TKR COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE STRUCTURE & SYLLABUS -R18

B.Tech. VII SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	**B47PC1**	Microwave Engineering	3	1	0	3
2		**OE-3**	3	0	0	3
3	**B47HS3**	Professional Ethics	2	0	0	1
4	**B47HS4**	Business Economics and Financial Analysis	2	0	0	2
5	**B47PC5**	Microwave Engineering Lab	0	0	3	1.5
6	**B47PC6**	Advanced Technologies Lab	0	0	2	1
7	**B47PC7**	Project Stage – I	0	0	22	9
					TOTAL CREDITS	**20.5**

B.Tech. VIII SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	**B48PE1**	**Professional Elective-III** **B48PE1-I:** Adhoc Wireless Sensors Networks **B48PE1-II:** Biomedical Electronics **B48PE1-III:** Optimization Techniques	4	0	0	4
2	**B48PE2**	**Professional Elective-IV** **B48PE2-I:** Satellite Communications **B48PE2-II:** Design of Fault Tolerant Systems **B48PE2-III:** Speech Signal Processing	4	0	0	4
3	**B48PE3**	**Professional Elective-V** **B48PE3-I:** Embedded Systems **B48PE3-II:** Radar Systems **B48PE3-III:** Database Management Systems	3	0	0	3
4	**B48EC4**	Project Stage – II	0	0	18	6
					TOTAL CREDITS	**17**

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ELECTRONICS AND COMMUNICATION ENGINEERING – R18

MICROWAVE ENGINEERING - B47PC1

B.Tech. B.TECH. VII SEMESTER **L/T/P/ C**
3/1/0/ 3

COURSE OBJECTIVES:

This is a core course in Microwave Communications domain, and covers contents related to Microwave theory and techniques. The main objectives of the course are:

1. To get familiarized with microwave frequency bands, their applications and to understand the limitations and losses of conventional tubes at these frequencies.
2. To develop the theory related to microwave transmission lines, and to determine the characteristics of rectangular waveguides, microstrip lines, and different types of waveguide components and ferrite devices.
3. To distinguish between different types of microwave tubes, their structures and principles of microwave power generation, and to characterize their performance features and applications - at tube levels as well as with solid state devices.
4. To impart the knowledge of Scattering Matrix, its formulation and utility, and establish the S-Matrix for various types of microwave junctions.
5. To understand the concepts of microwave measurements, identify the equipment required and precautions to be taken, and get familiarized with the methods of measurement of microwave power and various other microwave parameters.

COURSE OUTCOMES:

Having gone through this course covering different aspects of microwave theory and techniques, the students would be able to

1. To analyze completely the rectangular waveguides, their mode characteristics, and design waveguides for solving practical microwave transmission line problems.
2. To distinguish between the different types of waveguide and ferrite components, explain their functioning and select proper components for engineering applications.
3. To distinguish between the methods of power generation at microwave frequencies, derive the performance characteristics of 2-Cavity and Reflex Klystrons, Magnetrons, TWTs and estimate their efficiency levels, and solve related numerical problems.
4. To realize the need for solid state microwave sources, understand the concepts of TEDs, RWH Theory and explain the salient features of Gunn Diodes and ATTDevices.
5. To establish the properties of Scattering Matrix, formulate the S-Matrix for various microwave junctions, and understand the utility of S-parameters in microwave component design.

UNIT – I:

Microwave Transmission Lines - I: Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – Solution of Wave Equations in Rectangular Coordinates, TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations, Power Transmission, Impossibility of TEM Mode. Illustrative Problems, Micro strip Lines– Introduction, Z_o Relations, Effective Dielectric Constant.

UNIT – II:

Cavity Resonators– Introduction, Rectangular Cavities, Dominant Modes and Resonant Frequencies, Q Factor and Coupling Coefficients, Illustrative Problems

Waveguide Components and Applications: Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide Windows, Tuning Screws and Posts, Matched

Loads. Waveguide Attenuators – Different Types, Resistive Card and Rotary Vane Attenuators;

Waveguide Phase Shifters – Types, Dielectric and Rotary Vane Phase Shifters, Waveguide Multiport Junctions – E plane and H plane Tees, Magic Tee. Directional Couplers – 2 Hole, Bethe Hole types, Illustrative Problems

Ferrites– Composition and Characteristics, Faraday Rotation, Ferrite Components – Gyrator, Isolator, Circulator.

UNIT – III:

Microwave Tubes: Limitations and Losses of conventional Tubes at Microwave Frequencies, Microwave Tubes – O Type and M Type Classifications, O-type Tubes : 2 Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory – Expressions for O/P Power and Efficiency. Reflex Klystrons – Structure, Velocity Modulation and Applegate Diagram, Mathematical Theory of Bunching, Power Output, Efficiency, Oscillating Modes and O/P Characteristics, Illustrative Problems.

Helix TWTs: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Gain Considerations.

