National University of Sciences & Technology (NUST)
School of Electrical Engineering and Computer Science (SEECS)
Department of Humanities and Sciences

Multivariate Calculus			
Course Code:	MATH-234	Semester: 3rd	
Credit Hours:	3+0	Prerequisite Codes:	
Instructor:		Discipline: BSCS	
Office:		Telephone:	
Lecture Days:		E-mail:	
Class Room:		Consulting Hours:	
Knowledge Group: Calculus		Updates on LMS:	

Course Description:

 The course introduces functions of several variables, partial differentiation with applications. Important quadric surfaces are included while students also become familiar with 3-dimensional cylindrical and spherical coordinate systems. Double and triple integration are included with applications to find areas and volumes. In the second part advanced topics in vector analysis like calculus of del operator, gradient, curl and divergence along with their physical interpretations are covered. The course also covers Fourier Series: periodic functions, Functions of any period P-2L, Even & odd functions, Half Range expansions and Fourier Transform.

Course Objectives:

The course objective is that its successful completion should develop understanding of multivariable functions, partial differentiation and multiple integrals. The applications will be covered from several engineering problems. The other objective is to learn basic vector differential operators, gradient, divergence and curl along with their applications to calculate surface integrals, flows, flux across surfaces, Fourier series and transforms.

Course Learning Outcomes (CLOs):

After successful completion of this course, a student should be able to:	PLO	BT Level*
[CLO - 1] Describe the functions of several variables and partial derivatives with applications to find extrema and saddle points.	2	C-1
[CLO - 2] Apply the theory to calculate the gradients, area of surfaces and volumes of solids.	1	C-3
[CLO - 3] Represent a given function into Fourier series and Fourier transform.	1	C-2
* BT= Bloom's Taxonomy, C=Cognitive domain, P=Psychomotor domain, A= Affective domain		

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Mapping of CLOs to Program Learning Outcomes

PLOs/CLOs	CLO1	CLO2	CLO3
PLO 1 (Engineering Knowledge)	√		
PLO 2 (Problem Analysis)		√	√
PLO 3 (Design/Development of Solutions)			
PLO 4 (Investigation)			
PLO 5 (Modern tool usage)			
PLO 6 (The Engineer and Society)			
PLO 7 (Environment and Sustainability)			
PLO 8 (Ethics)			
PLO 9 (Individual and Team Work)			
PLO 10 (Communication)			
PLO 11 (Project Management)			
PLO 12 (Lifelong Learning)			

Books:

Text Books:
- Thomas's Calculus (11th Edition) George B. Thomas, Jr.
- Calculus (6th Edition) James Stewert.
- Advanced Engineering Mathematics (9th Edition) Ervin Kreyszig
- Calculus (6th Edition) Swokowski, Olinick and Pence Borisenko & Taranov, Vector and Tensor Analysis with Applications.

Sr. No	Main Topics to be covered	Estimated Contact Hours
1	Function of several variables, limits and continuity	4
2	Quadratic Surfaces	2
3	Relative changes, Partial Differentiation, local and absolute extremas, saddle point and their applications	6
4	Cylindrical and Spherical coordinates	2
5	Double integrals and areas of irregular regions	3
6	Triple integrals, change of order of integration	3
7	Volumes of surfaces and multiple integrals in different coordinate systems	4
8	Vector fields, gradient, directional derivatives and its geometrical understanding	4
9	Concepts of divergence and curl, vector differential identities	2
10	Tangent planes and Normal Lines.	3
11	Taylor series Expansion in multivariables.	3
12	Fourier Series, Periodic functions.	3
13	Functions of an arbitrary period P.	2
14	Even & odd functions, Half Range expansions.	2

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15	Complex Fourier series	2
	ESE	

Weightages:	
Quizzes:	10%
Assignments:	10%
OHT-1:	15%
OHT-2:	15%
Final Exam:	50%

Grading Policy:	
Quiz Policy:	The quizzes will be unannounced and normally last for ten minutes. The question framed is to test the concepts involved in last few lectures. Number of quizzes that will be used for evaluation is at the instructor's discretion. Grading for quizzes will be on a fixed scale of 0 to 10. A score of 10 indicates an exceptional attempt towards the answer and a score of 1 indicates your answer is entirely wrong but you made a reasonable effort towards the solution. Scores in between indicate very good (8-9), good (6-7), satisfactory (4-5), and poor (2-3) attempt. Failure to make a reasonable effort to answer a question scores a 0.
Assignment Policy:	In order to develop comprehensive understanding of the subject, assignments will be given. Late assignments will not be accepted / graded. All assignments will count towards the total (No 'best-of' policy). The students are advised to do the assignment themselves. Copying of assignments is highly discouraged and violations will be dealt with severely by referring any occurrences to the disciplinary committee. The questions in the assignment are meant to be challenging to give students confidence and extensive knowledge about the subject matter and enable them to prepare for the exams.
Plagiarism:	SEECS maintains a zero tolerance policy towards plagiarism. While collaboration in this course is highly encouraged, you must ensure that you do not claim other people's work/ ideas as your own. Plagiarism occurs when the words, ideas, assertions, theories, figures, images, programming codes of others are presented as your own work. You must cite and acknowledge all sources of information in your assignments. Failing to comply with the SEECS plagiarism policy will lead to strict penalties including zero marks in assignments and referral to the academic coordination office for disciplinary action.

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Sr. No	Main Topics to be covered	Estimated Contact Hours
1		
2		
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