Scheme & Syllabus of UG

Engineering Program

Bachelor of Technology

(B.Tech.)

Electronics & Communication Engineering

2024 - 25

IPS ACADEMY

INSTITUTE OF ENGINEERING & SCIENCE, INDORE

(A UGC Autonomous Institute affiliated to RGPV)

IPS Academy, Institute of Engineering & Science, Indore
(A UGC Autonomous Institute, Affiliated to RGPV)
Scheme & Syllabus Based on AICTE Flexible Curricula (B. Tech.)
Electronics & Communication Engineering Department

Bachelor of Technology (B.Tech.) VIII Semester

S.No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory			Practical						
				End Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem	Term work Lab Work & Sessional		L	T	P	
1.	PEC-EC06	PEC	Professional Elective Courses-VI	60	25	15	-	-	100	3	-	-	3
2.	PEC-EC07	PEC	Professional Elective Courses-VII	60	25	15	-	-	100	3	-	-	3
3.	IOC-XXXX	IOC	Interdisciplinary Open Course-II	60	25	15	-	-	100	3	-	-	3
4.	PROJ-EC05	PROJ	Project Phase II	-	-	-	120	80	200	-	-	16	8
5.	Additional Credits#	*#Additional credits can be earned through successful completion of credit based MOOC's Courses available on SWAYAM platform (MHRD) at respective UG level.*											
			Total	180	75	45	120	80	500	09	-	16	17

Professional Elective Courses-VI	Professional Elective Courses-VII	Interdisciplinary Open Course-II
PEC-EC06 (A) Mobile and Satellite Communication	PEC-EC07 (A) Computer Network	IOC-EX02 (A) Electric and Hybrid Vehicle
PEC-EC06 (B) Analog Mixed Signal Design	PEC-EC07 (B) TV & Radar Engineering	IOC-CS01 (B) Digital Marketing and SEO (CS01)
PEC-EC06 (C) SDR and Cognitive Radio	PEC-EC07 (C) Artificial Neural Network	IOC-CS09 (C) E- Commerce and Web Technology (CS09)
PEC-EC06 (D) Electronic Packaging Technologies	PEC-EC07 (D) Nano Electronics	IOC-ME01 (D) Ergonomics (ME01)

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	**1 Credit**	**1 Credit**

PEC-EC06 (A)	Mobile & Satellite Communication	3L: 0T: 0P (03 hrs.)	Credits: 03

Prerequisite: Communication Engineering, Wireless Communication, Digital Communication

Course Objective: Objective of the subject is to have understanding of Mobile Communication, Satellite systems and its applications.

MODULE I **(8 hrs.)**

Introduction to wireless communication systems, different generations of wireless networks, GSM, 5 G technology and its performance, Cellular system design fundamentals, frequency reuse, handoff strategies, Interference and system capacity, Trunking and grade of service.

MODULE II **(8 hrs.)**

Mobile radio propagation**:** free space propagation model, Ground reflection propagation model, Long term fading, Small scale multipath propagation, Time dispersion parameters, Coherence bandwidth, Doppler spread and coherence time, types of small scale fading, Clarke's model for flat fading, level crossing and fading statistics.

MODULE III **(8 hrs.)**

Capacity in cellular systems, cell splitting and sectoring, cell-site antennas and mobile antenna, co channel interference reduction, Frequency management and channel assignment, MAC Layer.

MODULE IV **(8 hrs.)**

Overview of Satellite Systems, Orbits and launching methods, Space segment, Earth segment, Geostationary Orbit, Polarization, Depolarization, Space link.

MODULE V **(8 hrs.)**

Satellite services: VSAT (very small aperture terminal) systems: overview, Network architecture, Access control protocols, basic techniques, VSAT earth station, and calculation of link margins for a VSAT star network. Direct broadcast satellite (DBS) Television and radio: digital DBS TV, BDS TV system design and link budget, error control in digital DBS-TV, installation of DBS-TV antennas, satellite radio broadcasting.

