidates will have an option to appear either in computer based test at Islamabad or the paper based test.
- » Candidates will have an option to change their programme preferences after the announcement of NET results within the time-frame to be specified after the test.

### Eligibility Criteria

- » A minimum of 60% aggregate marks each in SSC and HSSC / equivalent exams.
- » Candidates of FSc stream can apply for the NUST Entry Test on the basis of FSc Part – I but the confirmation of their admission is subject to provision of FSc certificate or Detailed Marks Certificate (with a minimum of 60% aggregate marks) before the commencement of the relevant programme of study.
- » O & A level and other non-FSc stream candidates need to obtain equivalence certificates from Inter Board Committee of Chairmen (IBCC), Pakistan.
- » Candidates of O / A Level stream can apply on the basis of O Level equivalence certificate duly issued by IBCC, but the confirmation of their admission is subject to provision of A Level equivalence certificate before the commencement of the relevant programme of study. Valid O Level equivalence certificate is mandatory at the time of applying to NUST.

- » Candidates can apply on the basis of NUST Entry Test (NET) or SAT or both.
- » Candidates having diploma of Associate Engineering (DAE) with minimum 60% marks in various technologies can apply for relevant Engineering programmes through NUST Entry Test. For details, visit NUST website.
- » Due to COVID-19 pandemic, candidates of FA /FSc stream who are in Part II, can apply on basis of Matric marks for session 2021 only

### Computing Programmes

#### (Software Engineering, Computer Engineering, BE Information Security)

FSc Pre-Engineering Group / FSc Computer Science Group OR O level (SSC) equivalence of “Science group” and A level (HSSC) equivalence of “Pre-Engineering group” OR “Computer Science group” including Maths, Physics, Chemistry/Computer Science/Computer Studies as mandatory subjects

DAE candidates can apply for admission in selected engineering programmes on open merit. To apply, the candidates should have minimum 60% marks in Matric as well as DAE. For details, please visit NUST website.

### BS Computer Science

FSc Pre-Engineering Group / FSc Computer Science Group / FSc Pre-Medical Group OR O level (SSC) equivalence of “Science group” and A level (HSSC) equivalence of “Pre-Engineering group” OR “Computer Science group” including Maths, Physics, Chemistry/Computer Science/Computer Studies as mandatory subjects.

Candidates with FSc Pre-Medical / equivalent qualification enrolled in BS Computer Science programme will have to clear deficient Mathematics courses of 6 credit hours, within one year.

### Ineligibility

Candidates with any of the following deficiencies are NOT eligible to apply for admission in UG programmes:

- » Having secured less than 60% marks in Matric and FSc.
- » Having failed / not appeared in any subject in FSc Part-I / II.
- » Having secured less than 60% marks in O/A level as per the equivalence certificate issued by IBCC.
- » In case of O & A level / equivalent foreign qualification, those not in possession of valid O level or equivalent qualification certificate issued by IBCC at the time of applying to NUST.
- » Female candidates can not apply for Aerospace, Avionics and Civil Engineering at Risalpur Campuses.
- » Expelled from NUST on disciplinary grounds.

### Submission of Online Applications

NUST accepts only online application forms for UG programmes. A candidate can fill and submit the application form, available online at <http://ugadmissions.nust.edu.pk>

For subsequent correspondence with NUST, the following address may be used:

**Admissions Directorate,  
National University of Sciences and Technology (NUST),  
Sector H-12, Islamabad, Pakistan.  
Tel: +92-51-90856878  
E-mail: [ugadmissions@nust.edu.pk](mailto:ugadmissions@nust.edu.pk)**

## Application Processing Fee

NUST Entry Test (per exam)	Rs 3,500 or USD 35
SAT National Seat	Rs 5,000 or USD 40
SAT International Seat	Rs 10,000 or USD 80

## Procedure of Admission on the Basis of NET

- » Submission of online application for admission at <http://ugadmissions.nust.edu.pk>
- » Confirmation of receipt of application by NUST through e-mail (within 24 hours of submission of application)
- » Printing of Fee Invoice
- » Fee deposit through any online branch of Habib Bank Ltd (HBL)
- » Confirmation of receipt of payment by NUST through e-mail (within 5 days of payment)
- » For computer based test, selection of Test Date and Session by Re-Login to candidate's NET account
- » For Islamabad Test Center, confirmation of Test Date, Test Session and allocation of Roll Number, Log-in ID, Password for Computer Based Test.
- » For Paper Based Test at Karachi and Quetta, issuance of Roll Numbers and allocation of test centers through email (within 24 hours of payment confirmation).
- » Printing of Admit Cards by all candidates by login in to individual accounts
- » Conduct of the test as per the schedule i.e., computer based at Islamabad and paper based test at Karachi and Quetta
- » Announcement of NET results
- » Desirous candidates may apply in another NET series before the completion of admission cycle
- » Generation of Merit list on completion of NUST Entry Tests
- » Candidates may review their preferences of programmes within given time frame after uploading of merit list
- » Issuance of Selection List on NUST website
- » Printing of Provisional Selection Letter, Medical Certificate Form and Admission Dues Fee Invoice by the selected candidates
- » Deposit of Admission dues (in any online branch of HBL) and submission of required documents to the UG Section, Registrar Directorate, NUST, Sector H-12, Islamabad
- » Issuance of Joining Instructions to the selected candidates who have completed admission formalities by the respective institution
- » Successful candidates join their respective programmes

■ To do list for candidates   ■ To do list for NUST

## Instructions for Online Application Form

- » Visit <https://ugadmissions.nust.edu.pk> and get registered by providing valid e-mail address.
- » Candidate will be allotted a login ID and password to access the online application form.
- » Fill the online form, upload recent (not more than 6 months old) passport size photograph (with plain background), and submit the form.
- » Successful submission of form will be confirmed through an e-mail by NUST.
- » Re-Login to your account and print Fee Invoice for depositing processing fee from My Account page.
- » Candidates can deposit fee with any branch of HBL. Fee deposit will be verified through e-mail within 5 days of payment.
- » Candidates of computer based test will have to choose Test Date and Session out of the available options.
- » Allocation of Test Date and Session will be made on 'First Come First Served' basis.
- » Candidates of computer based test will be allocated Roll Number, Test Center, Test Session, Log-in ID and Password.
- » For Paper Based Test at Karachi and Quetta, candidates will be informed through email regarding printing of Admit Card containing exact time and center for Entry Test.
- » Candidates are required to print their Admit Cards and bring the same to the Test Centre along with original CNIC/ family registration certificate/passport/original matric/FSc certificate bearing photograph as proof for identification.
- » Candidates can appear more than once to improve their score. Best score will be picked by the system for merit generation.
- » The seats becoming available as a result of drop-outs will be re-allocated and filled through the up-gradation of candidates who have confirmed their willingness by depositing admission dues in time.
- » Candidates failing to deposit admission dues within the given time will not be considered for admission any further.
- » Closing merit of session 2020 for different programmes will be available on the website for guidance
- » Admit Cards will be retained at the Test Centres for further verification.
- » Candidates with any disability are required to mention the same in the online application form.

