Scheme & Syllabus of UG

Engineering Program

Bachelor of Technology

(B.Tech.)

Electronics & Communication Engineering

2022-23

IPS ACADEMY

INSTITUTE OF ENGINEERING & SCIENCE, INDORE

(A UGC Autonomous Institute affiliated to RGPV)

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Electronics & Communication Engineering

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-EC801	PEC	Professional Elective Courses-6	70	20	10	-	-	100	3	-	-	3
2.	PEC-EC802	PEC	Professional Elective Courses-7	70	20	10	-	-	100	3	-	-	3
3.	OEC-EC801	OEC	Open Elective Courses-4	70	20	10	-	-	100	3	-	-	3
4.	OEC-EC802	OEC	Advanced Open Elective Courses-5	70	20	10	-	-	100	3	-	-	3
5.	PROJ-EC801	PROJ	Project Phase II	-	-	-	120	80	200	-	-	12	6
6.	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	280	80	40	120	80	600	12	-	12	18

Professional Elective Courses-6	Professional Elective Courses-7	Open Elective Courses-4	Open Elective Courses-5
PEC-EC801 (A) Mobile and Satellite Communication	PEC-EC802 (A) Computer Network	OEC-EC801 (A) PMME	OEC-EC802 (A) IPR
PEC-EC801 (B) Wireless Communication	PEC-EC802 (B) TV & Radar Engineering	OEC-EC801 (B) Industrial Electronics	OEC-EC802 (B) Electric & Hybrid Vehicle
PEC-EC801 (C) Analog Mixed Signal Design	PEC-EC802 (C) Artificial Neural Network	OEC-EC801 (C) Non-Conventional Energy Sources	OEC-EC802 (C) Basics of Python

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

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Electronics & Communication Engineering Department

PEC-EC801 (B)	Wireless Communication	3L: 0T: 0P (03 hrs.)	Credit: 03

Prerequisite: Digital Signal Processing, Mobile Communication

Course Objective: Explain how the major wireless technologies are used today. Describe various applications of wireless communications technology. Describe the wireless channel propagation, standards & concept of smart antenna system.

MODULE I **(7 hrs.)**
Introduction to wireless communication systems: Application and requirement of existing technologies, QoS, requirement for services, economical requirements, bandwidth concept, types of signals, 5G technology, general model for wireless communication link analysis.

MODULE II **(7 hrs.)**
Challenges in wireless communication: Multipath propagation, fading, ISI, spectral limitation energy, user mobility, noise and interference limited system, link budget.

MODULE III **(9 hrs.)**
Wireless channel propagation: Basic propagation mechanism, free space propagation, ground wave propagation, Ionospheres propagation, troposphere propagation, channel noise and losses, satellite link shadowing, Channels Models: narrow band model, wide band model, Rician fading model, nakagami fading model.

MODULE IV **(9 hrs.)**
Wireless communication & standard: Broadcast system, GSM system, GPRS, EDGE technology, CDMA, WLL, Bluetooth, wifi, WiMAX, wireless sensor network, Zigbee, Lora communication.

MODULE V **(8 hrs.)**
Multiple Input Multiple Output System: Concept of diversity, smart antenna system, MIMO architecture, space time processing, channel modeling, channel measurement, and channel capacity.

Assessment: Internal Assessment for continuous evaluation, mid-term tests, Tutorials, Quizzes, Class Performance, etc.

Course outcome:

Students earning credits will develop ability to:

1. Analyze the economical and social aspect of wireless communication.
2. Analyze the basic challenges of wireless communications.
3. Describe the basic propagation mechanism and various channel models.
4. Understand the standardized wireless systems.
5. Analysis of concepts and techniques from Multiple-Input Multiple-Output (MIMO) theory to communication systems.

Text/ Reference Book:

1. Molisch, Andreas F. Wireless communications. Vol. 34. John Wiley & Sons, 2012.
2. Dalal, Upena. Wireless communication. Oxford University Press, Inc., 2010.
3. Simon, M. K. and Alouini, M. S., Digital communication over fading channels, John Wiley and Sons, 2005
4. Cover, T. A. and Thomas, J. A., Elements of Information Theory, John Wiley and Sons, 2006
5. Rappaport, T. S., Wireless Communication Systems: Principles and Practice, Prentice Hall, 2002
6. Paulraj, A., Nabar, R. and Gore, D., Introduction to Space-Time Wireless Communication, Cambridge University Press, 2003.
7. C.Y. Lee: Mobile Cellular Telecommunication (Analog & Digital Systems) Second Edition, Tata McGraw Hill Edition.
8. Taub and Schilling: Principles of Communication Systems, Second Edition, TMH.
9. Simon Haykin, Michael Mohar :Mordern Wireless Communication, Low Price Edition, Pearson Education 2007.
10. Palanivelu, T. G., Nakkeeran, R.: Wireless and Mobile Communication, PHI Learning.
11. Chidambara Nathan: Wireless Communication, PHI Learning, 2008.

PEC-EC801(C)	**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-InterscienePublication, 2002.

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PEC-EC 802(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.

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PEC-EC 802(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-EC802(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.