UNIT – IV:

M-Type Tubes: Introduction, Cross-field Effects, Magnetrons – Different Types, Cylindrical Traveling Wave Magnetron –Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics, Illustrative Problems.

Microwave Solid State Devices: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diodes – Principle, RWH Theory, Characteristics, Modes of Operation - Gunn Oscillation Modes, Introduction to Avalanche Transit Time Devices.

UNIT –V:

Scattering Matrix– Significance, Formulation and Properties, E plane and H plane Tees, Magic Tee, Circulator and Isolator, Illustrative Problems. Microwave Antennas-Fundamental Parameters, Definitions for Antennas , Radiation from Rectangular Antennas.

Microwave Measurements: Description of Microwave Bench – Different Blocks and their Features, Errors and Precautions, Microwave Power Measurement, Bolometers. Measurement of Attenuation, Frequency, Standing Wave Measurements – Measurement of Low and High VSWR, Cavity Q, Impedance Measurements.

TEXT BOOKS

1. Microwave Devices and Circuits – Samuel Y. Liao, Pearson, 3rd Edition, 2003.
2. Microwave Principles – Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBS Publishers and Distributors, New Delhi,2004.

REFERENCE BOOKS

1. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2. Microwave Engineering - G. S. Raghuvanshi, Cengage Learning India Pvt. Ltd., 2012.
3. Microwave Engineering Passive Circuits – Peter A. Rizzi, PHI, 1999.
4. Microwave Engineering - David M. Pozar, John Wiley & Sons (Asia) Pvt Ltd., 1989, 3r ed., 2011Reprint.

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

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ELECTRONICS AND COMMUNICATION ENGINEERING – R18

PROFESSIONAL ETHICS - B47HS3

B.Tech. B.TECH. VII SEMESTER **L/T/P/ C**
2/0/0/ 1

COURSE OBJECTIVE:

To enable the students to imbibe and internalize the Values and Ethical Behavior in the personal and Professional lives.

COURSE OUTCOME:

The students will understand the importance of Values and Ethics in their personal lives and professional careers. The students will learn the rights and responsibilities as an employee, team member and a global citizen.

UNIT – I:

Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

UNIT – II:

Basic Theories: Basic Ethical Principles, Moral Developments, Deontology, Utilitarianism, Virtue Theory, Rights Theory, Casuist Theory, Moral Absolution, Moral Rationalism, Moral Pluralism, Ethical Egoism, Feminist Consequentialism, Moral Issues, Moral Dilemmas, Moral Autonomy.

UNIT – III:

Professional Practices in Engineering: Professions and Norms of Professional Conduct, Norms of Professional Conduct vs. Profession; Responsibilities, Obligations and Moral Values in Professional Ethics, Professional codes of ethics, the limits of predictability and responsibilities of the engineering profession. Central Responsibilities of Engineers - The Centrality of Responsibilities of Professional Ethics; lessons from 1979 American Airlines DC-10 Crash and Kansas City Hyatt Regency Walk away Collapse.

UNIT – IV:

Work Place Rights & Responsibilities, Ethics in changing domains of Research, Engineers and Managers; Organizational Complaint Procedure, difference of Professional Judgment within the Nuclear Regulatory Commission (NRC), the Hanford Nuclear Reservation. Ethics in changing domains of research - The US government wide definition of research misconduct, research misconduct distinguished from mistakes and errors, recent history of attention to research misconduct, the emerging emphasis on understanding and fostering responsible conduct, responsible authorship, reviewing & editing.

UNIT – V:

Global issues in Professional Ethics: Introduction – Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Deflection, Pollution, Ethics in

Manufacturing and Marketing, Media Ethics; War Ethics; Bio Ethics, Intellectual Property Rights.

TEXT BOOKS

1. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
2. Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, Cambridge University Press 2015.

REFERENCE BOOKS

1. Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, 4e, Cengage learning, 2015.
2. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008.

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

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ELECTRONICS AND COMMUNICATION ENGINEERING – R18

BUSINESS ECONOMICS AND FINANCIAL ANALYSIS -B47HS4

B.Tech. B.Tech. VII SEMESTER **L/T/P/ C**
2/0/0/ 2

COURSE OBJECTIVE:

To learn the basic Business types, impact of the Economy on Business and Firms specifically. To analyze the Business from the Financial Perspective.

COURSE OUTCOME:

The students will understand

1. The various Forms of Business and the impact of economic variables on the Business.
2. The Demand, Supply, Production, Cost, Market Structure, Pricing and taxes on goods are learnt.
3. The firm's financial position by analyzing the Financial Statements of a Company.

UNIT – I:

Introduction to Business and Economics

Business: Define Business, characteristics of business, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist,

UNIT – II:

Demand and supply Analysis

Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Steps in Demand Forecasting, Methods of Demand Forecasting.

Supply Analysis: determinants of supply, supply function

UNIT- III:

Production, Cost, Market Structures & Pricing

Production Analysis: Production function, Law of returns to scale, Internal and External Economies of Scale.

