List of Courses Focus on Employability/ Entrepreneurship/ Skill Development

Department : *Electronics and Communication Engineering*

Programme Name : *B.Tech.*

Academic Year : 2020-21

List of Courses Focus on Employability/ Entrepreneurship/Skill Development

Sr. No.	Course Code	Name of the Course
01.	MA201TBS01	Mathematics-I
02.	PH201TBS02	Physics
03.	EC201TES01	Basic Electrical & Electronics Engineering
04.	IT201TES02	Introduction to Information Technologies
05.	EN201THS01	English Communication
06.	PH201PBS01	Physics Lab
07.	ME201PES01	Engineering Graphics
08.	ME201PES02	Workshop Technology & Practices
09.	EC201PES03	Basic Electrical Engineering Lab
10.	MA202TBS03	Mathematics-II
11	CY202TBS04	Chemistry
12	CE202TES03	Engineering Mechanics
13	CS202TES04	Computer Programming
14	CM202TES05	Basic Civil & Mechanical Engineering
15	CY202PBS02	Chemistry Lab
16	CE202PES04	Engineering Mechanics Lab
17	CS202PES05	Computer Programming Lab
18	EC03TPC01	Electronic Devices
19	EC03TPC02	Digital System Design
20	EC03TPC03	Signals and Systems
21	EC03TPC04	Network Theory
22	EC03TBS05	Mathematics-III
23	EC03THS02	Engineering Economics
24	EC03PPC01	Electronics Devices Lab
25	EC03PPC02	Digital System Design Lab
26	EC04TPC05	Analog and Digital Communication

27	EC04TPC06	Analog Circuits
28	EC04TPC07	Microcontrollers
29	EC04TBS06	Numerical Methods
30	EC04TES05	Electronics Measurement & Instrumentation
31	EC04THS03	Effective Technical Communication
32	EC04PPC03	Analog and Digital Communication Lab
33	EC04PPC04	Analog Circuits Lab
34	EC04PPC05	Microcontrollers Lab
35	EC05TPC08	Electromagnetic Waves
36	EC05TPC09	Computer Network
37	EC05TPC10	LIC and its Application
38	EC05TPC11	Control Systems
39	EC05TPE01	Information Theory & Coding
40	EC05TPE02	CMOS Design
41	EC05TPE03	Introduction to MEMS
42	EC05TPE04	Computer Architecture
43	EC05TOE01	Data Structure and Algorithms
44	EC05TOE02	Operating Systems
45	EC05PPC06	Electromagnetic Waves Lab
46	EC05PPC07	Computer Networks Lab
47	EC05PPC08	LIC and its Application Lab
48	EC06TPC12	Digital Signal Processing
49	EC06TPC13	Probability Theory and Stochastic Processes
50	EC06TPE05	Antenna & Wave Propagation
51	EC06TPE06	Power Electronics
52	EC06TPE07	High Speed Devices & Circuits
53	EC06TPE08	Nanoelectronics
54	EC06TOE03	Cryptography & network Security
55	EC06TOE04	Artificial Intelligence
56	EC06TBS07	Life Science
57	EC06PPC09	Digital Signal Processing Lab
58	EC06PPC10	Electronic Measurement Lab
59	EC06PPC11	Mini Project/Electronic Design Wokshop
60	EC5TPC07	Lic & Its Application
61	EC5TPC08	Communication System- II

62	EC5TPC09	Electromagnetic Field Theory
63	EC5TPE01	Microprocessor & Its Application
64	EC5TPE02	Data Structure & Operating System
65	EC5TOE11	Computer Architecture
66	EC5TOE12	OOP in C++
67	EC5TOE13	Introduction to Information Security
68	EC5TOE14	Project Management
69	EC5TOE15	Rural Technology and Community Development
70	EC5PPC07	Lic & Its Application Lab
71	EC5PPE01	Microprocessor & Its Application Lab
72	EC5PPC08	Communication System -II Lab
73	EC6TPC10	Digital Signal Processing
74	EC6TPC11	Antenna & wave propagation
75	EC6TPE03	Data Communication & Computer Networking
76	EC6TPE04	Fundamental of VLSI Design
77	EC6T0E21	UNIX, Operating System
78	EC6T0E22	Probability & Stochastic Process
79	EC6TOE23	Advanced Instrumentation
80	EC6T0E24	Knowledge management
81	EC6T0E25	Engineering System Design Optimization
82	EC6PPE02	VHDL Lab
83	EC6PPC06	Digital Signal Processing Lab
84	EC6PSP01	Seminar
85	EC7TPC12	Microwave Engineering
86	EC7TPC13	Wireless Mobile Communication
87	EC7TPE05	Advance Hardware Design
88	EC7TPE06	Power Electronics
89	EC7TOE31	Wireless Sensor Network
90	EC7TOE32	Information theory and coding
91	EC7TOE33	Nanotechnology
92	EC7TOE34	Optical instrumentation and measurement
93	EC7TOE35	Neural Network and Fuzzy Logic
94	EC7TPPC12	Microwave Engineering Lab
95	EC7TPPE05	Comprehensive Viva
96	EC7PSP02	Project-I

