R23 REGULATIONS

B.TECH. – ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech. – IV Year I Semester

S.No.	Category	Title	L	T	P	Credits
1	23ECT26	Data Communications and Networking	3	0	0	3
2	23MBTU4a 23MBTU4b 23MBTU4c	**Management Course-II** Business Ethics and Corporate Governance E-Business Management Science	2	0	0	2
3	23ECT27a 23ECT27b 23ECT27c	**Professional Elective-IV** Radar Engineering DSP Processors & Architectures Cellular & Mobile Communications	3	0	0	3
4	23ECT28a 23ECT28b 23ECT28c	**Professional Elective-V** Low Power VLSI Design Wireless Sensor Networks 5G Communications	3	0	0	3
5		**Open Elective-III**	3	0	0	3
6		**Open Elective-IV**	3	0	0	3
7	23ECP14a 23ECP14b	**Skill Enhancement course** RF System Design tools Industrial IOT & Automation	0	1	2	2
8	23BST39	**Audit Course** Gender Sensitization	2	0	0	-
9	23ECEII	Evaluation of Industry Internship	-	-	-	2
Total			**19**	**1**	**2**	**21**

Open Elective – III

S.No	Course Code	Course Name	Offered by the Dept.
1	23CET24	Building Materials and Services	CIVIL
2	23CET25	Environmental Impact Assessment	
3	23EET23	Smart Grid Technologies	EEE
4	23MET23	3D Printing Technologies	ME
5	23CST32	Data Base Management Systems	CSE & Allied/IT
6	23CST18b	Cyber Security	
7	23CST23e	Agentic AI Engineering	
8	23BST30	Wavelet transforms and its Applications	Mathematics
9	23BST31	Smart Materials And Devices	Physics
10	23BST34	Introduction to Quantum Mechanics	
11	23BST32	Green Chemistry And Catalysis For Sustainable Environment	Chemistry
12	23BST33	Employability Skills	Humanities

Open Elective – IV

S.No	Course Code	Course Name	Offered by the Dept.
1	23CET26	Geo-Spatial Technologies	CIVIL
2	23CET27	Solid Waste Management	
3	23EET24	Electric Vehicles	EEE
4	23MET24	Total Quality Management	ME
5	23CST33	Introduction to Computer Networks	CSE & Allied/IT
6	23CST23d	Internet of Things	
7	23CST34	Introduction to Quantum Computing	
8	23CST30d	AI Powered Application Development	
9	23BST35	Financial Mathematics	Mathematics
10	23BST36	Sensors And Actuators For Engineering Applications	Physics
11	23BST37	Chemistry Of Nanomaterials And Applications	Chemistry
12	23BST38	Literary Vibes	Humanities

B.Tech. – IV Year II Semester

S.No.	Course code	Title	Category	L	T	P	Credits
1	23ECIAP	Internship		-	-		4
		Project					8
Total							**12**

B.TECH. – IV YEAR I SEMESTER

Course Code	DATA COMMUNICATIONS AND NETWORKING	L	T	P	C
23ECT26		3	0	0	3
Semester				VII	

Course Objectives:

1. To provide a conceptual understanding of the fundamentals of data communications and computer networks.
2. To explore different network architectures, models, and transmission media used in data communication.
3. To analyze error detection and correction methods, data link protocols, and medium access techniques.
4. To understand the functioning of network and transport layer protocols, including addressing, routing, and congestion control.
5. To study application layer protocols, network security mechanisms, and techniques to ensure data integrity.

Course Outcomes: At the end of the course, the students will be able to

After completing the course, the student will be able to,

CO1: Understand of the fundamentals of data communications and computer networks.

CO2: Learn different network architectures, models, and transmission media used in data communication.

CO3: Analyze error detection and correction methods, data link protocols, and medium access techniques.

CO4: Grasp the functioning of network and transport layer protocols, including addressing, routing, and congestion control.

CO5: Gain knowledge on application layer protocols, network security mechanisms, and techniques to ensure data integrity.

UNIT I

Overview of Data Communication and Networking: Introduction; Data communications: components, direction of data flow; network criteria, physical structure, categories of network (LAN, MAN, WAN); Internet: brief history, Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative study.

UNIT II

Physical Layer: Overview of data (analog & digital), signal (analog& digital), transmission (analog & digital) & transmission media (guided & unguided), queuing theory , its applications in data communication, Data Encoding Techniques, Circuit switching, time division & space division switching.

UNIT III

Data link Layer: Types of errors, framing (character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC

Medium Access sub layer: Point to Point Protocol, Token Ring; Reservation, Polling, Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA Traditional Ethernet, fast Ethernet.

UNIT IV

Network layer: Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing: IP addressing, subnetting; Routing: techniques, static vs. dynamic routing, Unicast Routing Protocols: RIP, OSPF, BGP; Other Protocols: ARP, IP, ICMP, IPV6

Transport layer: Process to Process delivery; UDP; TCP; Congestion Control: Open Loop, Closed Loop choke packets; Quality of service: techniques to improve QoS: Leaky bucket algorithm, Token bucket algorithm.

UNIT V

Application Layer: Introduction to DNS, SMTP, SNMP, FTP, HTTP & WWW; Security: Cryptography (Public, Private Key based), Digital Signature, Firewalls.

Textbooks:

1. B. A. Forouzan – ―Data Communications and Networking (3rd Ed.) ― – TMH
2. A.S. Tanenbaum – ―Computer Networks (4th Ed.)‖ – Pearson Education/PHI

References:

1. W. Stallings – ―Data and Computer Communications (5th Ed.)‖ – PHI/ Pearson Education
2. Kurose and Rose – ―Computer Networking -A top down approach featuring the internet‖ – Pearson Education
3. Leon, Garica, Widjaja – ―Communication Networks‖ – TMH

(Common for all B.Tech Branch)

Course Code	BUSINESS ETHICS AND CORPORATE GOVERNANCE	L	T	P	C
23MBTU4a		2	0	0	2
	Semester	IV-I			

Course Objectives:

1. To make the student understand the principles of business ethics
2. To enable them in knowing about the ethics in management
3. To facilitate the student role in corporate culture
4. To impart knowledge about the fair-trade practices
5. To encourage the student in knowing about the corporate governance

Course Outcomes (CO): Student will be able to

- Understand the Ethics and different types of Ethics.
- Understand business ethics and ethical practices in management
- Understand the role of ethics in management
- Apply the knowledge of professional ethics & technical ethics
- Analyze corporate law, ethics, codes & principles
- Evaluate corporate governance & corporate scams.