Assessment: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Course Outcome:

1. Understand the basic Concept of mobile system and its design, frequency reuse, channels, Co channel interference, reduction factor, Hand off mechanisms, Cell splitting concept.
2. Illustrate the basic concept of free space propagation model, Ground reflection propagation model, Long term fading, Small scale multipath propagation
3. Analyze of Co channel interference reduction, Frequency management and channel assignment.
4. Overview of Satellite systems.

5. Overview of various Satellite services.

Text/ Reference Books:

1. W. C. Lee, Mobile cellular telecommunication , 2nd Edition McGraw-Hill, 2007
2. T. S. Rappaport, Wireless Communication, 2nd Edition Prentice Hall 2005
3. Simon Haykins, Wireless Communication, Pearson
4. Pritchard, Suyderhoud and Nelson: Satellite Communication Systems Engineering, 2nd Edition Pearson Education.1993
5. Schiller J., Mobile Communication, 2ndEdition AddisonWesley. 2006
6. Wilkisand Garg, Principles of GSM Technology, 2nd Edition. PHI 2004.
7. Fehar K., Wireless Digital Communication, 2nd Edition. PHI.2001.

PEC-EC06 (B)	Analog Mixed Signal Design	3L: 0T: 0P (03 hrs.)	Credit: 03

Prerequisite: VLSI, Embedded System

Course Objective: The course is designed to give the knowledge about various analog and digital CMOS circuits & develop the skill in analysis and design of analog and digital CMOS circuits.

MODULE I **(8 hrs.)**

Single-Stage Amplifier: Introduction to analog VLSI and mixed signal issues in CMOS technologies, Common Source Stage, Source Follower, Common-Gate Stage, Cascode Stage. Frequency Response of Amplifiers, Common-Source Stage, Source Followers, Common-Gate Stage, Cascode Stage, Differential Pair.

MODULE II **(8 hrs.)**

Differential Amplifier: Basic Differential Pair, Common-Mode Response, Differential Pair with MOS Loads, Feedback Amplifier, Feedback Topologies, Effect of Loading, Noise, Switched- Capacitor Circuits, Sampling Switches, Switched-Capacitor Amplifier, Switched-Capacitor Integrator, Switched-Capacitor Common-Mode Feedback.

MODULE III **(9 hrs.)**

Oscillator: General Consideration, Ring Oscillator, Voltage Controlled Oscillator, Mathematical Model of VCOs. Phase-Locked Loops: Simple PLL, Charge-Pump PLLs, Non-ideal Effects in PLLs, Delayed-Locked Loops.

MODULE IV **(8 hrs.)**

Sequential Circuit Design: Sequencing Static Circuit, Circuit Design of Latches and Flip-Flops, Static Sequencing Element Methodology. Array Subsystem, SRAM, DRAM, Read-Only Memory, Serial Access Memories, Content-Addressable Memory, Programmable Logic Arrays.

MODULE V **(7 hrs.)**

Data Converters DAC Specifications-DNL, INL, latency, SNR, Dynamic Range ADC Specifications-Quantization error, Aliasing, SNR, Aperture error ,DAC Architecture - Resistor String, Charge Scaling and Pipeline types, ADC Architecture- Flash and Pipe line types.

Assessment: Internal viva, Continuous evolution of experiments, Journal write-up, Quiz and End semester exam.

Course outcome:

Students earning credits will develop ability to:

1. Design the various Single Stage CMOS Amplifier circuits.
2. Able to understand the effect of CMOS Differential Amplifier Circuits.
3. Able to understand various types of Oscillator operation using CMOS.
4. Design of Sequential Circuit & Memory Devices using CMOS.
5. Analysis of pipelining process of DAC & ADC.