97	EC8TPC14	Radar and Satellite Engineering
98	EC8TPC15	Optical Fiber Communication
99	EC8TPE07	VLSI Fabrication Methodology
100	EC8TOE41	Basic building block of Microwave Engineering
101	EC8TOE42	Principle of Management
102	EC8TOE43	Mobile Computing
103	EC8TOE44	Embedded System
104	EC8TOE45	Advanced Power Electronics
105	EC8TPPC15	Optical Fiber Communication Lab
106	EC8TPPC16	Advanced RF and Microwave Design lab
107	EC8TPSP03	Project-II
108	EC8TPSP04	Comprehensive Viva
109	ET7100	Research Methodology in engineering
110	EC102	Vaccume Technology
111	EC103	Finite Element Method
112	EC104	Sensors Measurement Science & Technology
113	EC105	Artificial Intelligence
114	EC106	Optimization Techniques
115	EC107	Antenna for Modern Wireless Communication
116	EC108	Wireless and Computer Network

विभागाध्यक्ष (इले. एव संचार अभियांत्रिकी)
H.O.D. (Elect. & Comm. Engineering)
प्रौद्योगिकी संस्थान
Institute of Technology
गु. घा. वि., बिलासपुर (छ.ग.)
G. G. V. Bilaspur (C.G.)

ELECTRONICS & COMMUNICATION ENGINEERING Effective From 2018-19 (CBCS)

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC8TPC14	3	1		3 hours	40	60	4

RADAR &SATELLITE COMMUNICATION

Course Objectives: Student will try to learn:

1.The fundamentals of satellite communication.
2. To provide them with a sound understanding of how a satellite communication system successfully transfers information from one earth station to another.
3. Working principle of different RADAR systems and their applications.

UNIT – I

INTRODUCTION: Origin and brief history of satellite communication; Element of satellite communication link; Current status of satellite communication.

ORBITAL MECHANISM AND LAUNCHING OF SATELLITE: Equation of orbit. Describing the orbit, Look angle determination, Azimuth and elevation calculation, Geostationary and other orbit, Orbital perturbation, Orbit determination, Mechanic's of launching a synchronous satellite, selecting a launch vehicle.

UNIT – II

SPACECRAFT: Satellite subsystem, power supply altitude and orbit control system, Telelmetry and Command, Thermal control system communication subsystem, Space craft antennas, Frequency re-use antennas.

UNIT – III

SATELLITE CHANNEL &LINK DESIGN: Basic transmission theory, Noise temperature, Calculation of system noise temperature. Noise figure, G/T Ratio of earth station, Design of down and uplink using C/N ratio, FM improvement factor for multi channel signal, Link design for FDM/FM, TV signal and Digital signals.

UNIT – IV

MULTIPLE ACCESS TECHNIQUES & EARTH STATION TECHNOLOGY: Frequency Division Multiple Access (FDMA), FDM/FM/FDMA, Time Division Multiple Access, Frame structure and synchronization, Code Division Multiple Access, Space qualification and Equipment Reliability, random Access, Earth station design requirement, earth station subsystem, Monitoring and control, Antenna noise temperature, Tracking, Design of

ELECTRONICS & COMMUNICATION ENGINEERING — Effective From 2018-19 (CBCS)

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC8TPC15	3	1		3 hours	40	60	4

OPTICAL FIBER COMMUNICATION

Course Objectives: Students will try to learn:

1. The basics of signal propagation through optical fibers,
2. Study about fiber impairments, components and devices and system design.

