

SHADAN WOMEN'S COLLEGE OF ENGINEERING AND TECHNOLOGY
Khairatabad, Hyderabad
(An Autonomous Institution)

DIGITAL SYSTEMS & COMPUTER ELECTRONICS
APPLICABLE FOR ACADEMIC YEAR 2023-24 ADMITTED BATCH
R23 COURSE STRUCTURE AND SYLLABUS

II YEAR I – SEMESTER

Course Code	Course Title	L	T	P	Credits
5806BD	1. Embedded Networks	3	0	0	3
5806BE	2. Soft Computing Techniques	3	0	0	3
5806BF	3 5G and Beyond Communications	3	0	0	3
Open Elective	Open Elective	3	0	0	3
Dissertation	Dissertation Work Review – II	0	0	12	6
	Total Credits	6	0	12	12

II YEAR II - SEMESTER

Course Code	Course Title	L	T	P	Credits
Dissertation	Dissertation Work Review - III	0	0	12	06
Dissertation	Dissertation Viva-Voce	0	0	28	14
	Total	0	0	40	20

Open Electives:

1. 5802ZA -Business Analytics
2. 5802ZB-Industrial Safety
3. 5802ZC-Operations Research
4. 5802ZD-Cost Management of Engineering Projects
5. 5802ZE -Composite Materials

SHADAN WOMEN'S COLLEGE OF ENGINEERING & TECHNOLOGY
Khairatabad, Hyderabad
DEPARTMENT OF ECE, M.Tech. II YEAR - I SEMESTER
DIGITAL SYSTEMS & COMPUTER ELECTRONICS
EMBEDDED NETWORKS (PE – V)

Prerequisite: Computer Networks.

Course Objectives:

1. To elaborate on the conceptual frame work of physical layer and topological issues of networking in Embedded Systems.
2. To emphasis on issues related to guided and unguided media with specific reference to Embedded device level connectivity.

Course Outcomes: Students will be:

1. Expected to acquire knowledge on communication protocols of connecting Embedded Systems.
2. Expected to master the design level parameters of USB and CAN bus protocols.
3. Understand the design issues of Ethernet in Embedded networks.
4. Acquire the knowledge of wireless protocols in Embedded domain.

UNIT -I

Embedded Communication Protocols: Embedded Networking: Introduction – Serial/Parallel Communication – Serial communication protocols -RS232 standard – RS485 – Synchronous Serial Protocols -Serial Peripheral Interface(SPI) – Inter Integrated Circuits (I2C) – PC Parallel port programming - ISA/PCI Bus protocols – Firewire.

UNIT -II

USB and CAN Bus: USB bus – Introduction – Speed Identification on the bus – USB States – USB bus communication Packets –Data flow types –Enumeration –Descriptors –PIC 18 Microcontroller USB Interface – C Programs –CAN Bus – Introduction - Frames –Bit stuffing –Types of errors –Nominal Bit Timing – PIC microcontroller CAN Interface –A simple application with CAN.

UNIT -III

Ethernet Basics:Elements of a network – Inside Ethernet – Building a Network: Hardware options – Cables,Connections and network speed – Design choices: Selecting components – Ethernet Controllers – Using the internet in local and internet communications – Inside the Internet protocol.

UNIT -IV

Embedded Ethernet:Exchanging messages using UDP and TCP – Serving web pages with Dynamic Data – Serving web pages that respond to user Input – Email for Embedded Systems – Using FTP – Keeping Devices and Network secure.

UNIT V

Wireless Embedded Networking: Wireless sensor networks – Introduction – Applications – Network Topology – Localization – Time Synchronization - Energy efficient MAC protocols – SMAC – Energy efficient and robust routing – Data Centric routing.

TEXT BOOKS:

1. Embedded Systems Design: A Unified Hardware/Software Introduction - Frank Vahid, Tony Givargis, John & Wiley Publications, 2002.
2. Parallel Port Complete: Programming, interfacing and using the PC's parallel printer port - Jan Axelson, Penram Publications, 1996.

REFERENCE BOOKS:

1. Advanced PIC microcontroller projects in C: from USB to RTOS with the PIC18F series - Dogan Ibrahim, Elsevier 2008.
2. Embedded Ethernet and Internet Complete - Jan Axelson, Penram publications, 2003.
3. Networking Wireless Sensors - Bhaskar Krishnamachari, Cambridge press 2005.

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DIGITAL SYSTEMS & COMPUTER ELECTRONICS
SOFT COMPUTING TECHNIQUES (PE - V)

Course Objectives:

1. To know the Neural Networks and Feed Forward Networks, Learning Methods
2. To acquire a knowledge about Associative Memories and Hopfield Networks
3. To understand the design of Fuzzy logic and hybrid systems
4. To know the Genetic algorithm and its applications

Course Outcomes: Students will be able to:

1. Apply a different learning methods for various applications
2. Utilize Associative Memories in various networks
3. Design a Fuzzy based systems
4. Use the Genetic algorithm for Various systems

UNIT -I

Fundamentals of Neural Networks & Feed Forward Networks: Basic Concept of Neural Networks, Human Brain, Models of an Artificial Neuron, Learning Methods, Neural Networks Architectures, Signal Layer Feed Forward Neural Network :The Perceptron Model, Multilayer Feed Forward Neural Network
:Architecture of a Back Propagation Network(BPN), The Solution, Back propagation Learning, Selection of various Parameters in BPN. Application of Back propagation Networks in Pattern Recognition & Image Processing.