Cost analysis: Cost concepts, Types of Costs. Break-even Analysis (BEA).

Pricing: Types of Pricing, product life cycle, **GST** (**Goods & service Tax**).

Market Structures: Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition, oligopoly.

UNIT – IV:

Financial Accounting

Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, and Preparation of Final Account

UNIT – V:

Financial Analysis through Ratios

Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems).

TEXT BOOKS

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.
4. Rakeshgarg,sandeepgarg, Hand book of GST in India
5. A.R. Aryasri (2011), Managerial Economics and Financial Analysis, TMH, India.

REFERENCE BOOKS

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

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ELECTRONICS AND COMMUNICATION ENGINEERING - R18

MICROWAVE ENGINEERING LAB - B47PC5

B.TECH. VII SEMESTER **L/T/P/ C**
0/0/3/1.5

COURSE OBJECTIVES:

1. The goal of this course is to introduce students to the concepts and principles of the advanced microwave engineering
2. To understand the operation of different types of Microwave sources.
3. Scattering parameters are defined and used to characterize devices and system behavior

COURSE OUTCOMES:

1. Gain knowledge and understanding of microwave analysis methods.
2. Be able to apply analysis methods to determine circuit properties of passive/active microwave devices.
3. Know how to model and determine the performance characteristics of a microwave circuit or system using computer aided design methods.
4. Have knowledge of how transmission and waveguide structures and how they are used as elements in impedance matching and filter circuits.

Note:

Minimum of 12 experiments to be conducted List of Experiments

1. Reflex Klystron Characteristics
2. Gunn Diode Characteristics
3. Directional Coupler Characteristics
4. VSWR Measurement of Matched load
5. VSWR measurement of with open and short circuit loads
6. Measurement of Waveguide Parameters
7. Measurement of Impedance of a given Load
8. Measurement of Scattering Parameters of a E plane Tee
9. Measurement of Scattering Parameters of a H plane Tee
10. Measurement of Scattering Parameters of a Magic Tee
11. Measurement of Scattering Parameters of an Isolator
12. Measurement of Scattering Parameters of a Circulator
13. Attenuation Measurement
14. Microwave Frequency Measurement

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ELECTRONICS AND COMMUNICATION ENGINEERING - R18 ADVANCED TECHNOLOGIES LAB -B47PC6

B.TECH. VII SEMESTER **L/T/P/C**
0/0/2/1

LIST OF EXPERIMENTS

Following are some of the programs that a student should be able to write and test on an Raspberry Pi, but not limited to this only.

1. Start Raspberry Pi and try various Linix commands in command terminalwindow:
   ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, ping etc.
2. Run some python programs on Pi like:
   a. Read your name and print Hello message with name.
   b. Read two numbers and print their sum, difference, product and division.
   c. Word and character count of a given string.
   d. Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values from standard input
   e. Print a name 'n' times, where name and n are read from standard input, using for and while loops.
   f. Handle Divided by Zero Exception.
   g. Print current time for 10 times with an interval of 10 seconds.
   h. Read a file line by line and print the word count of each line. 3.
3. Light an LED through Python program
4. Get input from two switches and switch on corresponding LEDs.
5. Flash an LED at a given on time and off time cycle, where the two times are taken from a file.
6. Flash an LED based on cron output (acts as an alarm).
7. Switch on a relay at a given time using cron, where the relay's contact terminals are connected to a load.
8. Get the status of a bulb at a remote place (on the LAN) through web.
9. The student should have hands on experience in using various sensors like temperature, humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi.

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ELECTRONICS AND COMMUNICATION ENGINEERING - R18

ADHOC WIRELESS SENSOR NETWORKS - B48PE1

B.TECH. VIII SEMESTER **L/T/P/ C**
4/0/0/ 4

COURSE OBJECTIVES:

1. To understand the concepts of sensor networks
2. To understand the MAC and transport protocols for adhoc networks
3. To understand the security of sensor networks
4. To understand the applications of adhoc and sensor networks

COURSE OUTCOMES

1. Ability to understand the concept of ad-hoc and sensor networks.
2. Ability to design and implement sensor network protocols.
3. Ability to set up and evaluate measurements of protocol performance in sensor networks.

UNIT- I:

Introduction to Ad Hoc Wireless Networks: Characteristics of MANETs, Applications of MANETs, Challenges.

Routing in MANETs: Topology-based versus Position-based approaches, Topology based routing protocols, Position based routing, Other Routing Protocols.

UNIT- II:

Data Transmission in MANETs: The Broadcast Storm, Multicasting, Geocasting.

TCP over Ad Hoc Networks: TCP Protocol overview, TCP and MANETs, Solutions for TCP over AdHoc.

UNIT- III:

Basics of Wireless Sensors and Applications: The Mica Mote, Sensing and Communication Range, Design Issues, Energy consumption, Clustering of Sensors, Applications.