UNIT – I

Introduction to optical communication, Principles of light transmission, optical fiber modes and configurations, mode theory for circular wave-guides, single-mode fibers, multimode fibers, numerical aperture, mode field diameter, V-number, fiber materials, fiber fabrication techniques.

UNIT – II

Optical sources, LED´s, LASER diodes, Model reflection noise, Power launching and coupling, Population Inversion, Fiber Splicing, Optical connector, Photo detector, PIN, Avalanche detector, response time, avalanche multiplication noise.

UNIT – III

Signal degradation in optical fibers, attenuation losses, signal distortion in optical waveguides, material dispersion, wave guide dispersion, chromatic dispersion, inter-modal distortion, Pulse broadening in graded index fiber, mode coupling, advanced fiber designs: dispersion shifted, dispersion flattened, dispersion compensating fibers, design optimization of single mode fibers.

UNIT – IV

Coherent optical fiber communication, modulation techniques for homodyne and heterodyne system, optical fiber link design, Rise time budget and link power budget long haul systems, bit error rate, line coding, NRZ, RZ, Block codes, eye pattern.

UNIT – V

Advanced system and techniques, wavelength division multiplexing, optical amplifiers, semiconductor amplifier, EDFA, Comparison between semiconductor and optical amplifier, Gain bandwidth, photonic switching, optical networks, optical fiber bus, ring topology, star architecture, FDDI.

ELECTRONICS & COMMUNICATION ENGINEERING Effective From 2018-19 (CBCS)

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC8TPE07	3			3 hours	40	60	3

VLSI Fabrication Methodology

CourseObjective: Student will try to learn:
1.The basic MOS Circuits
2. the MOS Process Technology.
3. To understand the operation of MOS devices.
4.To impart in-depth knowledge about analog and digital CMOS circuits.

Unit 1
Introduction, Processing steps of BJT, Processing steps of MOSFET, Control of threshold voltage of MOS, Ion implantation, CVD, Patterning of polysilicon by etching, Self aligned technology, Advantage of polysilicon and problems of metal gate process.

Unit 2
Si structure, Packing density, Hard sphere model, Mismatch with dopant atom & Misfit factor, Concept of different crystal planes of Si, Natural cleavage plane, Self limiting etching or V-groove etching. Crystal defects- Point, Dislocation, Volume defects

Unit 3
Si crystal growth by Reduction process, Bridgemann Process, Czochralski Technique, Control of defects in crystal, Zone Refining, Gettering process.

Unit 4

Si Epitaxy, 3 cardinal rule of hetero-epitaxy, Liquid Phase Epitaxy, Vapor Phase Epitaxy, Problems of VPE, Tilted sample holder, Reactor configuration, Optimization of temperature and pressure, LPCVD from Silicon epitaxy by Silane route, Surface catalysed reaction, Efficiency of deposition, Problems of Silane route.

Unit 5

Doping during Epitaxy, Autodoping, Junction shift, Pattern shift and distortion, Molecular Beam Epitaxy, Insitu cleaning, Oxidation, Kinetics of oxidation

SUGGESTED BOOKS &REFERENCE:-

1. VLSI Fabrication Principles by S K Ghandhi,
2. VLSI Technologyed S M Sze,
3. Silicon VLSI Technology by J D Plummer, M Deal, P D Griffin

ELECTRONICS & COMMUNICATION ENGINEERING Effective From 2018-19 (CBCS)

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC8TOE41	3			3 hours	40	60	3

Basic Building Blocks of Microwave Engineering

CourseObjective: Student will try to learn
1. Rectangular and circular wave guides using field theory.
2. The theoretical principles underlying microwave devices and networks.
3. To design microwave components such as power dividers, hybrid junctions, Directional Couplers, microwave filters, Microwave Wave-guides and Components, Ferrite Devices.
4. about Microwave Solid-State Microwave Devices and Microwave Tubes.
5. about Microwave Measurement Techniques.

Unit 1: Concept of Mode, TEM, TE, TM and Impedance concept. Loss associated with microwave transmission –Coaxial line, Rectangular waveguide, Circular waveguide, Planar transmission line.

Unit2: Challenges of Microwave design-Smith Chart (1st tool), Measurement f unknown impedances, Need of impedance matching at Microwave frequencies, Lumped element based impedance matching network by Smith Chart, Distributed impedance matching by Smith Chart, Broadband impedance matching network.