UNIT -II

Associative Memories & ART Neural Networks: Basic concepts of Linear Associator, Basic concepts of Dynamical systems, Mathematical Foundation of Discrete-Time Hop field Networks(HPF), Mathematical Foundation of Gradient-Type Hopfield Networks, Transient response of Continuous Time Networks, Applications of HPF in Solution of Optimization Problem: Minimization of the Traveling salesman tour length, Summing networks with digital outputs, Solving Simultaneous Linear Equations, Bidirectional Associative Memory Networks; Cluster Structure, Vector Quantization, Classical ART Networks, Simplified ART Architecture.

UNIT-III

Fuzzy Logic & Systems: Fuzzy sets, Crisp Relations, Fuzzy Relations, Crisp Logic, Predicate Logic, Fuzzy Logic, Fuzzy Rule based system, Defuzzification Methods, Applications: Greg Viot's Fuzzy Cruise Controller, Air Conditioner Controller.

UNIT -IV

Genetic Algorithms: Basic Concepts of Genetic Algorithms (GA), Biological background, Creation of Offsprings, Working Principle, Encoding, Fitness Function, Reproduction, Inheritance Operators, Cross Over, Inversion and Deletion, Mutation Operator, Bit-wise Operators used in GA, Generational Cycle, Convergence of Genetic Algorithm.

UNIT -V

Hybrid Systems:Types of Hybrid Systems, Neural Networks, Fuzzy Logic, and Genetic Algorithms Hybrid, Genetic Algorithm based BPN: GA Based weight Determination, Fuzzy Back Propagation Networks: LR-type fuzzy numbers, Fuzzy Neuron, Fuzzy BP Architecture, Learning in Fuzzy BPN, Inference by fuzzy BPN.

TEXT BOOKS:

1. Introduction to Artificial Neural Systems - J.M.Zurada, Jaico Publishers
2. Neural Networks, Fuzzy Logic & Genetic Algorithms: Synthesis & Applications - S.Rajasekaran, G.A. Vijayalakshmi Pai, PHI, New Delhi, July 2011.
3. Genetic Algorithms by David E. Gold Berg, Pearson Education India, 2006.

REFERENCE BOOKS:

1. Artificial Neural Networks - Dr. B. Yagananarayana, PHI, New Delhi, , 1999.
2. An introduction to Genetic Algorithms - Mitchell Melanie, MIT Press, 1998
3. Fuzzy Sets, Uncertainty and Information- Klir G.J. & Folger. T. A., PHI, Delhi, 1993.
4. Neural Networks & Fuzzy Sytems- Kosko.B., PHI, Delhi,1994.

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DIGITAL SYSTEMS & COMPUTER ELECTRONICS
5G AND BEYOND COMMUNICATIONS (PE -V)

Course Objectives:

1. To understand the principles of MIMO Communications
2. To provide exposure to advanced research topics in the field of Beyond 5G/6G wireless systems
3. To know the various requirements beyond 2020 communications

Course Outcomes: Students will be able to:

1. Design MIMO Communication system
2. Utilize the Mobile Wireless Technology Generations
3. Know the propagation of mm waves
4. Face the challenges of beyond 2020 wireless communication

UNIT -I

Multiple Input Multiple Output (MIMO) Communications :

Spatial Multiplexing, Spatial Diversity, Beamforming in MIMO systems, Hybrid Precoding , 5G Communication Landscape, Related work on 5G.

UNIT -II

Introduction to Mobile Wireless Technology Generations:

5G, WISDOM, GIMVC, Requirements of 5G, standardization of WISDOM, Vision of 5G, WISDOM Concept and Challenges, Cellular D2D Communication, D2D Using Physical Layer Network Coding, Using FFR and Using Cognitive Radio.

SMNAT: Introduction, Network Architecture and the Process, Implementation of SMNAT for In-Band- D2D and Interoperability with WISDOM, Description of Network elements of SMNAT and Call Flow for Session Establishment.

UNIT -III

Radio Wave Propagation for Mm Wave:

Introduction, Large-scale Propagation Channel Effects, Small-Scale Channel Effects, Spatial Characterization of Multipath and Beam Combing, Outdoor Channel Models, Indoor Channel Models.

UNIT -IV

Higher layer Design Considerations for Mm Wave:

Challenges when Networking Mm Wave Devices, Beam Adaptation Protocols, Relaying for Coverage Extension, Support for Multimedia Transmission, Multiband considerations, Performance of Cellular networks, Mm Wave Standardization: ECMA-387, IEEE 802.11ad.

UNIT -V BEYOND 2020:

Major Challenges Surrounding Future Cyber Security, Users Awareness, Spectrum Related Security Issues in CRNs. Challenges for 2020 and beyond, Future Mobile Technologies, High Altitude Stratospheric Platform Station Systems, Human Bond Communications, CONASENSE.