Text/References Books:

1. BehzadRazavi, “Design of Analog CMOS Integrated Circuits”, Indian Edition, TMH Publication, 2001.
2. Phillip E. Allen, Douglas R. Holbery, “CMOS Analog Circuit Design”, 2nd Edition, Oxford University Press, 2004.
3. Weste, Harris and Banerjee, “CMOS VLSI Design”, 3rd Edition, Pearson Education, 2007.
4. J. M. Rabaey, “Digital Integrated Circuits”, 2nd edition, Pearson Education, 2003.
5. A. A. Raj and T. Latha, “VLSI Design”, Eastern Economy Edition, PHI Learning, 2008.
6. D. A. Johns and K. Martin, “Analog Integrated Circuit Design”, 2nd Edition, Wiley-IntersciencePublication, 2002.

PEC-EC06(C)	SDR & Cognitive Radio	3L: 0T: 0P (03 hrs.)	Credits: 03

Recommended Prerequisite: Communication Networks, Mobile Communication.

Course Objective: To make the students understand the fundamental concepts Software Defined Radios (SDR) and Cognitive Radio. This Course provides Comprehensive coverage of hardware and software architecture of software defined radio .The Course deals with the design of the wireless networks based on the cognitive radios.

MODULE I **(8 hrs.)**
Introduction to Software Defined Radio: Definitions and potential benefits, software radio architecture evolution, technology tradeoffs and architecture implications.

MODULE II **(8 hrs.)**
SDR Architecture: Essential functions of the software radio, basic SDR, hardware architecture, Computational processing resources, software architecture, top level component interfaces, interface topologies among plug and play modules.

MODULE III **(8 hrs.)**
Introduction to Cognitive Radios: Marking radio self-aware, cognitive techniques– position awareness, environment awareness in cognitive radios, optimization of radio resources, Artificial Intelligence Techniques.

MODULE IV **(8 hrs.)**
Cognitive Radio Architecture: Cognitive Radio - functions, components and design rules, Cognition cycle - orient, plan, decide and act phases, Inference Hierarchy, Architecture maps, Building the Cognitive Radio Architecture on Software defined Radio Architecture.

MODULE V **(8 hrs.)**
Next Generation Wireless Networks: The XG Network Architecture, Spectrum sensing, Spectrum management, spectrum mobility, spectrum sharing, upper layer issues, cross-layer design, channel modeling, RF front end design and applications.

Assessment: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Course Outcomes:
Students earning credits will develop ability to:
1. Describe the basics of the software defined radios.
2. Learn the hardware and software architecture of software defined radio.
3. Design the wireless networks based on the cognitive radios.
4. Gives an understanding of cognitive radio architecture.
5. Explain the concepts behind the wireless networks and next generation networks.

Text/ Reference Books:

1. Joseph Mitola III, “Software Radio Architecture: Object-Oriented Approaches to Wireless System Engineering”, JohnWiley & Sons Ltd. 2000.
2. Thomas W. Rondeau, Charles W. Bostain, “Artificial Intelligence in Wireless communication”, ARTECH HOUSE .2009.
3. Bruce A. Fette, “Cognitive Radio Technology”, Elsevier, 2009.
4. Ian F. Akyildiz, Won–Yeol Lee, Mehmet C. Vuran, Shantidev Mohanty, “Next generation /

dynamic spectrum access /cognitive radio wireless networks: A Survey" Elsevier Computer Networks, May 2006.

5. Simon Haykin, "Cognitive Radio: Brain–Empowered Wireless Communications", IEEE Journal on selected areas in communications, Feb 2005.
6. Hasari Celebi, Huseyin Arslan, "Enabling Location and Environment Awareness in Cognitive Radios", Elsevier Computer Communications, Jan 2008.
7. Markus Dillinger, Kambiz Madani, Nancy Alonistioti, "Software Defined Radio", John Wiley, 2003.
8. Huseyin Arslan, "Cognitive Radio, SDR and Adaptive System", Springer, 2007.
9. Alexander M. Wyglinski, Maziarnekovee, Y. Thomas Hu, "Cognitive Radio Communication and Networks", Elsevier, 2010, www.nptel.ac.in.
10. Jeffrey H. Reed, "Software Radio: A Modern Approach to Radio Engineering" Pearson Education Low Price Edition.
11. Kwang Cheng Chen, Ramjee Prasad, "Cognitive radio networks", John Wiley & Sons Ltd.