Unit 3: Voltage and current at microwave frequency, Scattering parameter (2nd tool) Properties of scattering parameter, Network analyser, Problem solving by equivalent voltage and current in waveguide and on scattering parameters.

Unit 4: Coaxial connectors, Microwave power divider and combiner, Microwave Resonators, Attenuators, Switching diode.

Unit 5: Microwave tubes, Microwave solid state diode oscillators, and Amplifiers, Microwave transistors

SUGGESTED BOOKS &REFERENCE:-

1. Microwave Engineering, David M Pozar,
2. Microwave Devices & Circuits, Samuel Y Liao,
3. Antenna Theory, C A Balanis

CourseOutcome : After completion of course, the student will be able to understand :
1. Integrating a wide range of Microwave components into one design oriented frame work
2. Design and solve real world problems
3. Characterize microwave devices in terms of the directionality of communication.
4. Use a microwave test bench in analyzing various types of microwave measurements.

ELECTRONICS & COMMUNICATION ENGINEERING — Effective From 2018-19 (CBCS)

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC8TOE42	3			3 hours	40	60	3

PRINCIPLE OF MANAGEMENT

CourseObjectives: Student will try to learn:

1.The functions and responsibilities of managers.
2. To provide them tools and techniques to be used in the performance of the managerial job.
3. To enable them to analyze and understand the environment of the organization.
4. To help the students to develop cognizance of the importance of management principles.

UNIT – I Management concepts, Nature, Scope, Significance, Function and Principle of Management Concepts.

Evolution of Management: Early Contribution, Taylor and Scientific management, Fayol's administrative management, Bureaucracy, Hawthrone Experiments and Human Relations.

UNIT – II

Planning- Concepts, Objectives, Goals, Components and Steps involved in planning process, MBO, Decision making process, Individual and Group Decision Making.

UNIT – III

Organizing- principles, Organization theories, Line & Staff Authority, Centralization, Decentralization, Delegation, Employee's empowerment, Span of control, Departmentation, Authority and Responsibility.

UNIT – IV

Staffing: Recruitment & Selection, Training & Development, Performance Appraisal Directing: Concept, Direction and Supervision, Co-ordination.

UNIT – V

Communication: Communication Process, Importance of Communication, Barriers to Communication, Controlling: nature, scope, functions, steps and process, control techniques.

SUGGESTED BOOKS & REFERENCE:

1. *Management, Stoner & Freeman, PHI*
2. *Principles of Management, Koontz, O'Donnell Wechrich, McGraw Hill*
3. *The Practice of Management, P F Drucker, Allied Pub*
4. *Essentials of Management, Massie, AITBS*
5. *Principles of Management, Terry and Franklin, AITBS*
6. *Organization and Management, R D Agarwal, TMH*

ELECTRONICS & COMMUNICATION ENGINEERING — Effective From 2018-19 (CBCS)

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC8TOE43	3			3 hours	40	60	3

MOBILE COMPUTING

CourseObjective: Studentwill try to learn:
1.About the concepts and principles of mobile computing;
2.To explore both theoretical and practical issues of mobile computing.
3. To develop skills of finding solutions and building software for mobile computing applications.

UNIT – I

Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, Hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.

UNIT –II

Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.

UNIT –III

Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.

UNIT –IV

Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

UNIT –V

Ad Hoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

ELECTRONICS & COMMUNICATION ENGINEERING — Effective From 2018-19 (CBCS)

EC8TOE44	**3**			**3 hours**	**40**	**60**	**3**

EMBEDDED SYSTEMS

Course Objective: Student will try to learn:
The modern embedded systems and to show how to understand and program such systems using a concrete platform built around.

UNIT-I Embedded system Introduction : Basic idea on system, definition of embedded system, characteristic of Embedded system,. Challenges in designing of an embedded system, characterization of embedded system.
UNIT-II Components of Embedded system : Difference between microprocessor and microcontroller, Functional building blocks of Embedded systems, processor and controller, Memory, ports and communication devices.

UNIT-III Methodologies, Life cycle and Modeling: Software Life cycle, Embedded Life cycle Water Fall Model , Spiral Model, RAD Model and Modeling of Embedded system. Simulation and Emulation.

UNIT-IV Layers of an Embedded system: Introduction, Need for Layering , The Middleware Layer, The Application Layer. Introduction to Real Time Operating Systems.