Data Retrieval in Sensor Networks: Classification of WSNs, MAC layer, Routing layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

UNIT- IV:

Security : Security in Ad hoc Wireless Networks, Key Management, Secure Routing, Cooperation in MANETs, Intrusion Detection Systems.

Sensor Network Platforms and Tools: Sensor Network Hardware, Sensor Network Programming Challenges, Node-Level Software Platforms.

UNIT- V:

Operating System – TinyOS.

Imperative Language: nesC, Dataflow style language: TinyGALS, NodeLevel Simulators, ns-2 and its sensor network extension, TOSSIM.

TEXT BOOKS

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P.Aggarwal, World Scientific Publications / Cambridge University Press, March 2006.
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science imprint, Morgan Kauffman Publishers, 2005, rp2009.

REFERENCE BOOKS

1. Adhoc Wireless Networks – Architectures and Protocols, C.Siva Ram Murthy, B.S.Murthy, Pearson Education, 2004.
2. Wireless Sensor Networks – Principles and Practice, Fei Hu, Xiaojun Cao, An Auerbach book, CRC Press, Taylor & Francis Group, 2010.
3. Wireless Ad hoc Mobile Wireless Networks – Principles, Protocols and Applications, Subir Kumar Sarkar, et al., Auerbach Publications, Taylor & Francis Group, 2008.
4. Ad hoc Networking, Charles E.Perkins, Pearson Education, 2001.
5. Wireless Ad hoc Networking, Shih-Lin Wu, Yu-Chee Tseng, Auerbach Publications, Taylor & Francis Group, 2007.
6. Wireless Ad hoc and Sensor Networks – Protocols, Performance and Control, Jagannathan Sarangapani, CRC Press, Taylor & Francis Group, 2007, rp 2010.
7. Security in Ad hoc and Sensor Networks, Raheem Beyah, et al., World Scientific Publications / Cambridge University Press, 2010.
8. Ad hoc Wireless Networks – A communication-theoretic perspective, Ozan K.Tonguz, Gialuigi Ferrari, Wiley India, 2006, rp2009. Wireless Sensor Networks – Signal processing and communications perspectives, Ananthram Swami, et al., Wiley India, 2007, rp2009.

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ELECTRONICS AND COMMUNICATION ENGINEERING - R18

BIOMEDICAL ELECTRONICS - B48PE1

B.TECH. VIII SEMESTER **L/T/P/ C**
4/0/0/ 4

COURSE OBJECTIVE:

To make the learner understand

1. Conduction system of heart, measurement of pH, pCO2, pO2
2. Biomedical equipment related to heart and brain
3. Different monitoring devices

COURSE OUTCOMES:

At the end of this course the learner will have good understanding of measuring and monitoring equipment.

UNIT – I:

Electrocardiogram - Conduction System of Heart, ECG Lead Configurations, ECG Machine – Block Diagram and Circuits, Artifacts in ECG Recording, Multichannel ECG Machines, Vectorcardiograph, Frank Lead System and Phonocardiograph – Origin, Microphones, Amplifiers and Writing Methods. Blood Pressure Measurement – Auscultatory, Oscillometric and Ultrasonic Techniques Blood Flow Meters – Electromagnetic, Ultrasonic and Laser Doppler Techniques.

UNIT – II:

Arrhythmia Monitor, Exercise Stress Testing, Ambulatory Monitor – Holter – Data recording, data replay and Analysis, Bedside Patient Monitoring System and Central Monitoring System – Block Diagram, Fetal Monitors, Apnea Monitors.

UNIT – III:

– 10-20 Electrode Placement, EEG Machine, Normal and Abnormal Waveforms, Evoked Potentials and their recording, E.M.G Machine – Block Diagram and Circuits.

UNIT – IV:

pH Meter, Conductivity Meter, Electrophoresis, Gas Liquid Chromatography, Flame Photometer, SpectroPhotometer, Automated Chemical Analyser, Electrolyte Analysers, Cell Counter - Coulter.

UNIT – V:

Oximetry, Ear Oximeter, Pulse Oximeter, Skin Reflectance Oximeter, Intravascular Oximeter. Blood Gas Analyser – measurement of pH, pCO2, pO2, Intra-arterial blood gas monitoring, A Complete Blood Gas Analyser.

TEXT BOOKS

1. R. S. Khandpur, Handbook of Bio Medical Instrumentation, Tata McGraw Hill, 2nd Edition, 2003
2. John G. Webster, Medical Instrumentation Application and Design, Wiley, 3rd Edition, 2013.

REFERENCE BOOKS

1. Joseph .J. Carr, John M. Brown, Introduction to Biomedical Equipment Technology, Pearson-2001.
2. Shakti Chatterjee and Aubert Miller, Biomedical Instrumentation, CENGAGE Learning, 2010.

