

Electronics Engineering

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| Code EE-227 | Credit Hours 2-1 |
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COURSE DESCRIPTION:

This course covers the elementary concepts required for the analysis and design of electronic circuits. Construction and device characteristics of semiconductor diodes, BJT, and Op Amp circuits. The course will also build the concepts of Digital Systems including binary adder, decoder, multiplexer. A brief introduction of microprocessor and microcontroller architecture will also be taught as a part of this course.

TEXT AND MATERIAL

Textbooks:

1. Electronic Principles Latest Available Edition by Albert Malvino (Author), David Bates (Author)
2. Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog Latest Available Edition by M. Morris Mano (Author), Michael Ciletti (Author)
3. Electrical Fundamentals by Aviation Maintenance Technician Certification Series, Latest Available Edition
4. Electronic Fundamentals by Aviation Maintenance Technician Certification Series, Latest Available Edition
5. Digital Techniques Electronic Instruments by Aviation Maintenance Technician Certification Series, Latest Available Edition

Reference Material:

1. 8051 Microcontroller, 4th Edition, Scott Mackenzie

PREREQUISITE:

Electrical Engineering

ASSESSMENT SYSTEM FOR THEORY

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| Quizzes | 10% |
| Assignments | 10% |
| Mid Terms | 30% |
| ESE | 50% |

ASSESSMENT SYSTEM FOR LAB:

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| Quizzes | 10%-15% |
| Assignments | 5% - 10% |
| Lab Work and Report | 70-80% |
| Lab ESE/Viva | 20-30% |

Teaching Plan

| Week No | Topics | Learning Outcomes | Delivery Method |
|----------------|------------------------------------|--|------------------------|
| 1/1 | Semiconductors | Introduction to semiconductors and principle of semiconductor components | Lecture and discussion |
| 1/2 | Diode | Basic principle of diode, biasing and Diode 1 st , 2 nd and 3 rd approximations | Lecture and discussion |
| 2/1 | Diode resistances | I-V characteristics, Bulk, Forward, DC, Ac resistances | Lecture and discussion |
| 2/2 | Rectification | Bridge rectification, Half wave rectifier, Full wave rectifier. | Lecture and discussion |
| 3/1 | Regulators: | Diodes as regulators, Zener diode. Clipper and Clamper | Lecture and discussion |
| 3/2 | Power Supply design | DC power supply design, filtering capacitor. | |
| 4/1 | Bipolar Junction Transistor | Introduction to BJTs, Operation parameters. | Lecture and discussion |
| 4/2 | BJT Configurations: | Common Emitter, BJT as amplifier | Lecture and discussion |
| 5/1 | BJT Amplifiers | Small signal amplification, Q point calculations | Lecture and discussion |
| 5/2 | BJT Applications | BJT as switch, Gates | Lecture and discussion |
| 6/1 | Digital System | Difference between Digital and analog system, Number system | Lecture and discussion |
| 6/2 | Number System | Conversion between different number system Present the developed solutions | |
| 7/1 | Boolean Algebra | Introduction to Boolean functions | Lecture and discussion |
| 7/2 | Boolean Maps | Mapping system, Don't care condition | Lecture and discussion |
| 8/1 | Combinational Logics | Designing of binary Adder and Subtractor | Lecture and discussion |
| 8/2 | Combinational Logics | Decoder, Encoder, Multiplexer | Lecture and discussion |

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| 9 | MID TERM EXAM | | |
| 10/1 | Sequential Logic | Latches, Flip Flops | Lecture and discussion |
| 10/2 | Programmable Logic | Memory Registers, RAM, ROM | Lecture and discussion |
| 11/1 | Data Conversion | Analog to Digital Convertors | Lecture and discussion |
| 11/2 | Data Conversion | Digital to Analog Convertors | Lecture and discussion |
| 12/1 | Microprocessor and controllers | Introduction to Microprocessors and microcontrollers | Lecture and discussion |
| 12/2 | 8086 Microprocessor | Introduction to 8086 Architecture | |
| 13/1 | 8051 microcontroller | Introduction to 8051 Architecture | Lecture and discussion |
| 13/2 | AVR Architecture | Introduction to AVR Architecture, AVR atmega328 | |
| 14/1 | Programming a microcontroller | Arduino Nano Programming | Lecture and discussion |
| 14/2 | General Purpose I/O | Input Output ports configuration | |
| 15/1 | Timer | Timer introduction and PWM programming | Lecture and discussion |
| 15/2 | Serial Communication | UART programming | Lecture and discussion |
| 16/1 | ADC | Analog to Digital Convertor Programming | Lecture and discussion |
| 16/2 | Interrupts | Intro to Microcontroller interrupts | Lecture and discussion |
| 17/1 | Filters | Operation, application and uses of the following filters: low pass, high pass, band pass, band stop. | |
| 17/2 | Electromagnetic Environment | Influence of the following phenomena on maintenance practices for electronic system: EMC-Electromagnetic Compatibility EMI-Electromagnetic Interference HIRF-High Intensity Radiated Field Lightning/lightning protection. | |
| 18 | End semester exam (ESE) | | |

List of Experiments

| Sr. No. | List of Experiments | Equipment's Used | Assessment |
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| 1 | Introduction to Oscilloscope and Function Generators | CRO, Function Generator | Lab reports and viva |
| 2 | Diode Characteristics | 1n4007 Diode | Lab reports and viva |
| 3 | Half and Full Wave Rectification | 1n4007 Diodes, CRO | Lab reports and viva |
| 4 | Clipping and Clamping Circuits | 1n4007 Diodes, CRO | Lab reports and viva |
| 5 | Light Emitting and Zener Diodes | LEDs, Zener Diodes & CRO | Lab reports and viva |
| 6 | Bipolar Junction Transistor Characteristics | BJTs, Power Supply, CRO | Lab reports and viva |
| 7 | Introduction to Logic gate and Logic Gate ICs | Logic Gate ICs i.e. 7486,7408,7432,7404,7400 etc | Lab reports and viva |
| 8 | Implementation of Boolean Expression through logic gates and verification of De-Morgan's Law. | Logic Gate ICs i.e. 7486,7408,7432,7404,7400 etc | Lab reports and viva |
| 9 | Implementation of XOR and XNOR gates using NAND Gates | Logic Gate ICs i.e. 7486,7408,7432,7404,7400 etc | Lab reports and viva |
| 10 | Implementation of Half Adder using fundamental Logic gate ICs | Logic Gate ICs i.e. 7486,7408,7432,7404,7400 etc | Lab reports and viva |
| 11 | Implementation of Half Adder using Universal Gate ICs. | Logic Gate ICs i.e. 7486,7408,7432,7404,7400 etc | Lab reports and viva |
| 12 | Implementation of Full Adder | Logic Gate ICs i.e. 7486,7408,7432,7404,7400 etc | Lab reports and viva |
| 13 | Implementation of Full Subtractor Circuit. | Logic Gate ICs i.e. 7486,7408,7432,7404,7400 etc | Lab reports and viva |
| 14 | Introduction and Implementation of Flip Flops using NAND and NOR Gates. | Logic Gate ICs i.e. 7486,7408,7432,7404,7400 etc | Lab reports and viva |