**Note:** Misrepresentation of facts or false information will lead to cancellation of candidature/admission at any stage.

## Equivalence Certificate

Candidates submitting A Level, 12th Grade, International Baccalaureate or Advanced Placement certificates are also required to submit equivalence certificates, obtained from the Inter Board Committee of Chairmen (IBCC), within two weeks

after joining the respective programme. Offices of the IBCC are located in all the provincial capitals. The address of IBCC office at Islamabad is as under:

**Inter Board Committee of Chairmen,  
Plot No.25, St 38, G-10/4,  
Near Federal Government Employees  
Housing Foundation (FGEHF),  
Islamabad  
Phone: (051) 9235018  
Web: <http://www.ibcc.edu.pk>**

**Note:** Candidates are advised to contact IBCC for their eligibility regarding issuance of equivalence certificate of relevant category as per their subjects of study in O/A level or any other foreign qualification.

## NUST Entry Test (NET)

NUST Entry Test will be Computer-based for the candidates of Islamabad center, conducted in two sessions daily on different dates whereas for the candidates of Karachi and Quetta centers, it will be conducted in paper based format.

The standard of test will be that of intermediate level education, aimed at evaluation of factual knowledge, comprehension and its application.

Instructions to attempt computer based Entry test along with mock test module is available on NUST website for guidance of candidates.

For paper based Entry test, correct filling of answer sheets is essential. Detailed instructions for the same are given in the NET section to help the candidates.

Pre-Medical candidates applying for BS Computer Science programme will be given following composition of paper:-

» Quantitative (Basic Mathematics)	40%
» Chemistry	30%
» English	10%
» Intelligence	5%

**Note:** Engineering candidates can also opt for BS Chemistry programme in online registration form without paying additional fee. Their merit will be calculated on the basis of Chemistry, English & Intelligence subjects.

## Re-checking of NET Papers

Re-checking of paper based Entry Test papers may be requested within 5 days of the declaration of result along with a fee of Rs.500/- in the form of a bank draft/pay order in favour of NUST. The original bank draft / pay order should be dispatched to Admissions Directorate, NUST, Sector H-12, Islamabad, along with written application. Re-checking involves the verification of paper for any unmarked answers and error free totaling of marks.

## Provision of Entry Test Results

Desirous candidates may obtain the result details of their test from the link available on NUST website.

## Selection Procedure

Final merit of Fall 2021 for Engineering / Computer Science programmes will be prepared by assigning weightings as follows:

» NUST Entry Test	75%
» Matric/O Level*	25%

\*O/A Level candidates who are in A Level (final year) will be assigned 25% weighting to their O Level equivalence marks as per equivalence certificate issued by IBCC. Similarly HSSC candidates who are in Part II of FA /FSc will be assigned 25% weighting to their Matric marks due to non-availability of FA/ FSc Part I marks (only for session 2021)

### Note

- » The above policy may be reviewed by the University whenever deemed necessary.
- » It is the responsibility of the candidate to provide his/her academic record in time to the University as per the deadline.
- » NUST will not be responsible if result of FSc/equivalent exams is not declared in time.

## SAT Seats for National Students

NUST has few reserved seats in Engineering & Computing programmes for induction through SAT scores to facilitate admissions of candidates from O/A Level background. Pakistani candidates of both O/A Level and FSc streams can exercise this option and compete for SAT seats by taking SAT Subject Test and submitting the following results in addition to academic qualification requirements already spelled out.

### Engineering

- » Mathematics Level-II
- » Physics
- » Chemistry

### Computing Programmes

**(Software Engineering, Computer Engineering, Information Security & BS Computer Science)**

- » Mathematics Level-II
- » Physics

**Note:** A minimum of 550 score is required in each subject.

## SAT Subject Test

SAT Subject Test is a computer-based test held under the management of College Board, USA. For more information on SAT and how to apply, please visit their website at [www.collegeboard.com](http://www.collegeboard.com)

SAT scores from College Board, USA should reach directly to NUST by July 15, 2021. Scores received after the deadline will not be entertained. SAT scores are valid for two years. NUST institutional code to receive SAT scores is 2790. Merit lists for candidates applying on the basis of SAT for national seats is prepared separately

## Medical Fitness

Selected candidates will be required to provide Medical Certificate, certifying that the candidate is mentally and physically fit to undertake undergraduate studies and do not require any kind of assistance in this regard, upon joining the relevant programme. Medical Fitness Certificate proforma will be sent to the selected candidates along with the Provisional Selection Letter for endorsement from any Government Hospital or a Registered Medical Practitioner.

## Rejection of Application

The University may reject an application for admission of any student without assigning any reason.

## Submission of Documents

Candidates are required to print the Provisional Selection Letters and send attested photocopies of the following documents along with paid fee invoice (NUST copy) of admission dues to **UG Section, Registrar Directorate, NUST, H-12, Islamabad:**

- » Matric/equivalent certificate along with Detailed Marks Certificate
- » Detailed marks certificate of FSc Part I
- » FSc/equivalent certificate along with Detailed Marks Certificate
- » Equivalence certificate(s) from IBCC in case of equivalent examinations

**The university will register the student's name as per his/her (SSC) Matric or O level equivalent certificate duly issued by IBCC.**

## Allocation of Programmes

Selection and allotment of programmes will be carried out strictly according to the merit position and preferences exercised by the candidates.

All candidates will be provided an opportunity to change their preferences given earlier in the online application form after the announcement of merit within the specified time period.

Candidate will be considered for upgradation in respective disciplines by default. However, if candidates want to retain allocated programme, they have to inform immediately through email for blocking of upgradation process in subsequent selections. The seats becoming available as a result of dropouts will be re-allocated and filled through up-gradation of candidates who have confirmed their willingness by depositing the admission dues in time.

