Jabalpur Engineering College, Jabalpur

(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)

(AICTE Model Curriculum Based Scheme) with Provision for Internship

Bachelor of Technology (B.Tech.) VIII Semester (Electronics & Tele Communication Engineering)

w.e.f. July 2024

S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours Per Week			Total Credits
				Theory			Practical						
				End. Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work		L	T	P	
1	EC801M	PEC-III	Professional Elective Course-III	70	20	10	-	-	100	3	1	-	4
2	EC802M	OEC-IV	Open Elective Course-IV	70	20	10	-	-	100	3	1	-	4
3	EC803M	PI	Major Project / Internship	-	-	-	150	100	250	-	-	16	8
			Total	140	40	20	150	100	450	**6**	**2**	**16**	**16**

Note: 1. Departmental BOS will decide list of three optional subjects for PEC III as well as for OEC IV.

Professional Elective Course-III		
S.No.	**Subject Code**	**Subject Name**
1	EC801M A	Nano Electronics
2	EC801M B	Sensor Technology
3	EC801M C	T.V. and Digital Display

Open Elective Course-IV		
S.No.	**Subject Code**	**Subject Name**
1	EC802M A	Economics & Social Issues
2	EC802M B	IoT
3	EC802M C	Advanced Mobile Communication

Note: 2. Students going for internship would have to opt MOOC/NPTEL subjects decided / listed by the HOD / Coordinator.

Professional Elective Course-III		
S.No.	**Subject Code**	**Subject Name**
1	EC801M D	NPTEL-1
2	EC801M E	NPTEL-2
3	EC801M F	NPTEL-3

Open Elective Course-IV		
S.No.	**Subject Code**	**Subject Name**
1	EC802M D	NPTEL-4
2	EC802M E	NPTEL-5
3	EC802M F	NPTEL-6

Note: 3. For Major Project / Internship, evaluation is based on work done, quality of report, presentation and performance in viva-voce through department project supervisor / Industry Project Coordinator.

1 hour lecture (L) = 1 credit | 1 hour Tutorial (T) = 1 credit | 2 hour Practical (P) = 1 credit

PEC: Professional Elective Course, OEC: Open Elective Course, PI: Project and Internship

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Subject code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
		End Sem	Mid-Sem Exam	Quiz Assignment	End Sem	Lab Work		L	T	P	
EC801M A	Nano Electronics	70	20	10	-	-	100	3	1	-	4

Module-I: Introduction Nanoscale technology: Consequences of the nanoscale for technology and society. Molecular building blocks for nanostructure systems, Nano-scale 1D to 3D structures, Band structure and density of states at low dimensional structure. Size dependent properties (Electrical, mechanical, optical, thermal etc).top down and bottom up technique, lithographic, nanolithographic and nonlithographictechniques:pulsed laser deposition,plasma arc discharge, e-beam sputtering, ball milling, solgel, electrodeposition, chemical vapour deposition.

Module-II : Characterization technique Scanning probe microscopy: (Principle, construction and working;) Scanning tunneling microscope, Atomic force microscope, scanning electron microscope, Transmission electron microscope, Carbon materials :Allotropes of carbon, Structure of Carbon Nanotubes, types of CNTs-, Electronic properties of CNTs, Band structure of Graphene,Band structure of SWNT from grapbene ,electron transport properties ofSWNTs ,

Module-III:Introduction to magnetism and superconductivity Basic magnetic phenomena: paramagnetism, ferromagnetism, ferrimagnetism, anti-ferromagnetism;nano-magnetism; giant and colossal magnetoresistance; ferrofluids. Basic superconductivity phenomena; flux quantization and Josephsoneffects.

Module-IV: Fundamental of nanoelectronics Charging of quantum dots, Coulomb blockade, Quantum mechanical treatment of quantum wells, wires and dots, Widening of bandgap in quantum dots, Strong and weak confinement, spin field effect transistor. single electron transistors, other SET and FET structure.