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ELECTRONICS AND COMMUNICATION ENGINEERING - R18

OPTIMIZATION TECHNIQUES - B48PE1

B.TECH. VIII SEMESTER **L/T/P/ C**
4/0/0/ 4

COURSE OBJECTIVES:

1. To introduce various optimization techniques i.e classical, linear programming, transportation problem, simplex algorithm, dynamic programming
2. Constrained and unconstrained optimization techniques for solving and optimizing an electrical and electronic engineering circuits design problems in real world situations.
3. To explain the concept of Dynamic programming and its applications to project implementation.

COURSE OUTCOMES:

After completion of this course, the student will be able to

1. explain the need of optimization of engineering systems
2. understand optimization of electrical and electronics engineering problems
3. apply classical optimization techniques, linear programming, simplex algorithm,
4. apply unconstrained optimization and constrained non-linear programming and dynamic programming
5. formulate optimization problems

UNIT – I:

Introduction and Classical Optimization Techniques: Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems.

Classical Optimization Techniques: Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints.

Solution by method of Lagrange multipliers – Multivariable Optimization with inequality constraints

– Kuhn – Tucker conditions.

UNIT – II:

Linear Programming: Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm.

Transportation Problem: Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems.

UNIT – III:

Unconstrained Nonlinear Programming: One dimensional minimization methods, Classification, Fibonacci method and Quadratic interpolation method.

Unconstrained Optimization Techniques: Univariant method, Powell's method and steepest descent method.

UNIT – IV:

Constrained Nonlinear Programming: Characteristics of a constrained problem - classification - Basic approach of Penalty Function method - Basic approach of Penalty Function method - Basic approaches of Interior and Exterior penalty function methods - Introduction to convex programming problem.

UNIT – V:

Dynamic Programming: Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution.

TEXT BOOKS

1. Singiresu S. Rao, Engineering Optimization: Theory and Practice by John Wiley and Sons, 4th edition, 2009.
2. H. S. Kasene&K. D. Kumar, Introductory Operations Research, Springer (India), Pvt. Ltd., 2004.

REFERENCE BOOKS

1. George Bernard Dantzig, MukundNarainThapa, "Linear programming", Springer series in operations research 3rd edition,2003.
2. H.A. Taha, "Operations Research: An Introduction", 8th Edition, Pearson/Prentice Hall, 2007.
3. Kalyanmoy Deb, "Optimization for Engineering Design – Algorithms and Examples", PHI Learning Pvt. Ltd, New Delhi, 2005.

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ELECTRONICS AND COMMUNICATION ENGINEERING - R18

SATELLITE COMMUNICATIONS - B48PE2

B.TECH. VIII SEMESTER **L/T/P/ C**
4/0/0/4

COURSE OBJECTIVES:

The course objectives are:

1. To prepare students to excel in basic knowledge of satellite communication principles
2. To provide students with solid foundation in orbital mechanics and launches for the satellite communication
3. To train the students with a basic knowledge of link design of satellite with a design examples.
4. To provide better understanding of multiple access systems and earth station technology
5. To prepare students with knowledge in satellite navigation and GPS & and satellite packet communications.

COURSE OUTCOMES:

At the end of the course, Students will be able to

1. Understand the historical background, basic concepts and frequency allocations for satellite communication.
2. Demonstrate orbital mechanics, launch vehicles and launchers.
3. Demonstrate the design of satellite links for specified C/N with system designexamples.
4. Visualize satellite sub systems like Telemetry, tracking, command and monitoring power systems etc.
5. Understand the various multiple access systems for satellite communication systems and satellite packet communications.

UNIT – I:

Introduction: Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency Allocations for Satellite Services, Applications, Future Trends of Satellite Communications, Advantages of Satellite Communications,.

Orbital Mechanics and Launchers: Orbital Mechanics, Orbital Period and Velocity, Look Angle determination, Orbital Perturbations, Orbit determination, Launches and Launch vehicles**,**Orbital Effects in Communication Systems Performance, Orbital Elements.

UNIT – II:

Satellite Subsystems: Attitude and Orbit Control System, Telemetry, Tracking, Command and Monitoring, Power Systems, Communication Subsystems, Satellite Antennas, Equipment Reliability and Space Qualification.

UNIT – III:

Satellite Link Design: Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design of Down Links, Up Link Design, Design Of Satellite Links For Specified C/N, System Design Examples.

Multiple Access: Frequency Division Multiple Access (FDMA), Intermodulation, Calculation of C/N, Time Division Multiple Access (TDMA), Frame Structure, Examples, Satellite Switched

TDMA Onboard Processing, DAMA, Code Division Multiple Access (CDMA), Spread Spectrum Transmission and Reception.

UNIT – IV:

Earth Station Technology: Introduction, Transmitters, Receivers, Antennas, Tracking Systems, Terrestrial Interface, Primary Power Test Methods.

UNIT – V:

Low Earth Orbit and Geo-Stationary Satellite Systems: Orbit Considerations, Coverage and Frequency Consideration, Delay & Throughput Considerations, System Considerations, Operational NGSO Constellation Designs.