**Name of those candidates who do not deposit admission dues will not be considered any further.**

## Cancellation of Admission

Admission is liable to be cancelled if the candidate is found guilty of suppression or misrepresentation of material facts at any stage. The University can further debar him/her from seeking admission elsewhere. Other universities in the country will also be informed about the same.

**The seats of those candidates who, after submission of admission dues, do not join within 15 days of commencement date of programmes will be declared vacant and filled up by candidates next on merit.**

## Migration and Transfer

Under extraordinary circumstances, on the recommendation of the Commandant/Principal of the concerned institution, the Rector may allow migration of a student within NUST, or from other foreign/Pakistani universities/colleges of repute, generally under the following conditions:

- » After completion of first year and before the beginning of final year
- » Possesses good academic record
- » Courses to be transferred have a minimum of B Grade
- » Transfer within NUST will be allowed to students admitted on the basis of NUST selection process
- » Inter-institutional transfers of students within NUST will be managed and processed on the basis of laid down procedure in vogue

**Provisions of NUST Migration Policy, as amended/updated from time to time, will be applicable in processing of all migration cases.**

## Migration/Transfer Fee

	PKR
» Processing Fee	5,000
» Migration/Transfer Fee	
Migration from foreign universities	250,000
Migration from local universities	100,000
Transfer within NUST	5,000

**Note:** For migration application form and details of migration policy and procedure, please visit <http://www.nust.edu.pk>



# MS/PhD Programmes

## Dates to Remember

<b>Commencement of Online Admission</b>	April 2021
<b>Commencement of Programmes</b> (Less MCE/EME/MCS)	September 13, 2020
<b>Submission of GRE (General) Score</b>	July 2021
<b>Commencement of Programmes</b> (MCE/EME/MCS)	October 18, 2020

## Masters Programmes of Study

### Military College of Signals (MCS), Rawalpindi

- » Electrical (Telecomm) Engineering (Evening)
- » Software Engineering (Evening)
- » Information Security (Evening)
- » Computer Science (Evening)

### College of Electrical & Mechanical Engineering (C of E&ME), Rawalpindi

- » Electrical Engineering (Evening)
- » Mechanical Engineering (Evening)
- » Computer Engineering (Evening)
- » Software Engineering (Evening)
- » Mechatronics Engineering (Evening)
- » Engineering Management (Evening)

### School of Electrical Engineering & Computer Science (SEECS), Islamabad

- » Information Technology (Evening)
- » Computer Science (Evening)
- » Information Security (Evening)
- » Electrical Engineering (Evening)
- » Innovative Technologies in Learning (Evening)
- » Data Science
- » Artificial Intelligence (Evening)

### School of Civil & Environmental Engineering (SCEE), Islamabad

- » Structural Engineering (Evening)
- » Transportation Engineering (Evening)
- » Geotechnical Engineering (Evening)
- » Construction Engineering and Management (Evening)
- » Water Resources Engineering & Management (Evening)
- » Remote Sensing and GIS (Evening)
- » Environmental Engineering (Evening)
- » Environmental Science (Evening)
- » Urban and Regional Planning (Evening)

### School of Chemical & Materials Engineering (SCME), Islamabad

- » Materials & Surface Engineering (Evening)
- » Chemical Engineering (Evening)
- » Nanoscience and Engineering (Evening)
- » Process Systems Engineering (Evening)

### Research Center for Modeling & Simulation (RCMS), Islamabad

- » Computational Science and Engineering (Morning)
- » Systems Engineering (Morning)
- » Bioinformatics (Morning)

### U.S Pakistan Center for Advanced Studies in Energy (USPCAS-E), Islamabad

- » Energy Systems Engineering (Morning)
- » Thermal Energy Engineering (Morning)
- » Electrical Engineering (Power) (Morning)

### School of Mechanical & Manufacturing Engineering (SMME), Islamabad

- » Mechanical Engineering (Evening)
- » Design & Manufacturing Engineering (Evening)
- » Robotics & Intelligent Machine Engineering (Evening)
- » Biomedical Engineering (Evening)
- » Biomedical Science (Evening)

### Pakistan Navy Engineering College (PNEC), Karachi

- » Electrical (Control/Communication) Engineering (Evening)
- » Mechanical Engineering (Evening)
- » Manufacturing Engineering & Management (Evening)
- » Naval Architecture (Morning)
- » Cyber Security (Evening)

### Military College of Engineering (MCE), Risalpur

- » Construction Engineering & Management (Afternoon)
- » Structural Engineering (Afternoon)
- » Transportation Engineering (Afternoon)
- » Disaster Management (Afternoon)
- » Geotechnical Engineering (Afternoon)

### College of Aeronautical Engineering (CAE), Risalpur

- » Aerospace Engineering (Morning)
- » Avionics Engineering (Morning)
- » Electrical Engineerig (Morning)
- » Mechanical Engineering (Morning)

### Research Institute for Microwave and Millimeter Wave Studies (RIMMS)

- » Electrical Engineering

# Masters Programmes

## Eligibility Criteria

Following is mandatory for admission in MS Programmes:

- » 16 years of schooling or 4 years education after FA/FSc/A Level with minimum CGPA 2.0 out of 4.0 or 55% marks in relevant discipline as mentioned in the table:-