Module-V: Silicon MOSFETs Silicon MOSFET: fundamental of MOSFET devices, scaling rules, silicon dioxide based gate dielectrics, metal gates , junction and contacts, advanced MOSFET concepts

References:

1.G. W. Hanson: Fundamentals of Nanoelectronics, Pearson Education.
2. K. K. Chattopadhyay and A. N. Banerjee: Introduction to Nanoscience and Nanotechnology, PHI Learning.
3. John H. Davis: Physics of low dimension semiconductor, Cambridge Press.
4.KTu, JW Mayer, LC Feldman, "Electronic Thin Film Science", Macmillan, New York, 1992.
5. Z Cui , "Mico-Nanofabrication", Higher Education press, Springer, 2005.
6.Brian Cantor, "Novel Nanocrystalline Alloys and Magnetic Nanomaterials," Institute of Physics Publications, 2005.

7. S.Chikazumi and S.H. Charap," Physics of Magnetism", Springer-verlag berlin Heideberg, 2005
8.CaoGuozhong, "Nanostructures and Nanomaterials - Synthesis, Properties and Applications", Imperial College Press, 2004.
9. SadamichiMaekawa, "Concepts in Spintronics", Oxford University Press, 2006.

Course Outcomes:
Upon successful completion of course students will be able to:

CO1	Understand Nanoscale technologies
CO2	Describe various characterization techniques
CO3	Illustrate magnetism and superconductivity
CO4	Knowledge about fundamental of nano electronics
CO5	Elaborate silicon MOSFET

Dr. BHAVANA JHARIA
Prof. & Head ~~Reader~~ Dept. of Electronics
& Telecommunications Engg.
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)

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Subject code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical			L	T	P	
EC801M B	Sensor Technology	End Sem.	Mid-Sem. Exam	Quiz Assignment	End Sem.	Lab Work	100	3	1	-	4
		70	20	10	-	-					

Module I- Sensors Fundamentals and Characteristics

Sensors, Signals and Systems; Sensor Classification; Units of Measurements; Sensor Characteristics

Module II-Physical Principles of Sensing

Electric Charges, Fields, and Potentials; Capacitance; Magnetism; Induction; Resistance; Piezoelectric Effect; Hall Effect; Temperature and Thermal Properties of Material; Heat Transfer; Light; Dynamic Models of Sensor Elements

Module III- Interface Electronic Circuits

Input Characteristics of Interface Circuits, Amplifiers, Excitation Circuits, Analog to Digital Converters, Direct Digitization and Processing, Bridge Circuits, Data Transmission, Batteries for Low Power Sensors

Module IV- Sensors in Different Application Area

Occupancy and Motion Detectors; Position, Displacement, and Level; Velocity and Acceleration; Force, Strain, and Tactile Sensors; Pressure Sensors, Temperature Sensors

Module V- Sensor Materials and Technologies

Materials, Surface Processing, Nano-Technology

Reference Books:

1. J. Fraden, Handbook of Modern Sensors:Physical, Designs, and Applications, AIP Press, Springer
2. D. Patranabis, Sensors and Transducers, PHI Publication, New Delhi
3. Mechatronics- Ganesh S. Hegde, Published by University Science Press (An imprint of Laxmi Publication Private Limited).

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Understand sensor fundamentals
CO2	Describe physical principle of sensing
CO3	Interface various Electronic circuits
CO4	Discuss sensors in different application area
CO5	Knowledge of sensor material and technologies

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Subject code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
		End Sem	Mid-Sem Exam	Quiz Assignment	End Sem	Lab Work		L	T	P	
EC801M C	T.V. and Digital Display Devices	70	20	10	-	-	100	3	1	-	4

Module-I
Fundamentals of television Engineering, Scanning mechanism frequency interleaving aspect ratio kell factor plumbicon, vidicon Image acquisition by CCD, CMOS Camera devices, B/W Picture Tube, Color picture tube principle, Various T. V. Standard.(NTSC CCIRB PAL)

Module-II
Composite Video Signal, Horizontal and Vertical blanking pulses, Calculation of BW in T. V., Vestigial side band transmission, Sound signal transmission, B/W T. V. Transmitter block diagram ad its working ,Color T.V. transmission.