UNIT-V Networks for Embedded Systems : Serial Communication RS 232 model, I square Model, CAN and CAN Open, SPI and SCI, USB, HDLC, Parallel Communication Basics PCI interface and PCI X- interface. Device Driver Serial Port and Parallel Port.

SUGGESTED BOOKS &REFERENCES: -

1. H.Kopetz, "Real-Time Systems", Kluwer, 1997.
2. R.Gupta, "Co-synthesis of Hardware and Software for Embedded Systems", Kluwer 1995.

CourseOutcome: After completion of the course student will be able to:

1. Identify the hardware and software components of an embedded system
2. Choose appropriate embedded system architecture for the given application
3. Write programs for optimized performance of an embedded system and validate

ELECTRONICS & COMMUNICATION ENGINEERING — Effective From 2018-19 (CBCS)

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC8TOE45	3			3 hours	40	60	3

Advanced Power Electronics

Course Objectives: Student will try to learn:

1.Selected areas of power electronics in greater depth.
2. Learn recent developments in power electronics.
3. in detail applications of power electronics

UNIT I Phase Controlled Rectifiers: Principle of phase control, Single Phase Full wave controlled converters: Midpoint and bridge type, analysis of two pulse bridge converter with continuous current., Single phase two pulse converters with discontinuous current

Unit-II
DC to DC switch mode Regulators: Introduction, Review of linear power supply and basic dc-dc voltage regulator configurations, Buck converters, Boost converters, Buck-Boost converters and their analysis for continuous and discontinuous conduction mode, other converter configurations.

Unit-III Resonant Converters: Introduction, Need of resonant converters, Classification of resonant converters, Load resonant converters, resonant switch converters, Zero Voltage Switching DC-DC Converters, Zero Current Switching DC-DC Converters, Applications Of Resonant Converters.

Unit-IV Multi-level converters: Need for multi-level inverters, Concept of multi-level, Topologies for multi-level: Diode Clamped, Cascaded H-bridge multilevel Converters configurations; Features and relative comparison of these configurations applications.

Unit-V Review of Inverters and Controllers: Review of single-phase half bridge, full bridge, bipolar, unipolar, VSI and CSI, review of single phase ac to ac controllers, Phase-Controlled Three-Phase AC Voltage Controllers.

Text Books:

1. Ned Mohan, Tore M. Undeland and William P. Robbins, "Power Electronics – Converters, Applications and Design", John Willey & sons, Inc., 3rd ed., 2003.
2. Muhammad H. Rashid, "Power Electronics - Circuits, Devices and Applications", Prentice Hall of India, 3rd ed., 2009.
3. Modern Power Electronics and AC Drives –B. K. Bose-Pearson Publications, 2002.
4. L. Umanand, "Power Electronics Essentials and Applications", Wiley India Ltd., 2009

REFERENCEBOOKS:-

RESEARCH METHODOLOGY IN ENGINEERING

SUB CODE	L	T	P	DURATION	ESE	CREDITS
ET7100	03	01	0	3 HRS	100	4

Introduction: Definition and objectives of Research — Types of research. Various Steps in Research process, Mathematical tools for analysis, developing a research question-Choice of a problem.

Literature review, Surveying, synthesizing, critical analysis, reading materials, reviewing, rethinking, critical evaluation. interpretation. Research Purposes, Ethics in rc.scarch APA Ethics code.

Quantitative Methods for problem solving: Statistical Modeling and Analysis. Time Series Analysis. Probability Distributions. Fundamentals of Statistical Analysis and Inference, Multivariate methods.

Concepts of Correlation and Regression_ Fundamentals of Time Series Analysis and Spectral Analysis, Error Analysis, Applications of Spectral Analysis.

Tabular and graphical description of data: Tables and graphs of frequency data of one variable. Tables and graphs that show the relationship between two variables Relation between frequency distributions and other graphs, preparing data for analysis.

Use of statistical sothvare,SPSS in research. Structure and Components of Research Report. Types of Report, Layout of Research Report, Mechanism of writing a research report, referencing in academic writing.

Reference Books

1. kothari, Research Methodology Methods and Techniques. 2/c, Vishwa Prakashan, 2006

2, Donald 1-1,McBum.cy, Research Methods, 5th Edition, Thomson Learning, ISEIN:31-3 L5- 0947-0, 2006

3, Donald R. Cooper, Pamela S. Schindler, Business Research Methods. &le, rata McGraw-Hill Co_ Ltd_ 2006.