Programmes	Eligibility Criteria
» Geotechnical Engineering » Structural Engineering	BE Civil
» Water Resources Engineering	BE Civil/Agriculture/Environmental/Geological/Geoinformatics/Transportation
» Transportation Engineering	BE Civil/Transportation
» Electrical Engineering (Power)	BE in Electrical/Electronics recognized by PEC
» Electrical Engineering » Electrical (Control) Engineering	BE in Electrical/Telecommunication/Mechatronics/Electronics/Industrial Electronics/ Electrical & Communication/Avionics /Communication Technologies/Computer System
» Mechanical Engineering	BE in Mechanical/Mechatronics/Industrial/Manufacturing/Aerospace/ Agricultural
» Mechatronics Engineering	BE in Mechatronics/Mechanical/Electrical/Telecommunication/Computer/Industrial/ Manufacturing/Aerospace/Avionics/Electronics/Biomedical/Software/Agriculture.
» Computer Engineering	BE in Electronics/Industrial Electronics/Computer/Electrical/Electrical and Communication/Telecom/Avionics
» Software Engineering » Information Technology » Computer Science	BE in any discipline OR MCS/MIT or MSc in Statistics/Physics/Applied Physics/Mathematics/Electronics with BCS/BIT
» Information Security	BE in Electrical/Telecom/Computer Software/ Computer System/Electronics/Industrial Electronics/Electrical and Communication/Avionics/Communication Technologies OR MCS/MIT/BCS (4 years)/BIT (4 years) or MSc in Statistics/Physics/Applied Physics/ Mathematics/Electronics with BCS/BIT
» Environmental Engineering	BE in any discipline
» Environmental Science	MSc (Physics / Applied Physics / Chemistry / Biological Science / Microbiology / Biochemistry / Forestry / Agriculture Science) / MBBS / BDS
» Construction Engineering & Management	BE Civil/Transportation/Architecture/Bachelor of Architecture
» GIS & Remote Sensing	MSc/BS (4 years) in Remote Sensing and GIS/Geography/Geology/Computer Science or Engineering/Environmental Science OR MSc/BS (4 years) in Town Planning/City and Regional Planning/Urban Planning/Forestry/Business Management/Health Management/ Public Health/Architecture OR BE in Civil/Environmental/Electrical/Mechanical/Petroleum/Mining /Marine /Transportation
» Materials and Surface Engineering	BE in Materials and Metallurgical/Mechanical/Mining /Petroleum/Chemical/ Engineering Sciences OR MSc in Chemistry/Physics/Mathematics/Environmental Sciences or equivalent qualification may be considered but may have to undertake additional courses as deemed necessary to cover deficiencies for Engineering degree essentials.
» Computational Science & Engineering	MSc/BS (4 years) in any discipline of Engineering, Natural Sciences, Computer Science/ Software Engineering, Operation Research, Defense/Strategic Studies, Management Sciences
» Engineering Management	BE in any discipline
» Artificial Intelligence	Bachelors in Computer Sciences, Computational Sciences and Engineering, Geoinformatics / Engineering (Mechatronics, Electrical, Mechanical, Aerospace, Avionics or Computer / Software

» Cyber Security	BE in Electrical/Telecommunications/Computer Software/Computer Systems/ Electronics/Industrial Electronics/ Electrical Communications/Avionics/Communication Technologies OR MCS/MIT/ BCS (04 years)/BIT (04 years) OR MSC in (Statistics/Physics/Applied Physics/Mathematics/Electronics)
» Manufacturing Engineering and Management	BE Mechanical/Manufacturing/Industrial/Mechatronics/Automotive/ Aerospace/Electrical/ Electronics/Avionics/Design Engineering
» Design and Manufacturing Engineering	
» Robotics & Intelligent Machine Engineering	BE Mechatronics/Mechanical/Electrical/Computer/Industrial/Manufacturing/ Aerospace/Avionics/Computer Software/Computer Science
» Biomedical Engineering	BE Biomedical/Chemical/Electrical/Mechanical/Mechatronics/Computer/Materials.
» Biomedical Science	BS (4 years) or Masters in Biology, Physics, Chemistry, Computer Science, Materials Science, Biosciences, Pharmacology, Molecular Biology, Genetic Engineering, Biotechnology or MBBS/BDS
» Energy Systems Engineering	BE in any Engineering discipline MSc / BS (4 years) in Chemistry/Physics/Electronics
» Disaster Management	Masters / BS (04 years) in any discipline from HEC recognized institute
» Urban and Regional Planning	BE Civil / Construction / Architecture or BS Architecture / Environmental / Geo Informatics/ City & Town Planning
» Chemical Engineering	BE Chemical Engineering/Petroleum Engineering
» Nano science & Engineering	16 years of education from a recognized institution in Materials Science & Engineering /Physics/Chemistry/Chemical Engineering/Mechanical Engineering/Environmental Science & Engineering/Electronics/Biosciences / Polymer Engineering
» Systems Engineering	BE Mechanical/Mechtronics/Production/Industrial/Automobile/Electrical/Electronics /Avionics/Telecom/Computer Engineering/Software Engineering. MCS/MIT/BCS (4 years)/BIT (4 years) or MSC in (Statistics/Physics/Applied Physics/ Mathematics/Electronics).
» Innovative Technologies in Learning	16 years of education, from HEC recognized Institutes, in Computer Science/ Information Technology/Education/Social Sciences/Management Sciences/Basic Sciences or BE in any discipline
» Transportation Engineering	BE in Civil/Transportation Engineering
» Thermal Energy Engineering	BE in any Engineering Discipline recognized by PEC OR MSc/BS (04 years) in Chemistry/Physics/Electronics/Environment
» Aerospace Engineering	BE in Aerospace /Mechanical/ Mechatronics/Industrial/Manufacturing/Electrical
» Avionics Engineering	BE in Electrical/Electronics/Avionics/Computer/Software/Aerospace
» Electrical Energy Engineering	BE in Electrical/Electronics
» Bioinformatics	BS in Bio-Informatics / Biosciences / MBBS / BS/MSc Molecular Biology / Biotechnology / BS/MSc in Computer Science
» Data Sciences	BS in Computer Science/IT/Software Engineering/Statistics/Mathematics OR BE in Computer Engineering/Electrical Engineering
» Naval Architecture	BE in Naval Architecture / Mechanical / Electrical / Civil / Aerospace / Avionics Engineering or any other related Engineering discipline.
» For all Masters programmes minimum 50 accumulative score in GAT (General) test conducted by NTS or HAT conducted by ETC (HEC) or GRE (General) conducted by ETS, USA with following minimum accepted score.	
Quantitative	151/170
Verbal	146/170
Analytical Writing	3.5/6.0
» NUST will accept the scores of GAT (General) conducted by NTS on or after August 2019. OR HAT conducted by ETC(HEC) on or after March 2020.	
» GRE conducted after August 1, 2018 will be accepted.	
» Candidates are responsible for providing hard copy of GRE score directly on following address:	

**Postgraduate Programme Directorate,  
National University of Sciences & Technology (NUST), Sector H-12, Islamabad**

**Note:**

- » PEC/HEC recognised degrees (as applicable) will only be accepted.
- » The degree must be relevant to the discipline applied for, as shown in the above table.
- » Candidates who are awaiting final result can also apply, provided their CGPA/Percentage till last semester is equal to 2.0/55% and they can submit their final result before commencement of classes..



## Selection and Admission

### MS Programmes

Admission of postgraduate students in various programmes of Engineering and Sciences will be based on GRE/GAT (General) / HAT conducted by ETS/NTS/ETC and previous academic record.