PEC-EC07(A)	Computer Networks	3L: 0T: 0P (03 hrs.)	Credit: 03

Prerequisite: - Communication System, Digital Communications

Course Objective: This course provides a foundation to understand computer networks using layered architectures. It also helps students to understand the various network models, addressing concept, routing protocols and design aspects of computer networks.

MODULE I **(8 hrs.)**
Computer Network: components, Architecture, Classifications & types, Layered Architecture: Protocol hierarchy, Connection Oriented & Connectionless Services, ISO-OSI Reference Model: Principle, Model, Descriptions of various layers and its comparison with TCP/IP. Network standardization. Examples of Networks: Telecommunication Network, Corporate Networks, Connection oriented network i.e., X.25, Frame relay & ATM, Wireless LAN 802.11, internet, Intranet, Extranet, SNA & DNA etc., Interface, Standards, EIA-232-D, RJ-45, RJ-11, BNC connector & EIA-449

MODULE II **(8 hrs.)**
Data Link Layer: Need, Services Provided, Framing & its methods, Flow Control, Error control. DLL Protocol: Elementary & Sliding Window. Piggybacking & Pipelining. Protocol verification: Finite State Machine Models & Petri net models. Example in Data Link Layers: HDLC & Internet. Comparison of BISYNC and HDLC Features. Bridges and layer-2 switches.

MODULE III **(8 hrs.)**
MAC Sub layer: Static & Dynamic channel allocation, Media access control for LAN & WAN. Classification of MAC Sub layer protocol, Study of various collision, Collision free & limited contention protocol i.e., ALOHA : pure, slotted , CSMA, CSMA/CD,CSMA/CA. IEEE 802 standards for LAN & MAN & their comparison. Ethernet, FDDI. Wireless LANs, Broadband Wireless, Bluetooth: Architecture, Application & Layering.

MODULE IV **(8 hrs.)**
Network Layer: Need, Services Provided, Design issues, Routing algorithms: Least Cost Routing algorithm, Dijkstra's algorithm, Bellman-ford algorithm, Hierarchical Routing, Broadcast Routing, Multicast Routing, Routing for mobile hosts, Routing in Ad Hoc Networks Routing Strategies, Congestion Control Algorithms: General Principles of Congestion control, Prevention Policies, Congestion Control in Virtual-Circuit Subnets, Congestion Control in Datagram subnets. IP protocol, IP Addresses, Comparative study of IPv4 & IPv6, Mobile IP.

MODULE V **(8 hrs.)**
Processes to Processes Delivery – Transmission Control Protocol (TCP) - User Datagram Protocol, Data Traffic, Congestion Control and Quality of Service, Techniques to improve QOS, Integrated Services, and Differentiated Services. Network Security: Cryptography, Message Security, Digital Signature, User Authentication, Key Management, Security Protocols in Internet, DNS,SMTP, FTP, HTTP, WWW, Virtual Terminal Protocol, VoIP: Basic IP Telephone System, H.323 Characteristic & Layering, SIP Characteristics, Method & Sessions.

Assessment: Internal viva, Continuous evolution of experiments, Journal write-up, Quiz and End semester exam.

Course Outcomes

Students earned credits will develop ability to

1. Model a problem or situation in terms of layering concept and map it to the TCI/IP stack and Illustrate different types of networks.
2. Understand the process of flow control and error control and framing of data.
3. Illustrate the process of accessing the channels in networks.
4. Describe the routing and congestion control strategies in networks.
5. Understand the process to process communication using security, authentication in TCP, UDP and IP protocol and application layer protocols.