UNIT-I		Lecture Hrs: 7

Introduction – Meaning – Nature, Scope, significance, Loyalty, and ethical behavior.. Value systems - Business Ethics - Types, Characteristics, Factors, Contradictions and Ethical Practices in Management -Corporate Social Responsibility – Issues of Management – Crisis Management.

UNIT-II		Lecture Hrs: 7

Introduction- Ethics in production, finance, Human resource management and Marketing Management - The Ethical Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics – Ethical Values in different Cultures - Culture and Individual Ethics – professional ethics and technical ethics.

UNIT-III		Lecture Hrs: 7

Introduction - Meaning, definition, Nature, and significance – Key elements of corporate culture, shared values, beliefs and norms, rituals, symbols and language - Types of corporate culture, hierarchical culture, market driven culture – Organization leadership and corporate culture, leadership styles and their impact on culture, transformational leadership and culture change.

UNIT-IV		Lecture Hrs: 7

Law and Ethics -Agencies enforcing Ethical Business Behavior - Legal Impact – Environmental Protection, Fair Trade Practices, legal Compliances, Safeguarding Health and wellbeing of Customers – Corporate law, Securities and financial regulations, corporate governance codes and principles.

UNIT-V		Lecture Hrs: 7

Introduction - Meaning – Corporate governance code, transparency & disclosure -Role of auditors, board of directors and shareholders. Global issues, accounting and regulatory frame work - Corporate scams - Committees in India and abroad, corporate social responsibility. BoDs composition, Cadbury Committee - Various committees - Reports - Benefits and Limitations.

Textbooks:

1. Murthy CSV: Business Ethics and Corporate Governance, HPH July 2017
2. Bholananth Dutta, S.K. Podder – Corporation Governance, VBH. June 2010

Reference Books:

1. Dr. K. Nirmala, KarunakaraReaddy. Business Ethics and Corporate Governance, HPH
2. H.R.Machiraju: Corporate Governance, HPH, 2013
3. K. Venkataramana, Corporate Governance, SHBP.
4. N.M.Khandelwal. Indian Ethos and Values for Managers

(Common for all B.Tech Branch)

Course Code	E-BUSINESS	L	T	P	C
23MBTU4b		2	0	0	2
	Semester	IV-I			

Course Objectives:

1. To provide knowledge on emerging concept on E-Business related aspect.
2. To understand various electronic markets & business models.
3. To impart the information about electronic payment systems & banking.
4. To create awareness on security risks and challenges in E-commerce.
5. To the students aware on different e-marketing channels & strategies.

Course Outcomes (CO): Student will be able to

- Remember E-Business & its nature, scope and functions.
- Understand E-market-Models which are practicing by the organizations
- Apply the concepts of E-Commerce in the present globalized world.
- Analyze the various E-payment systems & importance of net banking.
- Evaluate market research strategies & E-advertisements.
- Understand importance of E-security & control.

UNIT-I — Lecture Hrs: 7

Introduction – Nature, meaning, significance, functions and advantages - Definition of Electronic Business - Functions of Electronic Commerce (EC)-Advantages & Disadvantages of E-Commerce –E-Commerce and E-Business, Internet Services, Online Shopping- E-Commerce Opportunities for Industries.

UNIT-II — Lecture Hrs: 7

Introduction –E-Shops-E-Malls E-Groceries - Portals - Vertical Portals-Horizontal Portals - Advantages of Portals - Business Models- Business to Business (B2B)-Business to Customers(B2C) - Business to Government(B2G)-AuctionsB2B Portals in India

UNIT-III — Lecture Hrs: 7

Introduction to electronic payment systems (EPS) -Types of electronic payments - Credit/debit cards, e-wallets, UPI, and crypto currencies -Smart cards and digital wallets: Features and usage -Electronic Fund Transfer (EFT): Role in business transactions -Infrastructure requirements and regulatory aspects of e-payments

UNIT-IV — Lecture Hrs: 7

Security risks and challenges in electronic commerce - Cyber threats - Phishing, hacking, identity theft, and malware - Digital Signatures & Certificates - Security protocols over public networks (HTTP, SSL, TLS) -Firewalls in securing ebusiness platforms.

UNIT-V — Lecture Hrs: 7

Introduction – Online Marketing – Advantages of Online Marketing – Internet Advertisement – Advertisement Methods – Conducting Online Market Research– – E-marketing planning: Online branding, social media marketing, and email marketing - E-business strategies: Digital advertising, content marketing, and analytics – E-Customer Relationship Management (eCRM) E-supply chain management (e-SCM)

Textbooks:

1. Arati Oturkar & Sunil Khilari. E-Business. Everest Publishing House, 2022
2. P.T.S Joseph. E-Commerce, Fourth Edition, Prentice Hall of India, 2011

Reference Books:

Reference Books:

1. Debjani, Kamalesh K Bajaj. E-Commerce, Second Edition Tata McGraw-Hill's, 2005
2. Dave Chaffey.E-Commerce E-Management, Second Edition, Pearson, 2012.
3. Henry Chan. E-Commerce Fundamentals and Application, RaymondLeathamWiley India 2007
4. S. Jaiswal. E-Commerce GalgotiaPublication Pvt Ltd., 2003.

(Common for all B.Tech Branch)

Course Code	MANAGEMENT SCIENCE	L	T	P	C
23MBTU4c		2	0	0	2
	Semester	IV-I			

Course Objectives:

1. To provide fundamental knowledge on Management, Administration, Organization & its concepts.
2. To make the students understand the role of management in Production
3. To impart the concept of HRM in order to have an idea on Recruitment, Selection, Training & Development, job evaluation and Merit rating concepts
4. To create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management
5. To make the students aware of the contemporary issues in modern management

Course Outcomes (CO): Student will be able to

- Remember the concepts & principles of management and designs of organization in a practical world
- Understand the knowledge of Work-study principles & Quality Control techniques in industry
- Apply the process of Recruitment & Selection in organization.
- Analyze the concepts of HRM & different training methods.
- Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT.
- Create awareness on contemporary issues in modern management & technology.

UNIT-I		Lecture Hrs: 7

Management - Concept and meaning - Nature-Functions - Management as a Science and Art and both. Schools of Management Thought - Taylor‘s Scientific Theory-Henry Fayol‘s principles - Elton Mayo‘s Human relations - Organizational Designs - Line organization - Line & Staff Organization - Functional Organization - Matrix Organization - Project Organization - Committee form of Organization - Social responsibilities of Management.