Satellite Navigation & Global Positioning System : Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS Signal Levels, GPS Receiver Operation, GPS C/A Code Accuracy, Differential GPS.

TEXTBOOKS

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition,2003.
2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, 2nd Edition, Pearson Publications, 2003.

REFERENCE BOOKS

1. Satellite Communications: Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.
2. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Edition.
3. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004
4. Satellite Communications – Dennis Roddy, McGraw Hill, 4th Edition, 2009.

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ELECTRONICS AND COMMUNICATION ENGINEERING - R18

DESIGN OF FAULT TOLERANT SYSTEMS - B48PE2

(Professional Elective-IV)

B.TECH. VIII SEMESTER **L/T/P/ C**
4/0/0/ 4

COURSE OBJECTIVES:

1. To provide or broad understanding of fault diagnosis and tolerant design Approach.
2. To illustrate the framework of test pattern generation using semi and full automaticapproach.

COURSE OUTCOMES:

1. To acquire the knowledge of fundamental concepts in fault tolerant design.
2. Design requirements of self check-in circuits.
3. Test pattern generation using LFSR.
4. Design for testability rules and techniques for combinational circuits.
5. Introducing scan architectures.

UNIT – I:

Fault Tolerant Design: Basic concepts: Reliability concepts, Failures & faults, Reliability and Failure rate, Relation between reliability and mean time between failure, maintainability and availability, reliability of series, parallel and parallel-series combinational circuits.

Fault Tolerant Design: Basic concepts-static, dynamic, hybrid, triple modular redundant system (TMR), 5MR reconfiguration techniques, Data redundancy, Time redundancy and software Redundancy concepts.

UNIT – II:

Self Checking circuits & Fail safe Design: Self Checking Circuits: Basic concepts of self checking circuits, Design of Totally self checking checker, Checkers using m out of n codes, Berger code, Low cost residue code.

Fail Safe Design: Strongly fault secure circuits, fail safe design of sequential circuits using partition theory and Berger code, totally self checking PLA design.

UNIT – III:

Design for Testability: Design for testability for combinational circuits: Basic concepts of Testability, Controllability and observability, The Reed Muller's expansion technique, use of control and syndrome testable designs.

Design for testability by means of scan:

Making circuits Testable, Testability Insertion, Full scan DFT technique- Full scan insertion, flip-flop Structures, Full scan design and Test, Scan Architectures-full scan design, Shadow register DFT, Partial scan methods, multiple scan design, other scan design.

UNIT – IV:

Logic Built-in-self-test: BIST Basics-Memory-based BIST,BIST effectiveness, BIST types, Designing a BIST, Test Pattern Generation-Engaging TPGs, exhaustive counters, ring counters, twisted ring counter, Linear feedback shift register, Output Response Analysis- Engaging ORA's,

One's counter, transition counter, parity checking, Serial LFSRs, Parallel Signature analysis, BIST architectures-BIST related terminologies, A centralized and separate Board-level BIST architecture, Built-in evaluation and self test(BEST), Random Test socket(RTS), LSSD On-chip self test, Self – testing using MISR and SRSG, Concurrent BIST, BILBO, Enhancing coverage, RT level BIST design-CUT design, simulation and synthesis, RTS BIST insertion, Configuring the RTS BIST, incorporating configurations in BIST, Design of STUMPS, RTS and STUMPS results.

UNIT – V:

Standard IEEE Test Access Methods: Boundary Scan Basics, Boundary scan architecture- Test access port, Boundary scan registers, TAP controller, the decoder unit, select and other units, Boundary scan Test Instructions-Mandatory instructions, Board level scan chain structure-One serial scan chain, multiple-scan chain with one control test port, multiple-scan chains with one TDI,TDO but multiple TMS, Multiple-scan chain, multiple access port, RT Level boundary scan-inserting boundary scan test hardware for CUT, Two module test case, virtual boundary scan tester, Boundary Scan Description language.

TEXTBOOKS

1. Fault Tolerant & Fault Testable Hardware Design- ParagK.Lala,1984,PHI
2. Digital System Test and Testable Design using HDL models and Architectures – Zainalabedin Navabi, Springer International Edition.

REFERENCE BOOKS

1. Digital Systems Testing and Testable Design-MironAbramovici, MelvinA.Breuer and Arthur D. Friedman, Jaico Books.
2. Essentials of Electronic Testing- Bushnell & Vishwani D.Agarwal, Springers.
3. Design for Test for Digital IC's and Embedded Core Systems- Alfred L. Crouch, 2008, Pearson Education.

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ELECTRONICS AND COMMUNICATION ENGINEERING - R18

SPEECH SIGNAL PROCESSING - B48PE2

B.TECH. VIII SEMESTER **L/T/P/C**
4/0/0/4

UNIT–I:

Fundamentals of Digital Speech Processing: Anatomy & Physiology of Speech Organs, The process of Speech Production, Acoustic Phonetics, Articulatory Phonetics, The Acoustic Theory of Speech Production Uniform lossless tube model, effect of losses in vocal tract, effect of radiation at lips, Digital models for speech signals.