TEXT BOOKS:

1. Ramjee Prasad, 5G: 2020 and Beyond , River Publishers
2. T. S. Rappaport, R. W. Heath Jr., R. C. Daniels, and J. M. Murdock, Millimeter Wave Wireless Communication, Pearson Education , 2015.

REFERENCE BOOKS

1. M. Manish, G. Devendra, P. Pattanayak, and N. Ha, 5G and Beyond Wireless Systems PHY Layer Perspective, Springer Series in Wireless Technology
2. M. Vaezi, Z. Ding, and H. V. Poor, Multiple Access techniques for 5G Wireless Networks and Beyond, Springer Nature , Switzerland, 2019

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Khairatabad, Hyderabad
DEPARTMENT OF ECE, M.Tech. II YEAR - I SEMESTER
BUSINESS ANALYTICS (Open Elective)

Prerequisite: None

Course objectives:

- Understand the role of business analytics within an organization.
- Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
- To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
- To become familiar with processes needed to develop, report, and analyze business data.
- Use decision-making tools/Operations research techniques.
- Manage business process using analytical and management tools.
- Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

Course Outcomes:

- Students will demonstrate knowledge of data analytics.
- Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
- Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.
- Students will demonstrate the ability to translate data into clear, actionable insights.

UNIT- I

Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organization, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

UNIT- II

Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

UNIT- III

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative

Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

UNIT- IV

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

UNIT- V

Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making. Recent Trends in Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

TEXT BOOKS:

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
2. Business Analytics by James Evans, persons Education.

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DEPARTMENT OF ECE, M.Tech. II YEAR - I SEMESTER
INDUSTRIAL SAFETY (Open Elective)

Course Objectives:

- To provide information regarding different elements of industrial water pollution and Methods of treatment.
- To expose to the various industrial applications, maintenance, preventive measures taken against wear and tear.

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

- Know how to take safety measures in executing works
- Identify the need for maintenance (or) replacement of equipment
- Understand the need for periodic and preventive maintenance

UNIT- I

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

UNIT- II

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT- III

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications,

- i. Screw down grease cup,
- ii. Pressure grease gun,
- iii. Splash lubrication,
- iv. Gravity lubrication,
- v. Wick feed lubrication
- vi. Side feed lubrication,
- vii. Ring lubrication,

Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

UNIT- IV

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault-finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like,

- i. Any one machine tool,
- ii. Pump
- iii. Air compressor
- iv. Internal combustion engine,
- v. Boiler,
- vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT- V

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of:

- i. Machine tools,
- ii. Pumps,
- iii. Air compressors,
- iv. Diesel generating (DG) sets,

Program and schedule of preventive maintenance of mechanical and electrical equipment, Advantages of preventive maintenance. Repair cycle concept and importance

REFERENCE BOOKS:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, McGraw Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

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DEPARTMENT OF ECE, M.Tech. II YEAR - I SEMESTER
OPERATIONS RESEARCH (Open Elective)

Prerequisite: None

Course Outcomes: At the end of the course, the student should be able to

- Students should be able to apply the dynamic programming to solve problems of discrete and continuous variables.
- Students should be able to apply the concept of non-linear programming
- Students should be able to carry out sensitivity analysis
- Student should be able to model the real-world problem and simulate it.

UNIT- I

Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

UNIT- II

Formulation of a LPP - Graphical solution revised simplex method - duality theory – dual simplex method - sensitivity analysis - parametric programming

UNIT- III

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem – max flow problem - CPM/PERT

UNIT- IV

Scheduling and sequencing - single server and multiple server models – deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

UNIT- V

Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

TEXT BOOKS/ REFERENCE BOOKS:

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimization: Operations Research, Jain Brothers, Delhi, 2008
4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
5. Pannarselvam, Operations Research: Prentice Hall of India 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

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DEPARTMENT OF ECE, M.Tech. II YEAR - I SEMESTER
COST MANAGEMENT OF ENGINEERING PROJECTS (Open Elective)

Prerequisite: None

UNIT- I

Introduction and Overview of the Strategic Cost Management Process Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

UNIT- II

Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities. Detailed Engineering activities. Pre-project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

UNIT- III

Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints.

UNIT- IV

Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

UNIT- V

Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

TEXT BOOKS/ REFERENCE BOOKS:

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

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DEPARTMENT OF ECE, M.Tech. II YEAR - I SEMESTER
COMPOSITE MATERIALS (Open Elective)

Prerequisite: None

UNIT – I

INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT – II

REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT – III

Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. **Manufacturing of Ceramic Matrix Composites:** Liquid Metal Infiltration – Liquid phase sintering. **Manufacturing of Carbon – Carbon composites:** Knitting, Braiding, Weaving. Properties and applications.

UNIT – IV

Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

UNIT – V

Strength: Lamina Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first ply failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

TEXT BOOKS/ REFERENCE BOOKS:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.
3. Hand Book of Composite Materials-ed-Lubin.
4. Composite Materials – K. K. Chawla.
5. Composite Materials Science and Applications – Deborah D. L. Chung.
6. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.