UNIT-II		Lecture Hrs: 7

Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production), Work Study - Statistical Quality Control- Material Management - Objectives - Inventory-Functions - Types, Inventory Techniques - EOQ-ABC Analysis - Marketing Management - Concept - Meaning - Nature-Functions of Marketing - Marketing Mix - Channels of Distribution - Advertisement and Sales Promotion - Marketing Strategies based on Product Life Cycle.

UNIT-III		Lecture Hrs: 7

HRM - Definition and Meaning – Nature - Managerial and Operative functions - Job Analysis - Human Resource Planning(HRP) - Employee Recruitment-Sources of Recruitment - Employee Selection - Process - Employee Training and Development - methods - Performance Appraisal Concept - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration.

UNIT-IV		Lecture Hrs: 7

Definition& Meaning - Setting of Vision - Mission - Goals - Corporate Planning Process - Environmental Scanning - Steps in Strategy Formulation and Implementation - SWOT Analysis - Project Management - Network Analysis - Programme Evaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Probability of Completing the project within given time - Project Cost-Analysis - Project Crashing (Simple problems).

UNIT-V		Lecture Hrs: 7

Customer Relations Management(CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management(SCM) - Enterprise Resource Planning (ERP) - Performance Management – employee engagement and retention - Business Process Re-engineering and Bench Marking - Knowledge Management – change management – sustainability and corporate social

responsibility.
Textbooks:
1. Frederick S. Hillier, Mark S. Hillier. Introduction to Management Science, October 26, 2023 2. A.R Aryasri, Management Science, TMH, 2019
Reference Books:
1. Stoner, Freeman, Gilbert.Management, Pearson Education, New Delhi, 2019. 2. 2. Koontz & Weihrich, Essentials of Management, 6/e, TMH, 2005. 3. Thomas N.Duening & John M.Ivancevich, Management Principles and Guidelines, Biztantra. 4. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004. 5. Samuel C.Certo, Modern Management, 9/e, PHI, 2005

Course Code	RADAR ENGINEERING	L	T	P	C
23ECT27a		3	0	0	3
Semester				VII	

Course Objectives:

1. To understand the basic working principle of Radar and target detection procedure.
2. To learn about the working and applications of CW and Frequency modulated Radar.
3. To comprehend the working and applications of MTI and Pulse Doppler Radar
4. To understand different methods of tracking a target and their limitations.
5. To analyze the effect of noise at the receiver and uses of phased array antennas and navigational aids.

Course Outcomes: At the end of this course, the students will be able to

CO1: Learn the basic working principle of Radar and target detection procedure.
CO2: Know the working and applications of CW and Frequency modulated Radar.
CO3: Gain the knowledge of about MTI and Pulse Doppler Radar.
CO4: Understand different methods of tracking a target and their limitations.
CO5:Analyze the effect of noise at the receiver and uses of phased array antennas and navigational aids.

UNIT - I

Basics of Radar: Introduction, Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications, Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation, Illustrative Problems. Radar Equation**:** SNR, Envelope Detector, False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Display types, Illustrative Problems.

UNIT- II

CW and Frequency Modulated Radar: Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar, Illustrative Problems.FM-CW Radar, Range and Doppler Measurement, Block Diagram and Characteristics (Approaching/ Receding Targets), FM-CW altimeter, Multiple Frequency CW Radar.

UNIT-III

MTI and Pulse Doppler Radar: Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, And Staggered PRFs. Range Gated Doppler Filters, MTI Radar Parameters, Limitations to MTI Performance,MTI versus Pulse Doppler radar.

UNIT- IV

Tracking Radar: Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar – Amplitude Comparison Monopulse (one- and two-coordinates), Phase Comparison Monopulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

UNIT - V

Detection of Radar Signals in Noise: Introduction, Noise Figure and Noise Temperature, Matched Filter Receiver – Response Characteristics and Derivation, Correlation detection, Detection criteria, Detector Characteristics, Automatic Detection, Constant False Alarm Rate Receiver. Introduction to Software Defined Radio,Introduction to Stealth technology.

Radar Receivers: Introduction to Phased Array Antennas- Basic Concepts, Electronically Steered Phased Array Antennas, Phase Shifters, Frequency – scan Arrays, Radiation for Phased Array, Architecture for Phased Arrays. Radiation Pattern. Beam Steering and Beam Width changes. Navigational Aids : Direction Finder, VOR,ILS and Loran. Radar Range Equation and Doppler Frequency Shift using MATLAB

Textbooks:

1. Merrill I. Skolnik, —Introduction to Radar Systems‖, 2nd Edition, TMH Special Indian Edition, 2007.
2. Byron Edde, —Radar Principals, Technology, Applications‖, Pearson Education, 1992.

References:

1. Peebles, —Radar Principles‖, Wiley, New York, 1998.
2. G.S.N.Raju, —Radar Engineering and Fundamentals of Navigational Aids‖, I. K. International Pvt. Ltd.
3. G. SasiBhushan Rao, — Microwave and Radar Engineering‖, Pearson Education, 2014

Course Code	DSP PROCESSORS & ARCHITECTURES	L	T	P	C
23ECT27b		3	0	0	3
Semester				VII	

Course Objectives:

1. To describe the unique features and significance of Digital Signal Processing (DSP).
2. To demonstrate various computational parameters and accuracy considerations in DSP systems.
3. To introduce architectural improvements in programmable DSP devices and their execution models.
4. To expose students to basic DSP algorithms, including filtering, FFT, and adaptive processing.
5. To outline DSP processor applications and their interfacing with memory and I/O peripherals.

Course Outcomes: At the end of this course, the students will be able to

CO1: Summarize the fundamental features and role of Digital Signal Processing in real-world applications.
CO2: Evaluate dynamic range, precision, and error sources in DSP implementations.
CO3: Explain the architectural features of DSP processors and their computational efficiency.
CO4: Analyze the performance of DSP algorithms on programmable DSP platforms for specific applications.
CO5: Select and implement DSP processors for real-time applications, including memory and peripheral interfacing.

UNIT-I

Introduction to Digital Signal Processing: Introduction, a Digital signal-processing system, the sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), linear time-invariant systems, Digital filters, Decimation and interpolation, Analysis and Design tool for DSP Systems MATLAB, DSP using MATLAB.

Computational Accuracy in DSP Implementations: Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT-II

Architectures for Programmable DSP Devices: Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

Execution Control and Pipelining: Hardware looping, Interrupts, Stacks, Relative Branch support,

Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, Pipeline Programming models.

UNIT-III

Programmable Digital Signal Processors: Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On- Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

UNIT-IV

Implementations of Basic DSP Algorithms: The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing.