UNIT–II:

Time Domain Models for Speech Processing: Introduction- Window considerations, Short time energy and average magnitude Short time average zero crossing rate, Speech vs Silence discrimination using energy and zero crossing, Pitch period estimation using a parallel processing approach, The short time autocorrelation function, The short time average magnitude difference function, Pitch period estimation using the autocorrelation function.

UNIT–III:

Linear Predictive Coding (LPC) Analysis: Basic principles of Linear Predictive Analysis: The Autocorrelation Method, The Covariance Method, Solution of LPC Equations: Cholesky Decomposition Solution for Covariance Method, Durbin's Recursive Solution for the Autocorrelation Equations, Comparison between the Methods of Solution of the LPC Analysis Equations, Applications of LPC Parameters: Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters.

UNIT –IV:

Homomorphic Speech Processing: Introduction, Homomorphic Systems for Convolution: Properties of the Complex Cepstrum, Computational Considerations, The Complex Cepstrum of Speech, Pitch Detection, Formant Estimation, The Homomorphic Vocoder.

Speech Enhancement: Nature of interfering sounds, Speech enhancement techniques: Single Microphone Approach: spectral subtraction, Enhancement by re-synthesis, Comb filter, Wiener filter, Multi microphone Approach.

UNIT-V:

Automatic Speech & Speaker Recognition: Basic pattern recognition approaches, Parametric representation of speech, Evaluating the similarity of speech patterns, Isolated digit Recognition System, Continuous digit Recognition System.

Hidden Markov Model (HMM) for Speech: Hidden Markov Model (HMM) for speech recognition, Viterbi algorithm, Training and testing using HMMS, Speaker Recognition: Recognition techniques, Features that distinguish speakers, Speaker Recognition Systems: Speaker Verification System, Speaker Identification System.

TEXT BOOKS

1. Digital Processing of Speech Signals - L.R. Rabiner and S. W. Schafer. Pearson Education.
2. Speech Communications: Human & Machine - Douglas O'Shaughnessy, 2nd Ed., Wiley India, 2000.
3. Digital Processing of Speech Signals. L.R Rabinar and R W Jhaung, 1978, Pearson Education.

REFERENCE BOOKS

1. Discrete Time Speech Signal Processing: Principles and Practice - Thomas F. Quateri, 1st Ed., PE.
2. Speech & Audio Signal Processing- Ben Gold & Nelson Morgan, 1st Ed., Wiley

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ELECTRONICS AND COMMUNICATION ENGINEERING – R18

EMBEDDED SYSTEMS - B48PE3

B.TECH. VIII SEMESTER **L/T/P/C**
3/0/0/3

COURSE OBJECTIVES:

1. To provide an overview of Design Principles of Embedded System.
2. To provide clear understanding about the role of firmware, operating systems incorrelation with hardware systems.

COURSE OUTCOMES:

1. Expected to understand the selection procedure of Processors in the embedded domain.
2. Design Procedure for Embedded Firmware.
3. Expected to visualize the role of Real time Operating Systems in Embedded Systems.
4. Expected to evaluate the Correlation between task synchronization and latency issues

UNIT – I:

Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT – II:

Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS).
Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT – III:

Trends in Embedded Industry: Processor Trends in Embedded Systems, Embedded OS Trends, Development Language Trends, Open Standards, Frameworks & Alliances, Bottlenecks, Development Platform Trends, Cloud, Internet Of Things (IoT) & Embedded Systems.
Communication Interface: Onboard and External Communication Interfaces.

UNIT –IV:

RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

UNIT – V:

Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

TEXT BOOKS

1. Introduction to Embedded Systems - Shibu K.V, McGraw Hill.

REFERENCE BOOKS

1. Embedded Systems - Raj Kamal, McGraw Hill Education.
2. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
3. Embedded Systems – Lyla, Pearson, 2013.
4. An Embedded Software Primer - David E. Simon, Pearson Education.

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ELECTRONICS AND COMMUNICATION ENGINEERING – R18

RADAR SYSTEMS - B48PE3

B.TECH. VIII SEMESTER **L/T/P/ C**
3/0/0/ 3

COURSE OBJECTIVES:

This is a system oriented course and needs the knowledge of Signal and Systems, EM Theory and Transmission Lines, Antennas and Wave Propagation, and Microwave Engineering. The main objectives of this course are:

1. To understand the working principle of a radar, identify the frequency bands, and formulate the complete radar range equation, listing out all the losses to be accounted for.
2. To identify the need for modulation and Doppler effect; to get acquainted with the working principles of CW radar, FM-CW radar.
3. To impart the knowledge of functioning of MTI radar and its variants; to establish the DLC features and to bring out the MTI radar performance limitations.
4. To establish the principle of Tracking Radar and differentiate between different types of tracking radars, identifying their principle of operation with necessary schematics.
5. To explain the concept of a Matched Filter in radar receiver, and to configure its response characteristics; to impart the working knowledge of different receiver blocks – duplexers, displays, phased array antennas, their requirements and utilities.