Text/ Reference Books:

1. Tanenbaum A. S., "Computer Networks", Pearson Education, 5th edition, 2011.
2. Behrouz A Forouzan, "Data communication and networking", 4th edition, McGrawHill Education, 2017.
3. Comer, "Internetworking with TCP/ IP Vol-1", Pearson education, 6th edition, 2015.
4. Peterson & Davie, "Computer Networks", 5th edition, Morgan Kaufmann, 2011.
5. W. Richard Stevens, "TCP/IP Illustrated Vol-1", 2nd edition, Addison-Wesley, 2011.
6. Craig Zacker, "Networking the Complete Reference", 2nd edition, TMH, 2001.

PEC-EC07(B)	TV & Radar Engineering	3L: 0T: 0P (03 hrs.)	Credit: 03

Recommended Prerequisite: Signals & system, Antenna, Analog & Digital Comm.

Course Objective: To expose the students to the fundamentals of television, colour TV & technology used for TV & concept of radar system & types of radar.

MODULE I **(8 hrs.)**
Basic Television System: Introduction: Scanning principles: sound and picture transmission, scanning process, camera pick-up devices, transmission and reception of video signals, brightness perception and photometric quantities, aspect ratio and rectangular scanning, persistence of vision and flicker, vertical resolution, the Kell factor, horizontal resolution and video bandwidth, interlaced scanning. Composite Video Signal: Lines and scanning, video signal components, horizontal sync and blanking standards, vertical sync and blanking standards, video modulation and vestigial side band signal, sound modulation and inter-carrier system. Television Standards: Standard channel characteristics, reception of the vestigial side band signals, television broadcast channel, consolidated CCIR system-B standard, various television broadcast systems. Television Pick-up devices and Cameras: Camera lenses, auto-focus systems, television camera pick-ups, Silicon Vidicon, CCD image sensors, video processing of camera pick-up signal.

MODULE II **(8 hrs.)**
Colour Television: Colour fundamentals: mixing of colours and colour perception, chromaticity diagram, colour television camera, colour TV signals and transmission, NTSC, SECAM and PAL system, Trinitron picture tube, automatic degaussing, plasma, LCD displays. Television transmission and reception: requirement of TV broadcast transmission, design principle of TV transmitters, IF modulation, power output stages, block diagram of TV transmitter, co-channel interference and ghost images during propagation of television signals, antenna requirements for television system, block schematic and function requirements for television receivers, trends in circuit design, colour television receiver.

MODULE III **(8 hrs.)**
Digital Television Technology : Merits of digital technology, fully digital television system, digital television signals, digitized video parameters, digital video hardware, transmission of digital TV signals, bit rate reduction, digital TV receivers, video processor unit, audio processor unit. Other television systems: Closed Circuit television system (CCTV), Cable television system (CATV), multiplexed analog component encoding television system (MAC TV), High definition television system (HDTV),
High definition multiplexed analog component television (HD-MAC TV), High Performance Computer Controlled TV (HPCC TV), 3-D stereoscopic television techniques.

MODULE IV **(8 hrs.)**
RADAR: The Radar range equation, block diagram and operation, performance factors: prediction of range performance, minimum detectable signal, receiver noise, probability density functions, signal to noise ratios. Radar cross section of targets, transmitter power, pulse repetition frequency and range ambiguities, antenna parameters. The CW radar: the Doppler effect, FM-CW radar.
The Moving Target Indicator (MTI) Radar: delay line cancellers.

MODULE V **(8 hrs.)**
Radar Receivers: The radar receiver, noise figure, mixers, low noise front ends, displays- type A and PPI representations, duplexer and receiver protectors. Other Radar systems: Synthetic aperture

radar, HF over the horizon radar, Air Surveillance Radar (ASR), Bistatic radar.

Assessment: Internal viva, Continuous evolution of experiments, Journal write-up, Quiz and End semester exam.