Implementation of FFT Algorithms: An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

UNIT-V

Interfacing Memory and I/O Peripherals to Programmable DSP Devices: Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA). A Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example.

Textbooks:

1. Avtar Singh and S. Srinivasan, —Digital Signal Processing Implementation‖, 1st Edition, Cengage Learning, 2004.
2. Lapsley et al. S. Chand and Co, —DSP Processor Fundamentals, Architectures & Features‖, 2000.

References:

1. B. Venkata Ramani and M. Bhaskar, —Digital Signal Processors, Architecture, Programming and Applications‖, TMH, 2004.
2. Jonatham Stein, —Digital Signal Processing: A Computer Science Perspective‖, John Wiley, 2000.

Course Code	CELLULAR & MOBILE COMMUNICATIONS Professional Electives	L	T	P	C
23ECT27c		3	0	0	3
Semester				VII	

Course Objectives:

1. To explain the basic cellular system and its working.
2. To understand the impact of multipath fading channels and techniques to mitigate fading effects in cellular communication.
3. To explore frequency management, channel assignment strategies, and different types of handoffs in cellular networks.
4. To analyze the performance of mobile antennas, interference issues, and cellular system design principles.
5. To evaluate system performance metrics such as dropped call rates, handoff strategies, and spectrum efficiency.

Course Outcomes: **At the end of this course, the students will be able to**

CO1: Understand the basic cellular system and its working.

CO2: Explain the impairments caused by multipath fading and methods to mitigate fading effects in mobile communication.

CO3: Apply concepts of cellular communication to solve problems related to mobile antennas and system design.

CO4: Analyze co-channel and non-co-channel interferences, different types of handoffs, and dropped call rates.

CO5: Evaluate the performance of cellular systems, including signal reception, handoff efficiency, and spectrum utilization.

UNIT I

Cellular Mobile Radio Systems: Introduction to Cellular Mobile system, basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, Hexagonal shaped cells, Analog and Digital Cellular systems.

UNIT II

Elements of Cellular Radio System Design: General description of the problem, concept of frequency channels, Co-channel Interference Reduction Factor, desired C/I from a normal case in a Omni directional Antenna system, Cell splitting, consideration of the components of cellular

system.

Interference: Introduction to Co-channel interference, real time co-channel interference, Co-channel measurement, design of Antenna system, Antenna parameters and their effects, diversity receiver, non-co-channel interference-different types.

UNIT III

Cell Coverage for Signal and Traffic: Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long-distance propagation antenna height gain, form of a point-to-point model.

UNIT IV

Cell Site and Mobile Antennas: Sum and difference patterns and their synthesis, Omni directional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas, minimum separation of cell site antennas, high gain antennas.

Frequency Management and Channel Assignment: Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells, non fixed channel assignment.

UNIT V

Handoff: Handoff, dropped calls and cell splitting, types of handoffs, handoff invitation, delaying handoff, forced handoff, mobile assigned handoff. Intersystem handoff, cell splitting, micro cells, vehicle locating methods, dropped call rates and their evaluation.

System Evaluations: Performance evaluation, Signal evaluation, Measurement of average received level and level crossings, Spectrum efficiency evaluation.

Textbooks:

1. W .C. Y. Lee, —Mobile cellular telecommunications‖, Tata Mc-Graw Hill, 2nd Edition, 2006.
2. Theodore. S. Rapport, —Wireless communications‖, Pearson Education, 2ndEdn., 2002.

References:

1. Gordon L. Stuber, —Principles of Mobile communications‖, Springer International 2nd Edition, 2007.
2. Lee , —Wireless and Mobile Communications‖, Mc Graw Hills, 3rd Edition, 2006.
3. Jon W.Mark and WeihuaZhqung, —Wireless communications and Networking‖, PHI, 2005.
4. R.Blake, —Wireless communication Technology‖, Thompson Asia Pvt.Ltd., 2004.
5.

Course Code	LOW POWER VLSI DESIGN	L	T	P	C
23ECT28a		3	0	0	3
Semester				VII	

Course Objectives:

1. To understand the need for low-power circuit design and analyze different power dissipation mechanisms in VLSI circuits.
2. To explore various low-power design approaches at the system, circuit, and mask levels.
3. To study low-power adder architectures and their role in power-efficient computing.
4. To examine different low-power multiplier architectures and their impact on digital design.
5. To gain knowledge of low-power memory technologies and their future developments.

Course Outcomes: At the end of this course, the students will be able to

CO1: Understand the need for low-power circuit design and analyze different power dissipation mechanisms in VLSI circuits.
CO2: Learn various low-power design approaches at the system, circuit, and mask levels.
CO3: Gain knowledge on low-power adder architectures and their role in power-efficient computing.
CO4: Examine different low-power multiplier architectures and their impact on digital design.
CO5: Grasp knowledge of low-power memory technologies and their future developments.

UNIT I

Fundamentals: Need for Low Power Circuit Design, Sources of Power Dissipation – Static and Dynamic Power Dissipation, Short Circuit Power Dissipation, Glitching Power Dissipation, Short Channel Effects –Drain Induced Barrier Lowering and Punch Through, Surface Scattering, Velocity Saturation, Impact Ionization, Hot Electron Effect.

UNIT II

Low-Power Design Approaches: Low-Power Design through Voltage Scaling – VTCMOS circuits, MTCMOS circuits, Architectural Level Approach –Pipelining and Parallel Processing Approaches. Switched Capacitance Minimization Approaches: System Level Measures, Circuit Level Measures, Mask level Measures.

UNIT III

Low-Voltage Low-Power Adders: Introduction, Standard Adder Cells, CMOS Adder‘s Architectures – Ripple Carry Adders, Carry Look Ahead Adders, Carry Select Adders, Carry Save Adders, Low-Voltage Low-Power Design Techniques – Trends of Technology and Power Supply Voltage, Low-Voltage Low-Power Logic Styles.

UNIT IV

Low-Voltage Low-Power Multipliers: Introduction, Overview of Multiplication, Types of Multiplier Architectures, Braun Multiplier, Baugh Wooley Multiplier, Booth Multiplier, Introduction to Wallace Tree Multiplier.

UNIT V

Low-Voltage Low-Power Memories: Basics of ROM, Low-Power ROM Technology, Future Trend and Development of ROMs, Basics of SRAM, Memory Cell, Precharge and Equalization Circuit, Low-Power SRAM Technologies, Basics of DRAM, Self-Refresh Circuit, Future Trend and Development of DRAM, FinFET-Based Low-Power VLSI Design Techniques.