Module-III
B/W T. V. Receiver block diagram and its working. Color T.V. Receivers block Diagram and its working. RF section, IF section in receivers, Video detector, FM sound section. PAL-D system

Module-IV
Basics of color formations in color TV. Luminance signal, Chrominance signal, Negative modulation, Quadrature amplitude modulation. Various kinds of antennas used in T.V. transmission and reception satellite T.V. principle.

Module-V
Digital display method, TFT monitor, LCD, LED, PLASMA display system, High definition TV Flat panel T. V. OLED display, quantum dot display, Holography and 3D TV

Books
1. TV Engineering by R R Gulati
2. A.M. Dhake Television & Video Engineering.
3. For LCD, LED PLASMA "Service manuals of various companies"

Course Outcomes:
Upon successful completion of course students will be able to:

CO1	Understanding of basics of T.V. and scanning.
CO2	Knowledge of design aspect of video signal BW calculation
CO3	Understand of TV receiver and transmitter
CO4	Comprehensive knowledge of basics of T.V. modulation and Antenna
CO5	Comprehensive study of model Display devices.

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Prof. & Head ~~Reader~~, Dept. of Electronics
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Subject code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
		End Sem	Mid-Sem Exam	Quiz Assignment	End Sem	Lab Work		L	T	P	
EC802M A	Economics & Social Issues	70	20	10	-	-	100	3	1	-	4

Module –I Indian Economy on the eve of independence, British Rule and its impact on economy, Population growth its pattern, genders, rural urban literacy, Poverty and inequality agriculture and its productivity Green Revolution, Industrial economy pattern, small scale industries.

Module –II Micro economics, Theory of consumer behavior, Law of diminishing utility, demand and supply, Demand curve, elasticity of demand, Theory of production, Theory of cast.

Module –III National income, Measurement of national income, Measurement of cost of living, Consumption function, investment function, Economics fluctuations GDP,GVP.

Module –IV Concept of public and private goods public budget, optimum budget, plan budget, budget procedure of India, Taxes in India.

Module – V Indian economy policy, population policy anti povertyprogrammes, NRECA Risht to employment, MSME, growth, structure EXIM policies.

Reference Books:

1. Mishra &Puri Indian Economy
2. Rana&Verma Macro economics
3. NavendraJadhav, Monetary Policy
4. J. Ray Chellaih, Trends and Issues in Indian Finance

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Understanding Indian Economy since independence
CO2	General information about micro Economics, Demand supply Losses
CO3	Compressive Knowledge about GDP and GNP, consumption
CO4	Compressive study of private public systems functioning and taxation systems
CO5	Knowledge about polices of Indian Economy and MSME

Prof. & Head

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		Theory			Practical						
		End Sem.	Mid-Sem. Exam	Quiz Assignment	End Sem.	Lab Work		L	T	P	
EC802M B	IOT	70	20	10	-	-	100	3	1	-	4

Module 1: **IoT Introduction and Fundamentals**: Deciphering the term IoT, Applications where IoT can be deployed, Benefits/challenges of deploying an IoT, IoT components: Sensors, front-end electronics (amplifiers, filtering, digitization), digital signal processing, data transmission, choice of channel (wired/wireless), back-end data analysis. Understanding packaging and power constraints for IoT implementation

Module 2: Signals, Sensors, Actuators, Interfaces: Sensors: types, signal types, shape and strength, Sensor non-idealities: Sensitivity and offset drift, noise, minimum detectable signal, nonlinearity, Read-out circuits: Instrumentation-amplifier, SNR definition, noise-bandwidth-power trade off, Circuit component mismatch and mitigation techniques (calibration, chopping, auto zeroing etc.), Power/energy considerations, Basic signal processing (filtering, quantization, computation, storage),