Admission in MS will be based on the following weighting:

- » GRE (General) / GAT (Gen) score / HAT 65%
- » Previous Academic Record 35%

## Submission of Online Applications

### Instructions for Online MS Application Form

- » Visit [www.pgadmission.nust.edu.pk](http://www.pgadmission.nust.edu.pk) and register with valid e-mail address.
- » Candidate will be allotted a password to access the application form.
- » Fill the application form.
- » Enter CGPA only, If both percentage and CGPA are mentioned on Bachelors/Masters Degree/Transcript.
- » Enter earned percentage/CGPA of last term/semester, in case final results are awaited.
- » Upload recent photograph (with plain background).
- » Upload scanned copies of the following documents with the online application:
  - > Matric/equivalent certificate
  - > Intermediate/equivalent certificate
  - > Undergraduate degree along with final transcript(s) showing the exact duration
  - > Masters degree along with transcript showing the exact duration (if applicable).
  - > Computerised National Identity Card
- » Consult eligibility criteria before opting for the programme(s). **Candidates will not be considered for the programmes for which they are not eligible.**
- » Candidates can deposit the fee online, after taking print of Challan Form, in any branch of HBL.

**Misrepresentation of facts or false information will lead to cancellation of candidature/admission at any stage.**

Admission at NUST can be cancelled at any stage of studies if any document/information provided by a student is found to be fake/incorrect or not meeting the eligibility criteria, with no liability on NUST.

## Admission Process

### Application

- Access web-link: [www.pgadmission.nust.edu.pk](http://www.pgadmission.nust.edu.pk)
- Fill online application form.
- Upload scanned copies of required documents.

### Application Confirmation

Application confirmation will be sent at the given email address within 24 hours of submission.

### Application Fee

Deposit application fee online in any HBL branch.

### Fee Receipt

Fee confirmation will be sent at the given email address within 15 days of payment.

### Application Status

Application status would be communicated through email/website within 2 days of scrutiny of documents.

### Selection List

Selection list will be uploaded on NUST website by 1st week of August.

### Admission Dues

Candidates will deposit admission dues in any HBL branch as per challan form available online.

### Documents Submission

- Candidates will prepare documents as per given checklist available online and will submit to the PGP Directorate, Main Office NUST.
- All original documents, Medical Certificate and Affidavit will be submitted to the respective Schools/Colleges/Centers at the time of joining.

### Joining Instructions

Relevant NUST School/College/Center will issue joining instructions to those candidates who have completed all admission requirements.

### Joining

Successful candidates will join relevant programmes as per joining instructions in 1st week of September.

To do list for Applicant  To do list for NUST

## Rejection of Application

The University may reject an application for admission of any student without assigning any reason.

# PhD Programmes

## Eligibility Criteria

- » For admission into the PhD minimum CGPA 3.0 out of 4.0 (in the Semester System) or First Division (in the Annual System) in M.Phil/M.S/Equivalent degree is required. Percentage will be valid only if the CGPA is not mentioned in degree/transcript.
- » GRE Subject International (score  $\geq$  60 percentile) or GAT Subject by NTS (score  $\geq$  60 %) or NUST PhD admission Test (Score  $\geq$  70 %) conducted by NUST (as applicable) is required.

## Submission of Application

Desirous candidates for PhD programmes (all types) may apply to PGP Directorate online according to the advertised schedule of admissions. Each candidate finally selected for admission to the PhD programme will be notified formally.

## Evaluation of Research Proposal

Selection of candidates for the PhD Programmes is dependent on GRE Subject/GRE Subject-type Test score/GAT subject (as applicable), their acceptance by a supervisor and evaluation of their research proposals.



# International Students

## Undergraduate Programmes

National University of Sciences and Technology (NUST) has some SAT specific seats in undergraduate programmes for international candidates.

NUST encourage and facilitate both foreign as well as Pakistani origin dual nationality holder students, to seek admission in NUST.

## General Eligibility Criteria:-

- » The following categories can only apply for international seats:
  - › Foreigners and Pakistanis having dual nationality, irrespective of the place of their study of HSSC or equivalent, Pakistan or abroad.
  - › Pakistani students studied abroad for HSSC or equivalent but appearing in the Pakistani board from abroad.
  - › Pakistani national students having passed an examination, equivalent to intermediate level of Pakistan, from a foreign education system.
- » Desirous candidates can avail the facility accordingly, provided they meet the specified eligibility criteria and are willing to pay tuition fee and allied charges of the category.
- » Separate application form will be used for applying on SAT basis, available on NUST website.
- » The applicant must have passed Higher Secondary School Certificate (HSSC) or equivalent qualification like Cambridge Overseas Higher School Certificate, British General Certificate of Education (Advanced Level), American High School Graduation Diploma (9-12th Grade) or any other equivalent qualification in relevant category showing twelve years of school education with minimum 60% marks, which is mandatory requirement.
- » In case of any foreign qualification, candidates have to obtain equivalence certificates from IBCC, Pakistan with required subjects and minimum 60% marks, which is a mandatory requirement.
- » Valid TOEFL or IELTS with score of 500 or 5.5. (not applicable for those students whose medium of instruction is English at HSSC level).
- » For all Programmes, a minimum of 550 SAT score is required in each subject. SAT scores are valid for two years only.
- » All Bachelor programmes at NUST are taught in English. No SAT based seats available in Avionics & Aerospace Engineering programmes.
- » The candidate should also possess adequate mental and physical health to continue his/her course of studies.

## Academic Requirements

### Engineering

HSSC (Pre- Engineering group) from any Board of Intermediate and Secondary Education OR an equivalent qualification like A level OR any other foreign qualification with Mathematics, Physics and Chemistry.

### Computing Programmes

**(Software Engg, Computer Engg, Information Security & BS Computer Science)**

HSSC (Pre- Engineering Group / General Science Group) from

any Board of Intermediate and Secondary Education OR an equivalent qualification like A level OR any other foreign qualification with Mathematics, Physics and Chemistry / Computer Science / Computer Studies.

## SAT Requirements

### Engineering

SAT Subject Test in

- » Mathematics Level II
- » Physics
- » Chemistry

### Computing Programmes

SAT Subject Test in

- » Mathematics Level II
- » Physics

SAT scores from College Board, USA should reach directly to NUST by July 15, 2021. NUST institutional code to receive SAT scores is 2790.

It is the responsibility of the candidate to enter their SAT scores in online application form by due date.

### For correspondence:

Undergraduate Section, Registrar Directorate, National University of Sciences and Technology (NUST), Main Office, Sector H-12, Islamabad, Pakistan.