Textbooks:

1. CMOS Digital Integrated Circuits – Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 2011.
2. Low-Voltage, Low-Power VLSI Subsystems – Kiat-Seng Yeo, Kaushik Roy, TMH Professional Engineering.

References:

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011.
2. Low Power CMOS Design – AnanthaChandrakasan, IEEE Press/Wiley International, 1998.
3. Low Power CMOS VLSI Circuit Design – Kaushik Roy, Sharat C. Prasad, John Wiley & Sons,2000.

Course Code	WIRELESS SENSOR NETWORKS	L	T	P	C
23ECT28b		3	0	0	3
Semester				VII	

Course Objectives:

1. To introduce the fundamental concepts and architecture of wireless sensor networks.
2. To explore various network architectures, optimization techniques, and design principles for wireless sensor networks.
3. To study MAC protocols, routing techniques, and addressing mechanisms for efficient sensor network communication.
4. To understand the infrastructure establishment of sensor networks, including topology control and synchronization.
5. To provide knowledge on sensor network platforms, programming challenges, and simulation tools.

Course Outcomes: At the end of this course, the students will be able to

CO1: Learn the fundamental concepts and architecture of wireless sensor networks.
CO2: Explore various network architectures, optimization techniques, and design principles for wireless sensor networks.
CO3: Gain knowledge of MAC protocols, routing techniques, and addressing mechanisms for efficient sensor network communication.
CO4: Understand the infrastructure establishment of sensor networks, including topology control and synchronization.
CO5: Grasp the knowledge on sensor network platforms, programming challenges, and simulation tools.

UNIT I

Overview of Wireless Sensor Networks: Single-Node Architecture - Hardware Components- Network Characteristics- unique constraints and challenges, Enabling Technologies for Wireless Sensor Networks- Types of wireless sensor networks.

UNIT II

Architectures: Network Architecture- Sensor Networks-Scenarios- Design Principle, Physical Layer and Transceiver Design Considerations, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT III

Networking Sensors: MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols and Wakeup Concepts - SMAC, - B-MAC Protocol, IEEE 802.15.4 standard and ZigBee, the Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols Energy-Efficient Routing, Geographic

Routing.

UNIT IV

Infrastructure Establishment: Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

UNIT V

Sensor Network Platforms and Tools : Sensor Node Hardware – Berkeley Motes,Programming Challenges, Node-level software platforms, Node level Simulators, State-centric programming, Internet of Things (IoT) Integration with Wireless Sensor Networks.

Textbooks:

1. Holger Karl & Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks‖, John Wiley, 2005.
2. Feng Zhao & Leonidas J.Guibas, —Wireless Sensor Networks-An Information Processing Approach", Elsevier, 2007

Reference Books:

1. WaltenegusDargie , Christian Poellabauer, —Fundamentals Of Wireless Sensor Networks Theory And Practice‖, By John Wiley & Sons Publications, 2011
2. KazemSohraby, Daniel Minoli, &TaiebZnati, —Wireless Sensor Networks-Technology, Protocols, and Applications‖, John Wiley, 2007.
3. Anna Hac, —Wireless Sensor Network Designs‖, John Wiley, 2003

Course Code	5G COMMUNICATIONS	L	T	P	C
23ECT28c		3	0	0	3
Semester				VII	

Course Objectives:

1. To introduce the fundamental concepts of 5G spectrum, radio access technologies, and system requirements.
2. To understand the architecture and physical layer aspects of 5G networks, including MIMO and beamforming.
3. To explore advanced 5G radio-access technologies and their role in multi-user communication.
4. To study network slicing, SDN, NFV, and their applications in vehicular communications.
5. To analyze mobility management, interference control, and dynamic network reconfiguration in 5G.

Course Outcomes: At the end of this course, the students will be able to

CO1: Understand the 5G radio spectrum and channel models, including spectrum sharing and propagation challenges.
CO2: Analyze the 5G network architecture, including the core network, RAN, and physical layer procedures.
CO3: Evaluate different 5G radio-access technologies, including new waveforms and non-orthogonal multiple access schemes.
CO4: Apply network slicing concepts and vehicular communication techniques for efficient 5G network deployment.
CO5: Develop strategies for mobility and handoff management to optimize network performance and minimize interference.

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UNIT I

5G Radio Spectrum: Introduction to 5G Communications**,** 5G spectrum landscape and requirements, Spectrum access modes and sharing scenarios, 5G spectrum technologies.
5G Channel Model: The 5G wireless Propagation Channels: Channel modeling requirements, propagation scenarios and challenges in the 5G modeling.
5G Use Cases and System Concept: Use cases and requirements, 5G system concept

UNIT II

Radio Interface Architecture: 5G architecture options, core network architecture, RAN architecture. 5G PHYSICAL LAYER: Physical channels and signals, 5G frame structure, physical layer procedures (MIMO, Power control, link adaptation, beam forming).

UNIT III

5G Radio-Access Technologies: Access design principles for multi-user communications, multi-carrier with filtering: a new waveform, non-orthogonal schemes for efficient multiple access

UNIT IV

Introduction to 5G Network Slicing: Network Slicing, E2E Slicing, SDN and NFV Slicing

Vehicular Communications: From V2V to AV2X, key standards, VC architectures, V2X Use cases

UNIT V

Mobility and Handoff Management in 5G: Introdution to Handoff**,** Network deployment types, Interference management in 5G, Mobility management in 5G, Dynamic network reconfiguration in 5G. Introduction to 5G Simulations using LENA

Textbooks:

1. Afif Osseiran, Jose F Monserrat, Patrick Marsch,—5G Mobile and Wireless Communications
2. Technology‖, Cambridge University Press, 2016
3. Saad Z. Asif, —5G Mobile Communications Concepts and Technologies‖, CRC Press,
   Taylor & Francis Group, First Edition, 2018
4. HarriHolma, Antti Toskala, Takehiro Nakamura, —5G Technology 3GPP NEW RADIO‖, John Wiley & Sons First Edition,2020

References:

5. Gordon L. Stuber, —Principles of Mobile Communication‖, KLUWER ACADEMIC PUBLISHERS, 2nd Edition, 2002
6. Joseph C.Liberti, Theodore S. Rappaport, —Smart Antennas for Wireless Communications‖, Prentice Hall PTR, 1999
7. Ying Zhang, —Network Function Virtualization Concepts and Applicability in 5G Networks‖, John Wiley & Sons, 2018.