Vacuum Technology

SUB CODE	L	T	P	DURATION	ESE	CREDITS
ECE 102	03	01	0	3 HRS	100	4

Unit-1: Fundamentals of Vacuum Technology: vacuum nomenclature and definitions, Gas properties, Molecular process and Kinetic theory, Throughput, Pumping speed, Evacuation rate. Outgassing rate, Leak rate, Gas How, Conductance, Flow calculations.

Unit-2: Vacuum generation: Diaphragm pump, Rotary pump. Diffusion pump, Cryogenic pump, Turbomotecular pump, Sputter-ion pump and Getter pumps

Unit-3: Vacuum Measurement scale, Gauges and Leak detection: U.H.V. techniques, Mass Spectrometer.

Unit-4: Surface Physics and its Relation to Vacuum Science: Adsorptions, Chemisorptions, Isotherms, Desorptions and Photoactivation.

Unit-5: Materials for Vacuum tubes, Chemical and Thermal Cleaning. Sputtering Techniques. Brazing. Spot, Arc, Electron beam and Laser weldings. Vacuum and Protected Atmosphere Furnaces. Jigs and Tools Processing of Electron-Beam Devices.

References:

Vacuum Science and Technology, V V Rao, T B Ghosh, K L Chopra 2.
Vacuum Journal, Science direct. Elsevier Publication
. Journal of Vacuum Science and Technology A, IEEE Transaction 4.
Journal of Vacuum Science and Technology B, IEEE Transaction

Sensors & Measurement Science and Technology

SUB CODE	L	T	P	DURATION	ESE	CREDITS
ECE 104	03	01	0	3 HRS	100	4

Unit.1: Generalized Configurations and Functional Descriptions of Measuring Instruments: Functional elements Transducers, Analog and Digital modes of operation, Input-Output configuration of Instruments and Measurement systems, Static and Dynamic Characteristics of Instruments, Static calibration.

Unit-2: Motion Sensor and Measurement Fundamental Standards, Relative Displacements-Translational & Rotational, Relative Velocity, Relative Acceleration Measurements, Seismic Displacement Pickups, Seismic Velocity Pickups, Seismic Acceleration Pickups,

Unit-3: Force, Torque and Power Measuremeni• Methods of Force Measurement, Elastic Force Transducers, Torque Measurement on Rotating Shafts, Shaft Power Measurement, Vibrating. WireForce Trahsducers.

Unit-4; Pressure Measurement: Methods of Pressure Measurements, Deadweight Gages, Manometers, Elastic Transducers, Vibrating Cylinder and other Resonant Transducers, Dynamic Testing of Pressure measuring Systems, High and Low Pressure Measurement systems.

Unit-5: Temperature Measurements: Standards and Calibration, Thermal-Expansion Methods, Thermoelectric Sensors, Electrical-Resistance Sensors, Junction Semiconductor Sensors, Digital Thermometers, Radiation Methods.

References:

1. Measurement Systems, E Doebelin, D N Manik, McGraw Hill Publication
2. Sensor Technology Handbook, Jon S Wilson, Elsevier, 2004, ISBN-10: 0750677295
3. Journal of Sensors and Actuators, Science direct, Elsevier Publication
4. Journal of Sensors and Actuators A:Physical, Science direct, Elsevier Publication,

Artificial Intelligence

SUB CODE	L	T	P	DURATION	ESE	CREDITS
ECE 105	03	01	0	3 HRS	100	4

Unit-1: Definition of Al, Brie(history of Al, General problem Solving Approaches in Al-Learning Systems, Knowledge representation and reasoning, Planning, Knowledge Acquisition, Intelligence search, Logic Programming, Sort computing, Applications of Al techniques, Characteristic requirement for the realization of intelligent system. Programming languages for Al. Architecture for Al machine.