Course Outcomes

Students earned credits will develop ability to:
1. Review of basic concept of television & terminology of television
2. Understanding the concept of colour television
3. Understanding the concept of television technology.
4. Review the basic concept of radar system & its terminology
5. Understanding of radar receiver & its types

Text/ Reference Books:
1. Dhake: Television and Video Engineering, TMH.
2. Skolnik: Introduction to Radar Systems, TMH, New Delhi.
3. Gupta: Television Engineering and Video Systems, TMH, New Delhi.
4. Gulati: Monochrome and Colour Television, New Age International.
5. Grob and Herndon: Basic Television and Video Systems, McGraw Hill International.
6. Peebles, Jr.: Radar Principles, Wiley India Pvt. LTD.
7. Edde: Radar- Principles, Technology Applications, Pearson Education.

PEC-EC07(C)	Artificial Neural Network	3L: 0T: 0P (03 hrs.)	Credit: 03

Recommended Prerequisite: Fundamental of Computing

MODULE I **(8 hrs.)**
Introduction: Biological Neuron – Artificial Neural Model - Types of activation functions – Architecture: Feed forward and Feedback, Convex Sets, Convex Hull and Linear Separability, Non-Linear Separable Problem. XOR Problem, Multilayer Networks.
Learning: Learning Algorithms, Error correction and Gradient Descent Rules, Learning objective of TLNs, Perceptron Learning Algorithm, Perceptron Convergence Theorem.

MODULE II **(8 hrs.)**
Supervised Learning: Perceptron learning and Non Separable sets, α-Least Mean Square Learning, MSE Error surface, Steepest Descent Search, μ-LMS approximate to gradient descent, Application of LMS to Noise Cancelling, Multi-layered Network Architecture, Back propagation Learning Algorithm, Practical consideration of BP algorithm.

MODULE III **(8 hrs.)**
Support Vector Machines and Radial Basis Function: Learning from Examples, Statistical Learning Theory, Support Vector Machines, SVM application to Image Classification, Radial Basis to face recognition.

MODULE IV **(8 hrs.)**
Attractor Neural Networks: Associative Learning Attractor Associative Memory, Linear Associative memory, Hopfield Network, application of Hopfield Network, Brain State in a Box neural Network, Simulated Annealing, Boltzmann Machine, Bidirectional Associative Memory.

MODULE V **(8 hrs.)**
Self-organization Feature Map: Maximal Eigenvector Filtering, Extracting Principal Components Generalized Learning Laws, Vector Quantization, Self-organization Feature Maps, Application of SOM, Growing Neural Gas.

Assessment: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Course Outcomes:
Students earning credits will develop ability to:
1. Understand and review the basic concepts of Artificial Neural Network (ANN) and its applications
2. Discuss and Analyze different types of learning and training algorithm for ANN.
3. Illustrate and Analyze Support Vector Machines and Radial Basis Function.
4. Discuss and analyze concept of Attractor Neural Networks.
5. Discuss and analyze the concept of Self-organization Feature Map.

Text Books/ Reference Books:

1. Lawrence Fussett, "fundamental of Neural network Prentice" PHI.
2. Bart Kosko, "Neural network and Fuzzy System" PHI.
3. J. M. Zurada, "Introduction to artificial neural systems, Jaico Publication house, Delhi.
4. Vallusu Rao and Hayagvna Rao, "C++ Neural network and fuzzy logic" BPB and Publication.

PEC-EC07 (D)	Nano Electronics	3L: 0T: 0P (03 hrs.)	Credits: 03

Prerequisite: Physics, Electronic Devices

Course Objective: The course is designed to give the fundamental knowledge of nano electronic devices and nano technology & also able to understand the characteristic & behavior of Nanostructures.

MODULE I **(8 hrs.)**

Introduction to nanotechnology, Impacts, Limitations of conventional microelectronics, Trends in microelectronics and optoelectronics, Mesoscopic physics, characteristic lengths in mesoscopic systems, Quantum mechanical coherence Classification of Nano structures, Low dimensional structures Quantum wells, wires and dots, Density of states and dimensionality, Basic properties of two dimensional semiconductor nanostructures, square quantum wells of finite depth, parabolic and triangular quantum wells.