Course Code	EMPLOYABILITY SKILLS	L	T	P	C
23BST33	OPEN ELECTIVE - III	3	0	0	3

Course Objectives:

- To encourage all round development of the students by focusing on productive skills
- To make the students aware of Goal setting and writing skills
- To enable them to know the importance of presentation skills in achieving desired goals.
- To help them develop organizational skills through group activities
- To function effectively with heterogeneous teams

Course Outcomes (CO):	Blooms Level
CO1: Understand the importance of goals and try to achieve them	L1, L2
CO2: Explain the significance of self-management	L1, L2
CO3: Apply the knowledge of writing skills in preparing eye-catchy resumes	L3
CO4: Analyse various forms of Presentation skills	L4
CO5: Judge the group behaviour appropriately	L5
CO6: Develop skills required for employbility.	L3, L6

UNIT - I	**Goal Setting and Self-Management**	Lecture Hrs

Definition, importance, types of Goal Setting – SMART Goal Setting – Advantages-Motivation – Intrinsic and Extrinsic Motivation– Self-Management- Knowing about self– SWOC Analysis

UNIT-II	**Writing Skills**	Lecture Hrs

Definition, significance, types of writing skills – Resume writing Vs CV Writing - E-Mail writing, Cover Letters - E-Mail Etiquette -SoP (Statement of Purpose)

UNIT - III	**Technical Presentation Skills**	Lecture Hrs

Nature, meaning & significance of Presentation Skills – Planning, Preparation, Presentation, Stage Dynamics –Anxiety in Public speaking (Gloss phobia)- PPT & Poster Presentation

UNIT - IV	**Group Presentation Skills**	Lecture Hrs

Body Language – Group Behaviour - Team Dynamics – Leadership Skills – Personality Manifestation - Group Discussion-Debate –Corporate Etiquette

UNIT - V	**Job Cracking Skills**	Lecture Hrs

Nature, characteristics, importance & types of Interviews – Job Interviews – Skills for success – Job searching skills - STAR method - FAQs- Answering Strategies – Mock Interviews

Textbooks:

1. Sabina Pillai, Agna Fernandez. Soft Skills & Employability Skills, 2014.Cambridge Publisher.

2.Alka Wadkar. Life Skills for Success, Sage Publications, 2016.
Reference Books:
1. Gangadhar Joshi. Campus to Corporate Paperback, Sage Publications. 2015 2. Sherfield Montogomery Moody, Cornerstone Developing Soft Skills, Pearson Publications. 4 Ed. 2008 3. Shikha Kapoor. Personality Development and Soft Skills- Preparing for Tomorrow .1 Edition, Wiley, 2017. 4. M. Sen Gupta, Skills for Employability, Innovative Publication, 2019. 5. Steve Duck and David T McMahan, The Basics f Communication Skills A Relational Perspective, Sage press, 2012.
Online Learning Resources:
1. https://youtu.be/gkLsn4ddmTs 2. https://youtu.be/2bf9K2rRWwo 3. https://youtu.be/FchfE3c2jzc 4. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ 5. https://www.youtube.com/c/skillopedia/videos 6. https://onlinecourses.nptel.ac.in/noc25_hs96/preview 7. https://onlinecourses.nptel.ac.in/noc21_hs76/preview 8. https://archive.nptel.ac.in/courses/109/107/109107172/# 9. https://archive.nptel.ac.in/courses/109/104/109104107/

23CST23d	INTERNET OF THINGS (Open Elective-IV)	L	T	P	C
		3	0	0	3

Course Objectives:

- Understand the basics of Internet of Things and protocols.
- Discuss the requirement of IoT technology
- Introduce some of the application areas where IoT can be applied.
- Understand the vision of IoT from a global perspective, understand its applications, determine its market perspective using gateways, devices and data management

Course Outcomes:

After completion of the course, students will be able to

- Understand general concepts of Internet of Things.
- Apply design concept to IoT solutions
- Analyze various M2M and IoT architectures
- Evaluate design issues in IoT applications
- Create IoT solutions using sensors, actuators and Devices

UNIT I Introduction to IoT

Definition and Characteristics of IoT, physical design of IoT, IoT protocols, IoT communication models, IoT Communication APIs, Communication protocols, Embedded Systems, IoT Levels and Templates

UNIT II Prototyping IoT Objects using Microprocessor/Microcontroller

Working principles of sensors and actuators, setting up the board – Programming for IoT, Reading from Sensors, Communication: communication through Bluetooth, Wi-Fi.

UNIT III IoT Architecture and Protocols

Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, Protocols- 6LowPAN, RPL, CoAP, MQTT, IoT frameworks- Thing Speak.

UNIT IV Device Discovery and Cloud Services for IoT

Device discovery capabilities- Registering a device, Deregister a device, Introduction to Cloud Storage models and communication APIs Web-Server, Web server for IoT.

UNIT V UAV IoT

Introduction toUnmanned Aerial Vehicles/Drones, Drone Types, Applications: Defense, Civil, Environmental Monitoring; UAV elements and sensors- Arms, motors, Electronic Speed Controller(ESC), GPS, IMU, Ultra sonic sensors; UAV Software –Arudpilot, Mission Planner, Internet of Drones(IoD)- Case study FlytBase.

Textbooks:

1. Vijay Madisetti and ArshdeepBahga, ― Internet of Things (A Hands-on-Approach)‖, 1st Edition, VPT, 2014.
2. Handbook of unmanned aerial vehicles, K Valavanis;George J Vachtsevanos, New York, Springer, Boston, Massachusetts : Credo Reference, 2014. 2016.

Reference Books:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, ― From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence‖, 1st Edition, Academic Press, 2014.
2. ArshdeepBahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.
3. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.
4. Francis daCosta, ―Rethinking the Internet of Things: A Scalable Approach to Connecting Everything‖, 1st Edition, Apress Publications, 2013
5. Cuno Pfister, Getting Started with the Internet of Things, O‟Reilly Media, 2011, ISBN: 9781-4493- 9357-1
6. DGCA RPAS Guidance Manual, Revision 3 – 2020
7. Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs, John Baichtal

Online Learning Resources:

1. *https://www.arduino.cc/*
2. *https://www.raspberrypi.org/*
3. *https://nptel.ac.in/courses/106105166/5*
4. *https://nptel.ac.in/courses/108108098/*4

Course Code	RF SYSTEM DESIGN TOOLS	L	T	P	C
23ECP14a		0	1	2	2
Semester				VII	

Course Objectives:

1. To introduce RF design software and tools for designing and simulating RF systems.
2. To understand impedance matching techniques and the role of scattering parameters in RF circuit design.
3. To explore the design of RF power amplifiers, filters, oscillators, mixers, and voltage-controlled oscillators (VCOs).
4. To analyze microstrip transmission lines, their discontinuities, and their applications in RF systems.
5. To study the design, simulation, and measurement of antennas and microwave integrated circuits.