Email : [satadmissions@nust.edu.pk](mailto:satadmissions@nust.edu.pk)

## Provisional Admission

On fulfillment of the requirements mentioned, a candidate will be admitted to the University as per policy in vogue. This admission shall, however, be provisional until all the original degrees or certificates submitted by him / her have been checked and verified. In case any document proves to be false, fake, or fabricated at a later stage, a provisionally admitted student shall be liable to expulsion from the University at any stage or to any other disciplinary or legal action the University may deem necessary.

On receipt of university admission / acceptance letter, foreign nationality holders will approach the Pakistani mission abroad for the visa and submit the following documents:-

- » Application Form (Student Visa Form)
- » Photocopy of passport
- » No Objection Certificate (NOC) issued by the home country for studying in Pakistan.
- » Photograph
- » Educational Documents
- » Admission letter of university

For more details, please visit the under mentioned link of Higher Education Commission (HEC), Pakistan: -<http://www.hec.gov.pk/InsideHEC/Divisions/AECA/Pages/AdmissionofForeignStudents.aspx>

## Merit List

Merit list of international students is prepared separately.

## Final Approval

Cases of the international students, finally selected for admission, will be referred to Higher Education Commission and relevant Government department(s) for final approval as per policy in vogue.

## Postgraduate Programmes

International students, Pakistanis holding foreign nationality and Pakistanis living abroad can apply for postgraduate programmes. They have to compete with the local students for admission on merit.

### Eligibility Criteria

Eligibility criteria is the same as for national students. International Students are only eligible for programme at Main Campus H-12, Islamabad.

### GRE Score

International applicants are required to appear for GRE conducted by ETS, USA. Last date for scores of GRE to reach NUST is July, 2021.

Minimum Score is mentioned below:

Quantitative	151/170
Verbal	146/170
Analytical Writing	3.5/6.0

» Degree must be in relevant discipline

The candidates are responsible for providing GRE score directly to NUST on the following address:

**Postgraduate Programme (PGP) Directorate,  
National University of Sciences and Technology  
Sector H-12, Islamabad, Pakistan.**

### Processing

- » Cases of international students selected for admission will be processed through HEC/relevant government departments.
- » International students have to obtain NOC from their respective Embassy in Pakistan.

### Accommodation

Hostel accommodation to international students is guaranteed.





## Fee & Funding

# National Students

## Undergraduate Programmes

### Fee Structure

Admission Dues	PKR
Admission Processing Fee (Non-refundable)	35,000
Security Deposit (Refundable)	10,000

#### Tuition Fee

Engineering & Computing Programmes (Per semester)	100,000
Miscellaneous dues (Per semester)	2,700

#### Payment of Dues

- » At the time of admission students have to pay the admission processing fee, security and full semester fee in advance. Dues have to be paid on semester basis.
- » Invoice/Challan for admission charges along with first semester fee and Provisional Selection Letter will be available on NUST website.
- » Tuition fee will be payable on semester basis. Students have to pay their fee in advance before the commencement of semester.

**Note:** All fees are subject to revision.

#### Merit-based Financial Assistance

A fixed amount is allocated for financial assistance, and will be provided to top 3 position holders of each section of a batch / class as per policy in vogue. Qualifying GPA is 3.5 or above in a semester

#### Need-based Scholarship/Fee Waiver

NUST has launched a need-based scholarship scheme to enable financially under-privileged but talented students to acquire higher education. Salient features of the scheme are:

- » Scholarships will be awarded to needy students of the new batch every year.
- » The scholarships will be for full duration on-campus of the programme in which the student is enrolled.

- » Awardees are given half/full tuition fee waiver. All financial challenged candidates are required to apply for NUST Need Based Scholarship by filling NUST financial aid application form (NFAAF) along with online admission application form.
- » NUST offers need based financial assistance to students from financially challenged backgrounds through its flagship programme the NEED Initiative (NUST Endowment for Educational Development). Students have to fill the need based scholarship form at the time of applying for admission at NUST, and if selected on merit, will be offered financial assistance.
- » Guidelines on how to apply for the need based scholarship can be viewed at <https://nust.edu.pk/admissions/scholarships/need-based-financial-aid/>
- » Details about the NEED initiative programme, operational since 2015, can be viewed at <https://advancement.nust.edu.pk/#/> as well as <https://www.facebook.com/NEEDInitiative>

#### Deferred Payments

- » Financially under-privileged students, who cannot pay their fees and also do not qualify for merit-based scholarship are allowed deferred payment, on case-to-case basis on completion of 1st semester of their studies.

#### Other Opportunities for Financial Assistance

- » PEEF, CMEEF (KPK), FEF and certain philanthropic organizations provide scholarships to the Financially challenged students studying at NUST. Such students will be informed on “how to apply?” once they are selected.
- » Students may also apply on their own for other scholarships such as those offered by:
  - » HEC Ehsaas Scholarship
- » Further details are available on NUST web portal and with the respective institutions.

**Note:** The award of scholarship/financial assistance is subject to availability of funds, high performance and good conduct of the students.

### Tuition Fee Refund Policy Applicable to both UG and PG Students

% age of Tuition Fee	Timeline for Semester/Trimester System
Full (100%) of Tuition Fee Refund	Apply upto 7th day of convening of classes
Half (50%) of Tuition Fee Refund	From 8th – 15th day of convening of classes
No Fee (0%) Refund	From 16th day of convening of classes

- » Admission Processing Fee is not refundable under any circumstances.
- » University will not accept any claim of refund after 3 years of the completion of degree / withdrawn from university and the amount of security will be transferred to the NUST Endowment Fund.

#### Fines/Penalties on Late Payments

Period	National Students	International Students
After the due date till start of semester	5% of the total payable amount	USD 35
From start of semester till 15th day *	10 % of the total payable amount	USD 70
16th day from start of semester *	Registration shall be suspended. For re-activation of registration, student will be required to pay the Admission Processing Fee again along with all outstanding charges and fines.	Registration shall be suspended. For re-activation of registration, the student will be required to pay the Admission Processing Fee again along with all outstanding dues.

\*In any case student will not be able to attend classes till clearance of dues.

