

## (i) COs

### M.Sc. (Electronics)

#### Course Outcomes (CO)

##### COs of the course “High-level Computer Language and Operating System”

CO1 The emphasis is to provide a rigorous theoretical background in high level computer language and operating system.

CO2 Helps students to get jobs in software industry, in telecom industry etc and to pursue higher studies in this field.

##### COs of the course “Engineering Mathematics”

CO1 The course provides a theoretical background in advanced engineering mathematics which provides a good background for other theoretical courses.

CO2 It is aimed at honing the analytical skills which are helpful to those which join industry or go for higher studies.

##### COs of the course “Network Analysis and Synthesis”

CO1 This is a rigorous course which focuses both on analysis and synthesis

CO2 Provides a good background to students who wish to join industry or those who want to go for higher studies as the course forms an important background for other electronics courses as well.

CO3 It is particularly useful for students who wish to join industry as analog or digital layout engineers

##### COs of the course “Advanced Analog and Digital Circuit Design”

CO1 The course focuses on theoretical skills in the area of analog and digital circuit design

CO2 It is in keeping with the current trends and is particularly useful for students who wish to join industry as analog or digital layout engineers

##### COs of the course “Practical I : High level Computer Languages and Operating Systems”

CO This course provides practical knowledge to supplement paper High level Computer Languages and Operating Systems

COs of the course "Practical II : Electronic Circuits"

CO This course provides practical knowledge to supplement paper 1.3 and 1.4 and provides rigorous training to students in circuit design and simulation of analog and digital circuits.

COs of the course "Practical III : Microprocessors

CO1 The laboratory course provides a system level understanding of the 8086 microprocessor involved in the design of microprocessor based electronic equipment.

CO2 It involves in depth studies of software architecture, instruction set and assembly level programming with PC interfacing

COs of the course "Practical IV : Computational Techniques"

CO This supplements paper Engineering Mathematics

COs of the course "Electromagnetics, Antenna and Propagation"

CO1 This provides a good theoretical background for basic electromagnetics and transmission lines.

CO2 Is particularly useful for students planning to join photonics and microwave industry

COs of the course "Semiconductor Devices and Materials"

CO 1 The course provides an understanding of electronic materials and devices used in the semiconductor industry.

CO2 Equips students with understanding of devices used in the semiconductor industry.

COs of the course “Microprocessors”

CO1 This course provides rigorous background in microprocessors and microcontrollers.

CO2 Enhances understanding of concepts useful in Embedded systems.

COs of the course “Signal Systems and Control ”

CO1 This paper develop understanding of various kinds of signals

CO2 Explains how these are useful in describing the electronic power and energy.

COs of the course “Practical I - Electromagnetics”

CO This supplements paper Electromagnetics, Antenna and Propagation

COs of the course “Practical II - Materials and Semiconductor Devices ”

CO This supplements paper Semiconductor Devices and Materials

COs of the course “Practical III - Circuit Design and Simulation ”

This hones the practical knowledge in the areas of circuit design and simulation tools used for analog/digital applications

COs of the course “Practical IV : Electrical Machines and Control Systems”

CO This supplements paper Semiconductor Devices and Materials

COs of “Summer Training”

CO1 Students undergo 2 months training in industry and R&D organizations CO2 This provides the necessary exposure to the current trends in industry and R&D

COs of the course “Optical Electronics”

CO1 This paper covers various optical effects and the design , operation of optical devices

COs of the course “Integrated Circuit Technology”

CO1 This course provides necessary background in the IC technology

CO2 This course provides the required exposure which is useful to students looking forward to join the semiconductor or fabrication industry.

COs of the course “Digital Signal Processing”

CO1 Signal and System as well DSP is backbone of modern electronics.

CO2 In this course students are trained rigorously in transforming discrete time domain signal into frequency domain signal using Z-transform.

CO3 Students are exposed to various structures of both infinite impulse response as well as FIR ( finite impulse response), Digital filters which are the ultimate base of this course .

CO4 Since we in an era where fast computation is mandatory the students are also exposed to digital Fourier transform, which is backbone of FFT algorithm.

COs of the course “Communication Systems ”

CO1 This provides background for students who wish to join communication, telecom, space industry

COs of the course “Practical I : Optical Electronics ”

CO1 This supplements paper Optical Electronics

COs of the course “Practical II : Science and Technology of Semiconductor Devices

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CO 1 This supplements paper Integrated Circuit Technology

COs of the course “Practical III : Digital Signal Processing ”

CO This supplements paper Digital Signal Processing

COs of the course "Practical IV : Communication Systems"

CO This supplements paper Communication Systems

COs of the course "Quantum Electronics "

CO1 This course provides a rigorous study of quantum phenomena taking place in devices at nanoscale regime

CO2 This paper enhances understanding of devices operating in this regime.

COs of the course "VLSI Circuit Design and Device Modelling"

CO1 This course provides a rigorous theoretical background in the areas of VLSI device and circuit technology

CO2 Is extremely helpful to students who wish to join the semiconductor, VLSI industry.

COs of the course "Modern Communication Systems

CO1 This provides background for students who wish to join communication, telecom, space industry

COs of the course "Microwave Electronics"

CO1 This provides background for students who wish to join microwave and space industry

COs of "Seminar"

CO1 Students are required to give presentations in current trends in industry and R&D.