Course Outcomes: At the end of this course, the students will be able to

CO1: Utilize RF design software and tools to simulate and analyze RF circuits and components.
CO2: Design and implement impedance matching networks such as L-match, Pi-match, and T-match circuits.
CO3: Develop and evaluate RF amplifiers, filters, oscillators, and mixers for high-frequency applications.
CO4: Analyze microstrip transmission lines and measure their characteristics using S-parameters and Smith charts.
CO5: Design and simulate various types of antennas, including microstrip patch antennas, Yagi-Uda antennas, and horn antennas.

Basic Concepts in RF Design: Introduce any RF design software and orient students with the tools of the laboratory. Practice the tool to use it for significant design.Introduction to RF Design, Time Variance and Nonlinearity, Effects of nonlinearity, Passive impedance transformation, Scattering parameters, impedance matching, L match,Pi match, T match, Passive IC Components-Resistors, capacitors Inductors, Schottky Diode, RF Switch.

RF Power Amplifiers and Filters: RF Power amplifier design examples, Gain equalizers, Voltage controlled oscillators, Phase locked loops, Linearized PLL models, PLL design examples, High frequency oscillators, Loop filters, lumped filter. LPF, HPF and BPF.

LNA, VCO and Mixers: General considerations, Problem of input matching, Low Noise Amplifiers design in various topologies, Gain Switching, Band Switching, Voltage Controlled Oscillators, Mixers-General considerations, Passive down conversion mixers, Active down conversion mixers, Up conversion mixers.

Microstrip transmission lines and discontinuities: S parameters of a Microstrip Transmission Line, Smith Chart, Analysis of Microstrip Transmission Line standing wave patterns at various frequencies, Different types of Transmission lines like CPW, Microstrip and Co-axial cable. Different types of Microstrip discontinuities like Bend, T, Via, Gap etc., Microstrip Ring Resonator.

Antennas and Microwave Integrated Circuits: Radiation Pattern, Gain, S Parameters, Return loss and VSWR. Design considerations of Microstrip Patch Antenna and Microstrip Array, Yagi Uda Antenna and Horn Antenna. Hybrid Microwave Integrated Circuits, Monolithic Microwave Integrated Circuits, Microwave Integrated Circuits: MMIC Amplifier, Phased Array Antennas and Beamforming Techniques. Reconfigurable Antennas.

Any twelve experiments are to be done:

1. Design and simulate Impedance matching circuits like L-Matching, Pi Matching and T-Matching.
2. Design and Simulate a Schottky Diode and RF Switch.
3. Design and simulate a RF BJT Amplifier and LNA.
4. Design and simulate a Power Amplifier and Gain Equalizer.
5. Analyse and measure the gain of a Power Amplifier and equalise its gain using an Equalizer.
6. Design and simulate a High Frequency Oscillator and Lumped Filter.
7. Measurement of insertion loss, -3dB Cut of frequency of LPF,HPF and BPF.
8. Design and Simulate a VCO and RF Mixer.
9. Measure the S parameters of a Micro strip Transmission Line and plot the normalised impedance on a smith chart
10. Analysis of Microstrip Transmission Line standing wave pattern at various frequencies.
11. Study of different types of Transmission lines like CPW, Microstrip and Co-axial and find/measure its Insertion Loss (S21 and S12)
12. Study of different types of Microstrip discontinuities like Bend, T, Via , Gap etc and find/measure its Insertion loss.
13. Determine the Bandwidth and Quality Factor of a Microstrip Ring Resonator.
14. Design and simulate the Radiation Pattern,gain, $S_{11}$and VSWRof a Microstrip Patch Antenna and Microstrip Array.
15. Design and simulate the Radiation Pattern, gain, $S_{11}$and VSWR of a Yagi Uda Antenna and Horn Antenna.
16. Design and Simulate a MMIC Amplifier.

Equipment Required

1. RF Circuit Design and Simulation Software, MATLAB
2. RF Training System
3. Antenna Measurement System with Antenna Design Software.

Course Code	INDUSTRIAL IOT AND AUTOMATION (SKILL COURSE)	L	T	P	C
23ECP14b		0	1	2	2
Semester				VII	

Course Objectives:

1. To introduce the fundamentals of Industrial IoT (IIoT), its architecture, and its differences from traditional IoT.
2. To understand the components of IIoT, including sensors, actuators, and control systems, and their integration with embedded platforms.
3. To explore communication technologies such as ZigBee, Bluetooth, NFC, RFID, and MQTT for IIoT applications.
4. To study data visualization techniques, dashboard creation, and web-based connectivity for IIoT systems.
5. To learn data retrieval techniques, machine-to-machine (M2M) communication, and cloud integration for IIoT applications.
6. To implement automation using PLCs, SCADA, and real-time control systems for industrial applications.

Course Outcomes: At the end of this course, the students will be able to

CO1: Explain the fundamental concepts of IIoT, its architecture, and the challenges associated with industrial automation.
CO2: Demonstrate the integration of sensors and actuators with Raspberry Pi/NodeMCU for real-time monitoring and control.
CO3: Implement communication protocols such as MQTT, ZigBee, and Bluetooth to enable seamless IIoT connectivity.
CO4: Develop web-based dashboards for real-time visualization and remote monitoring of IIoT devices.
CO5: Retrieve, analyze, and transmit industrial data using web-based interactions and M2M communication.
CO6: Implement PLC-based automation, ladder logic programming, and SCADA for supervisory control in industrial environments.

(All the modules need to be conducted and minimum one project to be done)

MODULE 1: Introduction & Architecture

What is IIoT and connected world? The difference between IoT and IIoT, Architecture of IIoT, IOT node, Challenges of IIOT. Practice

1. Introduction to Arduino, Introduction to raspberry Pi.
https://www.youtube.com/watch?v=AQdLQV6vhbk

MODULE 2: IIOT Components

Fundamentals of Control System, introductions, components, closed loop & open loop system.

Introduction to Sensors (Description and Working principle): What is sensor? Types of sensors, working principle of basic Sensors -Ultrasonic Sensor, IR sensor, MQ2, Temperature and Humidity Sensors (DHT-11).Digital switch, Electro Mechanical switches.