Unit-2: Cognitive perspective of pattern recognition- Template Matching, Prototype matching. feature based approach, Computational approach; Cognitive models of memoryAtkinson-Shiffrin's model, Tuiving's model, Parallel distributed processing approach: Underslariding of problem; Cybernetic view to cognition_

Unit-3: Production rules, Working memory, Control Unit/Interpreter, Conflict Resolution strategies, Types of production systems-Commutalive Production system, Decomposable Production system, Forward verses Backward reasoning, Merits of a Production system-Isolation of knowledge and control strategy, Direct Mapping onto State-space, Modular Structure of Production rules, Knowledge base Optimization in production system

Unit-4: Production Solving by Intelligent Search General problem solving approaches-Breadth first search, depth first search. Iterative deepening search, Hill Climbing; Simulated annealing; Heuristic Search- for OR Graph, Iterative deepening algorithm, AND-OR Graph, Adversary Search- MINIMAX algorithm, Alpha-Beta heuristics,

Unit•5: Logic of Propositions and Predicates- Formal definition. Propositional Logic-Semantic method for Ilworern proving. Syntactic method for theorem proving, Resolution in Propositional Logic, Predicate Logic. Unification of Predicates, Robinson's Interference Rule, Types of Resolution, Soundness and Completeness of Logic,

References:

1, Artifival Intelligence and Soft Computing, Amil Konar
2. Journal of Artificial Intelligence, ScienceDirect, Elsevier Publication 3, IEEE Transaction on Computational Intelligence and Al

OPTIMIZATION TECHNIQUES

SUB CODE	L	T	P	DURATION	ESE	CREDITS
ECE 106	03	01	0	3 HRS	100	4

Objective: Aims to teach various optimization techniques for wireless communication and antenna design.

Outcome.. Understand the fundamental optimization techniques in wireless communication for real time application.

Unit **I: Introduction Linear Programming**

Linear Programming: Graphical method, simplex method, Non-Simplex Method, revised simplex method, Big-ICI method. 2- phase method, alternate optimal solutions, unbounded LPs, degeneracy and convergence, duality in linear programming. sensitivity analysis. dual simplex **method,**

Unit II: Non-Linear Programming

Non-Linear Programming: Nonlinear Programming - Elimination methods, Interpolation methods, unconstrained optimization techniques - Direct search methods - Indirect search methods. Constrained Optimization methods — Direct methods. Indirect methods.

Unit in: Dynamic Programming

Dynamic Programming Multistage decision process. Concept (Asa optimization and principle of optimality, computational procedure in dynamic programming

Unit IV: Optimization Methods

Simulated annealing, Particle Swarm optimization, Ant colony optimization, Bee colony optimization. Bat Algorithms, Firefly Algorithms.

Unit V: Advanced Topics ill Optimization

Advanced Topics in Optimization for wireless communication and antenna design.

References Hooks:

1, Singiresu S Rao, "Engineering Optimization: rliory and Practice", 4th Edition, John Wiley and Sons.. 2009

2. **K. Deb,"Optimization for Engineering DesignAlgorithms and Examples",Prentice-Hall of India Pvt. Ltd., New Delhi, 1g95.**

3, Edwin K **P Chong** and Stanislaw S Zak, An Introduction to Optimization", Fourth Edition. John Wiley and Sons, 2013

4_55. Rao,"Engineering **Optimization:** Theory **and practice", New Age International Pvt. nLtd., New Delhi,. 2000.**

ANTENNAS FOR MODERN WIRELESS COMMUNICATION

SUB CODE	L	T	P	DURATION	ESE	CREDITS
ECE 107	03	01	0	3 HRS	100	4

Unit 1: Concepts of Radiation and Antenna Fundamentals

Fundamental parameters of antennas. Near and Far Field regions, S Parameters, Antenna Measurements: Radiation pattern, gain, directivity, phase and polarization measurement

Unit 2: Printed Antenna

Microstrip Antennas & Dielectric Resonator Antenna: Radiation mechanism - parameters and applications - feeding methods.

UNIT 3: Recontigurahle Antenna

Reconfigurable methodologies, Design Considerations for Reconfigurable systems', Reconfigurable Planar/printed antenna configurations. Active reconfigurable systems. Concept of Smart Antenna,

Unit 4: Array. of Antennas

Linear and planar array fundamentals, Mutual Coupling in Arrays. Multidimensional Arrays, Phased Arrays, Array Feeding Techniques. Array optimization techniques.

Unit 5 : MIMO System

Concept of MIMO Types of MIMO Systems Design Parameters of MIMO system.