COs of "Lectures from Industry"

CO Department invites experts from Industry and R&D organizations to give lectures and seminars to provide exposure to students to the current trends and an exam is held at the end of the semester

### COs of "Project"

CO As a part of Curriculum, students perform projects with their respective mentors in order to enhance their understanding in the electronics and practical problems

### **M. Tech. ( Microwave Electronics)**

#### COs for the course "Electromagnetic Theory and Transmission Lines"

CO1 Provides a good understanding of Electromagnetic Theory basics

CO2 allows detailed study of Transmission Line, with the use of EM Theory, Maxwell equations and Smith chart

CO3 helps to develop understanding in the propagation of EM waves

#### COs for the course " Microwave and MM-Wave Planar Transmission Lines "

CO1 gives introduction of Microwave planar transmission lines

CO2 describes the properties and behaviour of various transmission lines like microstrip line , strip line , coupled line and coplanar waveguide

#### COs for the course " Microwave Measurement Techniques and Industrial Microwaves"

CO1 describes the requirements of microwave parameters and their measurements using Microwave Instruments.

CO2 describes the exposure to Basic microwave measurement set up and helps to understand the propagation of microwaves and the role of each microwave components.

CO3 describes design and measurements for Electromagnetic Interference free environment.

#### COs for the course " Microwave Devices"

CO1 describes the basic construction details, working and operation of solid state devices, vacuum tubes based devices

CO2 helps to understand the non-linear applications in microwaves like amplifier, oscillator, mixer etc. using these devices

#### COs for the course "Microwave Measurements Laboratory"

CO1 supplements the learning developed by paper 1.1 - 1.4.

#### COs for the course " Microwave Passive Components and Circuits"

CO1 provides exposure to design microwave passive component, Transmission Line section basic component, microwave Filters, Non Reciprocal devices etc.

CO2 describes basics of MEMS Technology based Microwave Components.

#### COs for the course "Antenna Theory and Techniques"

CO1 describes working principle, parameters of antenna and antenna array

CO2 helps to understand the design aspect and application of different antennas like patch , horn antenna, array etc.

#### COs for the course "Communication Theory and Wave Propagation"

CO1 describes various Wave Propagation mechanism (Reflection, Diffraction, Scattering)

CO2 gives Concept of Random variables in Communication System Design

#### COs for the course "Computational Electromagnetics"

CO describes 2D and 3D Electromagnetic Solution Methods

CO2 provides the solution methods (FDTD, MOM, Green's Functions) used in various E-M solver software to solve different microwave structures.

#### COs for the course "Computational Laboratory "

CO1 provides an opportunity to design and analyze the various microwave passive components and use computational electromagnetic methods.

COs for the course " Microwave Active Circuits "

CO1 helps to learn the design techniques of active microwave circuits like amplifiers, oscillators, mixers.

CO2 develops understanding in deciding the features of such active components for certain applications

COs for the course " Communication Systems "

CO1 gives understanding in design requirement and types of various communication modes like Wireless Communications, Satellite Communications, Optical Fibre Communication.

COs for the course " Microwave Integrated Circuits (CAD, Fabrication and Measurements)"

CO1 provides design, fabricate and test the microwave components by the students

CO2 helps to develop various interpersonal skills like independent thinking, analytical, practical approach etc.

COs for the course " Major Project (six months duration)"

CO1 engages the students with external organization for their on-site training and exposure

CO2 exposes students to most advanced facility available in the Microwave field.

**Program: M.Sc. Electronic Science**  
**Program Specific Outcomes (PSO)**

**PSO1 Computer knowledge:** computer facilities in the department can provide computational techniques, understanding of numerical techniques and efficient practices in programming languages.



**PSO2 Engineering knowledge:** The knowledge of mathematics, electronic engineering fundamentals, and modelling of electronic devices specialization to the solution of complex electronic problems.

**PSO3 Analytical skills:** The courses like engineering mathematics enhance the analytical skills which serve a useful background for other courses as well and is useful to those who wish to pursue higher studies in the areas of modeling and theoretical studies etc.

**PSO4 Electronic Material Fabrication and Characterizations:** The material laboratory provides experimental set ups to fabricate/develop electronic materials and facilities for characterization.

**PSO5 Network Analysis & Synthesis and Analog/Digital Circuit Design** The course provides rigorous theoretical and practical background in the areas of network analysis and synthesis and analog/digital circuit design which is extremely useful to students who wish to join industry, R&D organizations or want to pursue higher studies.

**PSO6 VLSI Circuit Design & Device Modeling** The course provides rigorous theoretical and practical background in the area of semiconductor devices, circuits etc which is extremely important and helpful to students who wish to join semiconductor industry, R&D organizations or want to pursue higher studies. The course enhances the knowledge which is useful for application in these areas and also updates about the current technological trends in industry.

**Program: M.Tech Microwave Electronics**

**Program Specific Outcomes (PSO)**

**PSO1 Computer knowledge:** computer facilities in the department can provide computational techniques, understanding of numerical techniques and efficient practices in programming languages.

**PSO2 Engineering knowledge:** The knowledge of mathematics, electronic engineering fundamentals, and modelling of electronic devices specialization to the solution of complex electronic problems.

**PSO3 Analytical skills:** The courses like engineering mathematics enhance the analytical skills which serve a useful background for other courses as well and is useful to those who wish to pursue higher studies in the areas of modeling and theoretical studies etc.

**PO4 Microwave Integrated Circuits:** Design and simulation of passive components using 3D simulation tools