## Postgraduate Programmes

### Masters

#### Fee Structure

Admission Dues	PKR
Admission Processing Fee (Non refundable)	10,000
Security Deposit (Refundable)	10,000
<b>Tuition Fee per Semester</b>	
Engineering Management and Construction Engineering & Management	115,000
Other Engineering/IT programmes	71,500
Miscellaneous dues (Per semester)	2,700

### PhD

#### Admission Dues

Admission Processing Fee (Non refundable)	5,000
Security Deposit (Refundable)	10,000

#### Tuition Fee per Semester

All programmes	71,500
Miscellaneous dues (Per semester)	2,700

#### Tuition fee can be exempted subject to certain conditions

**Note:** All fees are subject to revision.

#### Payment of Dues

- » At the time of admission students have to pay the admission processing fee, security and full semester fee in advance. Dues have to be paid on semester basis.
- » Invoice/Challan for admission charges along with first semester fee and Provisional Selection Letter will be available on NUST website.
- » Tuition fee will be payable on semester basis. Students have to pay their fee in advance before the commencement of semester.

#### Supervisor's Fee and Research Fund

- » Sponsored Students: As per scholarship/sponsorship award.
- » Non-Sponsored Students: To be paid by the University

## HEC and Other Sponsorships

HEC will bear the cost of its scholarship awardees, as per the scholarship award details. For other sponsored students, all charges as per the details provided above, will be borne by their sponsoring agency. Students will be responsible for timely

deposit of dues by their sponsoring agency. Scholarship provisions for postgraduate studies for candidates from FATA and Balochistan are also available through HEC for which they may apply directly to HEC.

## Merit-based Scholarship/Tuition Fee Waiver

### MS Programmes

- » Selected students are awarded monthly stipend of **Rs 18000/-** pm and tuition fee waiver.

### PhD Programmes

- » NUST sponsored PhD students will be paid monthly stipend of **Rs 30,000/-** pm and tuition fee waiver in addition to supervisor remuneration.
- » There are numerous opportunities for additional academic pursuits, e.g. students will be provided financial support for attending seminars, conferences and making presentations/publication of research papers within Pakistan and abroad.
- » During research phase of PhD studies at NUST, students can also get an opportunity for collaborative/joint research training programmes with other well-reputed foreign universities.
- » Full time PhD students can also be exempted from payment of tuition fee, if they are willing to do Teaching Assistant (TA)/Research Assistant (RA) duties and fulfilled other conditions.

### Bond for NUST Sponsored Students

- » NUST sponsored MS/PhD students will be required to complete the programme.
- » NUST sponsored MS/PhD Students will work as TA/RA, as and when required.
- » The students who fail or do not fulfil the undertaking, will have to reimburse the total amount spent on them (including Tuition Fee, Stipend, Supervisor's Fee and Research Expenditure, etc).

### Need-based Scholarship/Fee Waiver

NUST has launched a need-based scholarship scheme to enable financially under-privileged but talented Masters students to acquire higher education. Salient features of the scheme are:

- » Scholarships will be awarded to needy students of the new batch every year.
- » The scholarship will be for full duration (2 years) of the programme in which the student is enrolled.
- » Awardees are given half/full tuition fee waiver

### Other Opportunities for Financial Assistance

- » PEEF, CMEEF (KPK), FEF and certain philanthropic organizations provide scholarships to the Financially challenged students studying at NUST. Such students will be informed on “how to apply?” once they are selected.

## International Students

### Undergraduate Programmes

#### Finances (UG Programmes)

Students selected through this process will be required to pay their fees and other charges in USD.

#### Fee Structure

Engineering and Computing Programmes	USD
Admission Processing Fee (Non-refundable)	600
Tuition Fee (Per Annum)	4900
Security Deposit (Refundable)	250
Health Facilities (per annum)	120

- » Tuition fee for the first academic year (two semesters) will be deposited (as per selection letter).
- » Tuition fee will be payable on annual basis. Students have to pay their fee in advance before the commencement of the academic year, otherwise they will not be eligible to sit in the class.
- » **All fees are subject to revision from time to time.**

### Postgraduate Programmes

#### Finances (PG Programmes)

International students selected through this process will be required to pay the applicable charges in USD. Please note that admission is granted only to those candidates who come up to the required position on the merit list meant for open merit.

#### Fee Structure

The fee structure of the programmes of study is as under:

	MPhil/MS		PhD
	Engineering Management and Construction & Engineering Management	Other Engineering/IT programmes	All Programmes
<b>One Time Charges:</b>	<b>USD</b>	<b>USD</b>	<b>USD</b>
Admission Processing Fee	60	60	30
Security Deposit (refundable)	60	60	60
Semester Fee	663	431	431
Course Repeat Fee (Per Credit Hour)	40	40	40

### Monthly Accommodation Charges (H-12 Campus)

#### Single Students

» Single occupancy (with attached bath)	USD 70
» Double occupancy (with attached bath)	USD 60
» Double occupancy (with community bath)	USD 50
» Tripple occupancy with community bath	USD 40

#### Married Students

» One bedroom apartment	USD 120
» Two bedroom apartment	USD 170

#### Note

- » Security Fee of USD 117/- (Refundable) will be charged at the time of allotment.
- » Hostel includes accommodation charges only.

Accommodation information in NUST Colleges can be found in their respective sections of the prospectus.





Following are the major organizational donors who are supporters of the programme through creation of permanent seats at NUST. There are numerous other donors supporting the programme through student adoption via annual fund and Zakat contributions. The detailed list of partners can be viewed at <https://advancement.nust.edu.pk/#/OurPartner>

- Asghar Butt & Nisar Aziz Butt Scholarship Endowment Fund
- Jawaher Fund for Advancement of Women Education
- NTF FC Quetta Endowment Fund
- Shamir Cheema Endowment Fund
- NUSTIAN USA Endowment Fund
- NTF Bestway Scholarship Fund
- NTF UBL Endowment Fund
- Akhter Hameed Khan Memorial Scholarship Fund
- NUST-HBL Scholarship Fund
- AKD Securities Scholarship Fund
- NUST MOL Pakistan Scholarship Endowment Fund
- NTF Netsol Tech Endowment Fund
- NTF Salman Butt & Mrs Saleeha Butt Endowment Fund
- NTF Fahmeeda Atiq Foundation Endowment Fund
- NTF Dawlance Pvt Ltd Endowment Fund
- Persual of Happiness Endowment Fund
- NTF DAAS Foundation Sch Endowment Fund
- NTF Feroz Alam Endowment Fund
- NTF Nafees Nagi Endowment Fund
- NTF Tufail Chemicals Endowment Fund
- NTF Creek Developers Scholarship Endowment Fund
- NTF ABAD Scholarship Endowment Fund
- NTF Textile Premium Endowment Fund
- NTF Fauji Cement Endowment Fund
- NEED Batchmark Endowment Fund
- NTF Lucky Cement Endowment Fund
- Atlas-NUST Scholarship Endowment Fund
- NTF Fatima Fertilizer Sch Endowment Fund
- NTF Hilton Pharma Endowment Fund
- Siddique Shafi Trust Endowment Fund
- Muhammad Umar Khan (Shaheed) Scholarship Fund
- Haidri Beverage (Pepsi) Scholarship Fund
- PPAF Scholarship Endowment Fund
- NTF SONA Welfare Endowment Fund