Reference Books:

1. Jordan E C and Bahl-lain K G, "Electromagnetic Waves and Radiating Systems", 2nd Edition, PL:arson Education.
2. Balanis C A, "Antenna Theory: Analysis and Design". 4th Edition, John Wiley and Sons, New Jersey, 2016.
3. Kraus J D and ;Viarhefka R J, "Antennas for All Applications", 3rd Edition, Tata McGraw Hill, 2001.
4. Girish Kumar and Ray K P. "Broadband Microstrip Antennas", Artech House, 2003.

Wireless Communication & Network

SUB CODE	L	T	P	DURATION	ESE	CREDITS
ECE 108	03	01	0	3 HRS	100	4

Module 1: Overview of wireless communication, cellular communication, different generations of cellular communication system, satellite Communication including, wireless local loop, cordless phone,

Module 2: Recent wireless technologies: multicarrier modulation, OFDM, MIMO system, diversity-multiplexing trade-off, MIMO-OPOM system, smart-antenna; beamforming and MIMO, cognitive radio,

Module 3: Multiple access techniques in wireless communication: contention-free multiple access schemes (FDMA TDMA, CDMA, SDMA and Hybrid), contention-based multiple access schemes (ALOHA and CSMA).

Module 4: Wireless personal area networks (Bluetooth, UW(3 and ZigBee), wireless local area networks (IEEE 802.11, network architecture, medium access methods, WLAN standards

Module 5: Ad-hoc wireless networks: Design Challenges in Ad-hoc wireless networks, concept of cross layer design, security in wireless networks MANET and WS.N. Wireless system protocols.

Books recommended:

Textbooks: 1. Andrea Goldsmith, "Wireless Communications", Cambridge University Press, 2005.7, Sanjay Kumar, "Wireless Communication the Fundamental and Advanced Concepts" River Publishers, Denmark, 2015 (Indian reprint).

Reference books: 1. Vijay K Garg, "Wireless Communications and Networks", Morgan Kaufmann Publishers an Imprint of Elsevier, USA 2009 (Indian reprint) 2...1. Schiller, "Mobile Communication" 2/e, Pearson Education, 2012. Iti Saha rvilisra, "Wireless Communication and Networks: 3G and Beyond", 2/e, McGraw Hill (India) Private Ltd, New Delhi, 2013

FINITE ELEMENT METHOD

SUB CODE	L	T	P	DURATION	ESE	CREDITS
ECE 103	03	01	0	4 HRS	100	4

Historical background, Basic concept of the Finite Element Method. Basic equationN in el asticity, Elemental shapes, nodes, nodal unknowns and coordinate systems, A general prz.)eedure for Finite Element Analysis, Application to the continuum, Discretization of the domain, Governing equations for continuum. Pre-processor. Processer and Post processor.

Basic concept of interpolation functions. Shape function in one, two and three dimension. Finding of shape function by Polynomial, Lagrange polynomial, Serendipity family and Hermite polynomial, Construction ofshape function by degrading technique.

Strain displacement and elemental stillness matrix, Assembling stillness equation, bctindaay conditions and solution, Spring and bar elements. Direct approach. Strain energy, Castigliano's first theorem, Minimum potential energy, Gaferkin's method. and Variational method, Isoparametric formulations.

Finite Element Analysis. liars, Beams Trusses and Rigid frame, Plates and shells, Heat transfer, Fluid and solid mechanics, Introduction to non-linear Finite Element rylcihods, Adaptive finite analysis, Automatic mesh generation. Choice of new mesh. Transfer variables,

Reference Books

1. Rao S.S., "The Finite Element Method in Engineering", Elsevier Se ience & TeehnDlogSi.
2. Hutton D,V., "Fundiamental of Finite Element Analysis", McGraw Hills.
3. Cook R.D., Malkus, D.S. and Plesha, M,E, "Concepts and Applications of Finite Element Analysis", 3 rd Ed,, John Wiley *et* Sons.
4. Bathe K.J., "Finite Element Procedures", Prentice I tall of India, New Delhi.
5. **Huebner** and Thorton, EA., "The Finite Element Methods for Engineers" John Wiley & Sons,
6. Zienewiccz 0.C. and Taylor, RI., The Finite Element Methods", Vol. I, Vol. 2 and Flo 1.3, McGraw Hill.
7. Belytshko, T., Liu, W.K. and Moran, B.. Non-linear Finite Elements for Continua and Structures", McGraw Hills.