Module 3: Networking in IoT: Review of Communication Networks, Challenges in Networking of IoT Nodes, range, bandwidth, Machine-to-Machine (M2M) and IoT Technology Fundamentals, Medium Access Control(MAC) Protocols for M2M Communications, Standards for the IoT, Basics of 5G Cellular Networks and 5G IoT Communications, Low-Power Wide Area Networks (LPWAN), Wireless communication for IoT: channel models, power budgets, data rates, IoT Security and Privacy, MQTT Protocol, Publisher and Subscriber Model

Module 4: Cloud Computing in IoT
Cloud computing platform (open source) and local setup of such environment, embedded software relevant to microcontroller and IoT platforms (enterprise or consumer), user interfaces

Module 5: Data Analysis for IoT applications
Statistics relevant to large data, linear regression, Basics of clustering, classification

Course Outcomes:
Upon successful completion of course students will be able to:

CO1	Understand the fundamentals of Internet of things
CO2	Knowledge of interfacing of signal, sensors and actuators in Internet of Things
CO3	Interpret networking in Internet of things
CO4	Implement on Cloud computing in Internet of things
CO5	Analyze the data for various Internet of things applications

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		Theory			Practical						
		End Sem	Mid-Sem Exam	Quiz Assignment	End Sem	Lab Work		L	T	P	
EC802M C	Advanced Mobile Communication	70	20	10	-	-	100	3	1	-	4

Module I:

Mobile Communications Overview: Evolution from 1G to 5G, Analog voice systems in 1G, digital radio systems in 2G, voice and messaging services, TDMA based GSM, CDMA, 2.5G (GPRS),2.75G (EDGE); IMT2000, 3GUMTS, W-CDMA, HSPA, HSPA+, 3G services and data rates, IMT Advanced, 4G, LTE, VoLTE, OFDM, MIMO, LTE Advanced Pro (3GPP Release 13+), IMT2020, enhancements in comparison to IMT Advanced.

Module II:

Introduction to 5G Communication: 5G potential and applications, Usage scenarios, enhanced mobile broad band (eMBB), ultra reliable low latency communications (URLLC), and massive machine type communications (MMTC), D2D communications, V2X communications.

Module III:

5G Radio access technologies: Spectrum for 5G, spectrum access/sharing, millimeter Wave communication, channels and signals/waveforms in 5G, carrier aggregation, small cells, dual connectivity. New Radio (NR), Standalone and non-standalone mode, non-orthogonal multiple access (NOMA).

Module IV:

5G Network: Massive MIMO, beam formation, PHY API Specification, flexible frame structure, Service Data Adaptation Protocol (SDAP), centralized RAN, open RAN, multi-access edge computing (MEC); Introduction to software defined networking (SDN), network function virtualization (NFV), network slicing; restful API for service-based interface, private networks.

Module V:

Current state and Challenges ahead: 5G penetration in developed countries; deployment challenges in low-middle income countries, stronger backhaul requirements, dynamic spectrum access and usage of unlicensed spectrum, contrasting radio resource requirements, large cell usage, LMLC, possible solutions for connectivity in rural areas (BharatNet, TVWS, Long-range WiFi, FSO); non-terrestrial fronthaul / backhaul solutions: LEOs, HAP/UAV.

Text and References Books:

1. Mobile Communications by Jochen Schiller Pub: Financial Times / Imprint ofPearson.
2. Mobile Communications Design Fundamentals by William Lee, Pub: Wiley India Pvt.Ltd.
3. Wireless Communications: Principles and Practice by Theodore S. Rappaport, Pub:Pearson.
4. Fundamentals of 5G Mobile Networks Jonathan Rodriguez Wiley First Edition.
5. 5G NR: The Next Generation Wireless Access Technology Erik Dahlman, Stefan Parkvall, Johan Skold Elsevier.

Course Outcomes:

At the end of this course students will demonstrate the ability to:

CO1	Understand the evolution of mobile communication standards developed over the years.
CO2	Evaluate the use of advanced techniques in cellular communications and understand D2D, MMTC,V2X communication and standardization
CO3	Study the in-depth functioning of 5G radio access technologies.
CO4	Draw and explain 5G architecture, its components and functional criteria
CO5	Understand current issues and future challenges in 5G

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