MODULE II **(8 hrs.)**

Introduction to characterization of nanostructures, tools used for of nano materials characterization, microscope-optical, electron, and electron microscope. Principle of operation of Scanning Tunnelling Microscope, Atomic Force Microscope, Scanning Electron microscope, Specimen interaction. Transmission Electron Microscope,X-Ray Diffraction analysis, PL & UV Spectroscopy, Particle size

MODULE III **(8 hrs.)**

Two dimensional electronic system, two dimensional behaviour, MOSFET structures, Heterojunctions Quantum wells, modulation doped quantum wells, multiple quantum wells ,The concept of super lattices Kronig - Penney model of superlattice.

MODULE IV **(9 hrs.)**

Transport of charge in Nanostructures under Electric field – parallel mtransport, hot electrons, perpendicular transport.Quantum transport in nanostructures, Coulomb blockade,Transport of charge in magnetic field - Effect of magnetic field on a crystal. Aharonov-Bohm effect, the Shubnikov-de Hass effect, the quantum Hall effect.

MODULE V **(7 hrs.)**

Nanoelectonic devices- MODFETS, heterojunction bipolar transistors Resonant tunnel effect, RTD, RTT, Hot electron transistors Coulomb blockade effect and single electron transistor, CNT transistors , Heterostructure semiconductor laser Quantum well laser, quantum dot LED, quantum dot laser Quantum well optical modulator, quantum well sub band photo.

Assessment: Internal viva, Continuous evolution of experiments, Journal write-up, Quiz and End semester exam.

Course outcome:
Students earning credits will develop ability to:
1. Student will able to learn fundamental knowledge of the Nanotechnology &Nanoelectronic.
2. The students will be able to understand the characteristic & behavior of Nanostructures.
3. The students will be able to understand the structures of Nano Devices.
4. The students will be able to understand the electric & Magnetic Behavior of nanostructure.
5. The students will be able to understand the application of Nano Devices.

Text/References Books:

1. Chattopadhyay, Banerjee, "Introduction to Nanoscience& Technology", Eastern Economy Edition, PHI, 2009.
2. George W. Hanson, "Fundamentals of Nanoelectronics", 1st Edition, Pearson Education, 2009. 3. K. Goser, P. Glosekotter, J. Dienstuhl, "Nanoelectronics and nanosystems", 1st Edition, Springer-Verlag Berlin Heidelberg, New York, 2004.
3. Murty, Shankar, "Text book of Nanoscience and Nanotechnology", 1st Edition, Universities Press, 2013.
4. Charles P. Poole Jr., Frank J. Owens, "Introduction to Nanotechnology", 1st edition, Wiley- Interscience Publication, 2003.
5. Supriyo Dutta, "Quantum Transport- Atom to transistor", 6th Edition, Cambridge University Press, 2013.

PROJ-EC05	**Project Phase-II**	**0L: 0T: 16P (16hrs.)**	**Credits: 08**

Course Objectives: The core objective of Project Phase I is to establish a solid and well-documented foundation for the subsequent phases by completing all necessary research, planning, and design tasks. This includes defining the scope, identifying critical resources and constraints, and finalising the detailed project plan (including timelines and milestones) to ensure the technical feasibility and strategic alignment of the overall project goals.

Course Outcomes:

1. To understand the mathematical and physical foundations of electronics engineering and how these are used in electronic devices and systems.

2. To critically evaluate alternate assumptions, approaches, procedures, tradeoffs, and results related to engineering problems.

3. To design a variety of electronic and computer-based components and systems for applications including signal processing, communications, computer networks, and control systems.

4. To lead a small team of student engineers performing a laboratory exercise or design project; to participate in various roles in a team and understand how they contribute to accomplishing the task at hand.

5. To use written and oral communications to document work and present project results.