# NUST Entry Test (Computer Based)

- » NUST Entry Test (computer based) will be held in multiple sessions. Paper based test will be held in Karachi and Quetta in (April and July).
- » Computer-based test is designed in accordance with the internationally practiced system of on-line examinations. It is easy to attempt with minimal practice. Instructions to attempt computer-based Entry test alongwith sample test module will be available on NUST website for guidance.
- » The pattern and the standard of question papers for both types of tests is the same.
- » All kinds of data carriers and calculators, including mobile phone, Bluetooth, hands free devices, etc, are strictly prohibited inside the examination hall.

Mathematics SAMPLE USER971 STUDENT NAME 971

Question No : 6 of 200 (Attempted:34) Maximize \ Restore Photograph

Question

If  $y_1$  is solution of the differential equation, then formula for finding Second solution of  $y'' + P(x)y' + Q(x)y = 0$  is

Answer ( Please select your correct option )

$y_2 = y_1 \int \frac{e^{-\int P dx}}{y_1^2} dx$

$y_2 = y_1 \int \frac{e^{-\int P dx}}{y_1^2} dx$

$y_2 = y_1 \int \frac{e^{\int P dx}}{y_1^2} dx$

$y_2 = y_1 \int \frac{P dx}{y_1^2} dx$

Start Time: 12:56 PM

166 min Remaining

6

ALL  
Reviewable  
Attempted  
UnAttempted

3 Save

4 Next

7 Prev

Review

5 Next Section

Prev Section

First

Last

8 Help

FEEDBACK

[Click here to FINISH Your Test](#)

# Instructions for Paper-based Entry Test of Engineering and Computer Science

The Entry Test will be held for applicants in the following subjects:

- a. **Mathematics**
- b. **Physics**
- c. **Chemistry/Computer Science**
- d. **English**
- e. **Intelligence**

These instructions deal with multiple choice answer sheets, which will be provided for examination. The answer sheets will have two parts, i.e., personal information and answers. A filled in answer sheet is printed on the next page for illustration and guidance. Answer sheets are marked through computer, therefore, it is important that the candidates read and understand these instructions thoroughly before taking the exam. Non-compliance will affect scoring adversely.

**PERSONAL INFORMATION** (See appropriate block in the specimen answer sheet). Exam superintendent will brief on filling in of this portion before start of the exam.

- » Clearly write your name in Capital Letters in the box titled **FULL NAME**. Fill corresponding circles. If the name is longer than the space provided, fill in as much as fits in the given space. (In the specimen answer sheet, **Ali Nawaz** is the name of a candidate).
- » Write your Roll No in the box titled **ROLL No**. (In the specimen answer sheet, the Roll No of the candidate is **16245016**).
- » In the SUBJECT column, use “**111**” as subject code for Engineering and “**222**” Computer Science.
- » In the SEQ CODE column, write NET Code written inside the question booklet. (SEQ Code 01 is marked in the specimen answer sheet).
- » In the **CITY/CENTRE** column, use the following codes and fill in the corresponding circles. (In the specimen sheet, **IS** is marked for Islamabad). **KI:** Karachi **QA:** Quetta **IS:** Islamabad
- » Put your date of birth in the column Date of Birth. 11-04-85 is marked as the Date of Birth on the specimen sheet.
- » In the **SEX** column, fill **M** for male candidates and **F** for female candidates and **O** for other candidates. (In the example a male candidate is marked).

## MARKING OF ANSWER SHEET

In the specimen answer sheet, first 6 questions have been attempted. See the specimen sheet and the following instructions:

- » Mark your choice with **2B lead pencil** by filling in the appropriate circle completely, making it a dark black circle as shown below.
- » Some examples of improper marking are shown below:

(The computer will mark improperly filled circle as wrong answer)

- » Do not mark more than a single circle for an answer choice. Multiple answers for a single question will be regarded as an unanswered question.
- » If you need to erase an answer, do so clearly/cleanly, using a good quality eraser.
- » Do not bend/fold your answer sheet, make stray marks or mark any area outside the provided circles.

## MISCELLANEOUS

- » **Answer sheet is to be signed both by the invigilator as well as by the candidate, in respective blocks, with ballpoint pen only.**
- » **PLEASE DON'T FORGET TO BRING A CLIPBOARD ALONG.**
- » **USE 2B lead pencil only. DO NOT USE ink pens, ballpoint pens or felt-tip pens on the answer sheet.**
- » You are allowed to bring along clipboard, pencils, eraser and sharpener only.
- » Use your time effectively. Do not spend too much time on one question, otherwise you will run short of time for other questions.
- » Write your **Roll No** on the front page of the **QUESTION BOOKLET** and the back side of the answer sheet in the given blocks. Do not write elsewhere.
- » **Return the complete questions booklet along with the answer sheet** on completion of the test.
- » You are not allowed to take away any part of the question booklet or note questions elsewhere. Non-compliance will be regarded as use of unfair mean.
- » You are **NOT ALLOWED** to use any device which could assist in calculation such as a **calculator, tables, digital watch, mobile phone, electronic diary, Palm Pilot, etc.**
- » **There is no negative marking.**





## The NUST Emblem

The Book of Knowledge lights up the darkness, through the Vine of Wisdom which bears the two moons and stars facing towards the East and the West, symbolising the diversity of disciplines and the fruit of knowledge.

The Rising Sun brings change, hope and enlightenment. It emanates inspiration and from the light of knowledge, four birds take wing from the nests of light, and spread out to the four corners of the world, symbolising the quest for spiritual gratification through knowledge and wisdom.

The NUST Blue is a colour that represents the future. It carries all the characteristics of the colour blue, like dignity, grace, freshness, professionalism, prudence and resolve.



## National University of Sciences & Technology

📍 ISLAMABAD 📍 RAWALPINDI 📍 RISALPUR 📍 KARACHI 📍 QUETTA

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