COURSE OUTCOMES:

Having gone through this course on Radar Systems, the students would be able to:

1. Explain the working principle of a pulse radar and establish the complete radar range equation, identifying the significance and choice of all parameters involved, and solve numerical problems to establish the radar characteristics.
2. Account for the need and functioning of CW, FM-CW and MTI radars, identifying the complete block diagrams and establishing their characteristics.
3. Illustrate the DLC characteristics, account for the range gated Doppler filter bank, and estimate the MTI radar performance characteristics and limitations.
4. Distinguish between Sequential Lobing, Conical Scan, Monopulse type of Tracking Radars, specify their requirements and compare their characteristic features.
5. Derive the matched filter response characteristics for radar applications and account for correlation receivers; to distinguish between different radar displays and duplexers.

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 , Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Illustrative Problems. Radar Clutter and radar range with clutter.

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, FM- CW altimeter.

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, Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler Radar, Digital MTI Processing.

UNIT – IV:

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

Introduction to Pulse Compression Radar: Air Traffic Control.

UNIT – V:

Detection of Radar Signals in Noise : Introduction, Matched Filter Receiver – Response Characteristics and Derivation, Correlation Function and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise.

Radar Receivers –Displays – types. Duplexers – Branch type and Balanced type.

Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Applications, Advantages and Limitations.

TEXT BOOKS

1. Introduction to Radar Systems – Merrill I. Skolnik, Mc Graw Hill Education Special Indian Edition, 2nd Ed., 2007.

REFERENCE BOOKS

1. Radar: Principles, Technology, Applications – Byron Edde, Pearson Education, 2004.
2. Radar Principles – Peebles, Jr., P.Z., Wiley, New York, 1998.

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ELECTRONICS AND COMMUNICATION ENGINEERING - R18

DATABASE MANAGEMENT SYSTEMS - B48PE3

B.TECH. VIII SEMESTER **L/T/P/C**
3/0/0/3

COURSE OBJECTIVES:

1. To understand the basic concepts and the applications of database systems.
2. To master the basics of SQL and construct queries using SQL.
3. To understand the relational database design principles.
4. To become familiar with the basic issues of transaction processing and concurrency control.
5. To become familiar with database storage structures and access techniques.

COURSE OUTCOMES:

1. Demonstrate the basic elements of a relational database management system.
2. Ability to identify the data models for relevant problems.
3. Ability to design entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data.
4. Apply normalization for the development of application software.

UNIT – I:

Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages – DDL, DML, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database Users and Administrators, History of Database Systems.

Introduction to Data base design: Database Design and ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises.

Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design: ER to Relational, Introduction to Views, Destroying /Altering Tables and Views.

UNIT – II:

Relational Algebra and Calculus: Preliminaries, Relational Algebra, Relational calculus – Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus.

SQL: Queries, Constraints, Triggers: Form of Basic SQL Query, UNION,INTERSECT, and EXCEPT, Nested Queries, Aggregate Operators, NULL values Complex Integrity Constraints in SQL, Triggers and Active Data bases, Designing Active Databases.

UNIT – III:

Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Dependencies - Reasoning about FDs, Normal Forms, Properties of Decompositions, Normalization, Schema Refinement in Database Design, Other Kinds of Dependencies.

UNIT – IV:

Transaction Management: Transactions, Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity Transaction Isolation Levels, Implementation of Isolation Levels.

Concurrency Control: Lock–Based Protocols, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols, Multiversion Schemes. Recovery System-Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with loss of nonvolatile storage, Early Lock Release and Logical Undo Operations, Remote Backup systems.

UNIT – V:

Storage and Indexing: Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing, Index Data Structures, Comparison of File Organizations. Tree-Structured Indexing: Intuition for tree Indexes, Indexed Sequential Access Method (ISAM), B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

Hash- Based Indexing: Static Hashing, Extendible hashing, Linear Hashing, Extendible vs. Linear Hashing.

TEXT BOOKS

1. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, McGraw Hill Education (India) Private Limited, 3rd Edition. **(Part of UNIT-I, UNIT-II, UNIT-III, UNIT- V)**
2. Data base System Concepts, A. Silberschatz, Henry. F. Korth, S. Sudarshan, McGraw Hill Education(India) Private Limited l, 6th edition. **(Part of UNIT-I, UNIT-IV)**

REFERENCE BOOKS

1. Database Systems, 6th edition, R Elmasri, Shamkant B.Navathe, Pearson Education.
2. Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning.
3. Introduction to Database Management, M. L. Gillenson and others, Wiley Student Edition.
4. Database Development and Management, Lee Chao, Auerbach publications, Taylor & Francis Group.
5. Introduction to Database Systems, C. J. Date, Pearson Education.