Practice

1. Measurement of temperature & pressure values of the process using raspberry pi/node mcu.

2. Modules and Sensors Interfacing (IR sensor, Ultrasonic sensors, Soil moisture sensor) using Raspberry pi/node mcu.

3. Modules and Actuators Interfacing (Relay, Motor, Buzzer) using Raspberry pi/node mcu.

MODULE 3: Communication Technologies of IIoT

Communication Protocols: IEEE 802.15.4, ZigBee, Bluetooth, BLE, NFC, RFIDIndustry standards communication technology (MQTT), wireless network communication.

Practice

1. Demonstration of MQTT communication.

MODULE 4: Visualization and Data Types of IIoT

Connecting an Arduino/Raspberry pi to the Web: Introduction, setting up the Arduino/Raspberry pi development environment, Options for Internet connectivity with Arduino, Configuring your Arduino/Raspberry pi board for the IoT. Big Data in IIOT, Industrial KPIs

Practice

1. Visualization of diverse sensor data using dashboard (part of IoT‘s _control panel‘)

2. Sending alert message to the user. ways to control and interact with your environment)

MODULE 5: Retrieving Data

Extraction from Web: Grabbing the content from a web page, Sending data on the web, Troubleshooting basic Arduino issues, Types of IoT interaction, Machine to Machine interaction (M2M).

Practice

1. Device control using mobile Apps or through Web pages.

2. Machine to Machine communication.

MODULE 6: Control & Supervisory Level of Automation

Programmable logic controller (PLC), Real-time control system, Supervisory Control & Data Acquisition (SCADA).

Practice

1. Digital logic gates programming using ladder diagram.
2. Implementation of Boolean expression using ladder diagram.
3. Simulation of PLC to understand the process control concept.

Projects:

IIoT based smart energy meter

Smart Agriculture system

Automation using controller via Bluetooth

Temperature controlled Fan/cooler using controller

Automatic streetlight

Smart Baggage Tracker

Textbooks

1. The Internet of Things in the Industrial Sector, Mahmood, Zaigham (Ed.) (Springer Publication)
2. Industrial Internet of Things: Cybermanufacturing System**,** Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer Publication)
3. Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail Butun (editor)

23BST39	Gender Sensitization (Common to All Branches of Engineering)	L	T	P	C
		2	0	0	-

Course Objectives:

- To enable students to understand the gender related issues, vulnerability of women and men
- To familiarize them about constitutional safeguard for gender equality
- To expose the students to debates on the politics and economics of work
- To help students reflect critically on gender violence
- To make them understand that gender identities and gender relations are part of culture as they shape the way daily life is lived in the family as well as wider community and the workplace.

Course Outcomes (CO):

COs	Statements	Bloom level
CO1	Understand the basic concepts of gender and its related terminology	L1, L2,
CO2	Identify the biological, sociological, psychological and legal aspects of gender.	L1, L2
CO3	Use the knowledge in understanding how gender discrimination works in our society and how to counter it.	L3
CO4	Analyzethe gendered division of labour and its relation to politics and economics.	L4
CO5	Appraise how gender-role beliefs and sharing behaviour are associated with more well-being in all culture and gender groups	L5
CO6	Develop students‘ sensibility with regard to issues of gender in contemporary India	L3

Unit-1UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

Unit-2GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and its Consequences- Declining Sex Ratio-Demographic Consequences-Gender Spectrum -

Unit-3GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- —My Mother doesn‘t Work.‖
—Share the Load.‖-Work: Its Politics and Economics -Fact and Fiction-Unrecognized and Unaccounted work -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

Unit-4GENDER-BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment - Domestic Violence - Different forms of violence against women - Causes of violence, impact of violence against women - Consequences of gender-based violence

Unit-5GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language- Just Relationships

Prescribed Books

1. A.Suneetha, Uma Bhrugubanda, et al. *Towards a World of Equals: A Bilingual Textbook on Gender*‖, Telugu Akademi, Telangana, 2015.
2. Butler, Judith. *Gender Trouble*: *Feminism and the Subversion of Identity.* UK Paperback Edn. March 1990

Reference Books

1. Wtatt, Robin and Massood, Nazia, *Broken Mirrors: The dowry Problems in India,*London : Sage Publications, 2011
2. Datt, R. and Kornberg, J.(eds), *Women in Developing Countries,*

Assessing Strategies for Empowerment, London: Lynne Rienner Publishers, 2002

3. Brush, Lisa D., *Gender and Governance*, New Delhi, Rawat Publication, 2007
4. Singh, Direeti, *Women and Politics World Wide*, New Delhi, Axis Publications, 2010
5. Raj Pal Singh, Anupama Sihag, *Gender Sensitization: Issues and Challenges* (English, Hardcover), Raj Publications, 2019
6. A.Revathy& Murali, Nandini, *A Life in Trans Activism*(Lakshmi Narayan Tripathi). The University of Chicago Press, 2016

Online Resources:

1. Understanding Gender

chrome-extension://kdpelmjpfafjppnhbloffcjpeomlnpah/https://www.arvindguptatoys.com/arvindgupta/k amla-gender1.pdf

https://onlinecourses.swayam2.ac.in/nou24_hs53/preview

2. Gender Roles and Relations

https://www.plannedparenthood.org/learn/gender-identity/sex-gender-identity/what-are-gender-roles-and-stereotypes

https://www.verywellmind.com/understanding-gender-roles-and-their-effect-on-our-relationships-7499408

https://onlinecourses.swayam2.ac.in/cec23_hs29/preview

3. Gender and Labour

https://www.economicsobservatory.com/what-explains-the-gender-division-of-labour-and-how-can-it-be-redressed

https://onlinecourses.nptel.ac.in/noc23_mg67/preview

4. **GENDER-BASED VIOLENCE**

https://eige.europa.eu/gender-based-violence/what-is-gender-based-violence?language_content_entity=en

https://www.worldbank.org/en/topic/socialsustainability/brief/violence-against-women-and-girls https://onlinecourses.swayam2.ac.in/nou25_ge38/preview

5. **GENDER AND CULTURE**

https://gender.study/psychology-of-gender/culture-impact-gender-roles-identities/ https://sociology.iresearchnet.com/sociology-of-culture/gender-and-culture/

https://archive.nptel.ac.in/courses/109/106/109106136/

Abdulali Sohaila—I Fought For My Life and Won.Available online (at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

B.TECH. – IV YEAR II SEMESTER

S.No.	Course code	Title	L	T	P	Credits
1	23ECIAP	Internship	-	-		4
		Project				8
Total						**12**