**OPEN ELECTIVES**

| Course Code | Course Name | Offered to the branches |
|---|---|---|
| 20AD81 | Introduction to ArtificialIntelligence | ASE, CE, ECE, EEE, & ME |
| 20AD82 | Introduction to DataScience | ASE, CE, ECE, EEE, & ME |
| 20AD83 | Introduction to MachineLearning | ASE, CE, ECE, EEE, & ME |
| 20AD84 | Fundamentals of DeepLearning | ASE, CE, ECE, EEE, & ME |
| 20AE81 | Principles of Flight | AI&DS, CE, CSE, CSE(AI&ML), ECE, EEE, IT & ME |
| 20AE82 | Space Science | AI&DS, CE, CSE, CSE(AI&ML), ECE, EEE, IT & ME |
| 20AE83 | Aircraft Systems | AI&DS, CE, CSE, CSE(AI&ML), ECE, EEE, IT & ME |
| 20AE84 | Air Transportation Systems | AI&DS, CE, CSE, CSE(AI&ML), ECE, EEE, IT & ME |
| 20CE81 | Basics of Civil Engineering | AI&DS, ASE, CSE, CSE(AI&ML), ECE, EEE, IT & ME |
| 20CE82 | Disaster Management | AI&DS, ASE, CSE, CSE(AI&ML), ECE, EEE, IT & ME |
| 20CE83 | Fundamentals of Geospatial Technologies | AI&DS, ASE, CSE, CSE(AI&ML), ECE, EEE, IT & ME |
| 20CE84 | Environmental Sanitation | AI&DS, ASE, CSE, CSE(AI&ML), ECE, EEE, IT & ME |
| 20CS81 | Unix and Shell Programming | ASE, CE, ECE, EEE, & ME |
| 20CS82 | Introduction to Algorithm Techniques | ASE, CE, ECE, EEE, & ME |
| 20CS83 | Principles of Computer Architecture | ASE, CE, ECE, EEE, & ME |
| 20CS84 | PHP Programming | ASE, CE, ECE, EEE, & ME |
| 20CS85 | Object Oriented Software Engineering | ASE, CE, ECE, EEE, & ME |
| 20EC81 | Satellite Technology | AI&DS, ASE, CE, CSE, CSE(AI&ML), EEE, IT & ME |
| 20EC82 | Elements of Communication Systems | AI&DS, ASE, CE, CSE, CSE(AI&ML), EEE, IT & ME |
| 20EC83 | Microprocessors and Interfacing | AI&DS, ASE, CE, CSE, CSE(AI&ML), EEE, IT & ME |
| 20EC84 | Analog and Digital Communications | AI&DS, ASE, CE, CSE, CSE(AI&ML), EEE, IT & ME |
| 20EC85 | Systems and Signal Processing | AI&DS, ASE, CE, CSE, CSE(AI&ML), EEE, IT & ME |
| 20EC86 | Cellular Technology | AI&DS, ASE, CE, CSE, CSE(AI&ML), EEE, IT & ME |

**OPEN ELECTIVES**

| Course Code | Course Name | Offered to the branches |
|---|---|---|
| 20EE81 | Linear Control Systems | AI&DS, ASE, CE, CSE, CSE(AI&ML), ECE, IT & ME |
| 20EE82 | Basics of Electrical Measurements | AI&DS, ASE, CE, CSE, CSE(AI&ML), ECE, IT & ME |
| 20EE83 | Utilization of Electrical Energy | AI&DS, ASE, CE, CSE, CSE(AI&ML), ECE, IT & ME |
| 20EE84 | Electric Vehicles | AI&DS, ASE, CE, CSE, CSE(AI&ML), ECE, IT & ME |
| 20IT81 | OOPS through JAVA | ASE, CE, ECE, EEE, & ME |
| 20IT82 | Web Technologies using PHP | ASE, CE, ECE, EEE, & ME |
| 20IT83 | Mobile Application Development | ASE, CE, ECE, EEE, & ME |
| 20IT84 | Cyber Security & Digital Forensics | ASE, CE, ECE, EEE, & ME |
| 20ME81 | Renewable Energy Sources | AI&DS, CE, CSE, CSE(AI&ML), ECE, EEE & IT |
| 20ME82 | Robotics in Automation | AI&DS, CE, CSE, CSE(AI&ML), ECE, EEE & IT |
| 20ME83 | Operations Research Techniques | AI&DS, CE, CSE, CSE(AI&ML), ECE, EEE & IT |
| 20ME84 | Elements of Automobile Engineering | AI&DS, CE, CSE, CSE(AI&ML), ECE, EEE & IT |

**B.Tech.**

## 20AD81-INTRODUCTION TO ARTIFICIAL INTELLIGENCE

| L | T | P | Cr. |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Pre-requisite** **:** Basic Engineering Mathematics Knowledge

**Course Educational Objective**: The objective of the course is to present an overview of artificial intelligence (AI) principles and approaches. Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic, reasoning, and learning. Students will implement a small AI system in a team environment. The knowledge of artificial intelligence plays a considerable rolein some applications students develop for courses in the program.

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

**CO1:** Enumerate the history and foundations of Artificial Intelligence. **(Understand-L2)**

**CO2:** Apply the basic principles of AI in problem solving**. (Apply-L3).**

**CO3:** Illustrate the different searching algorithms to find and optimize the solution for the given problem**. (Apply-L3)**

**CO4:** Illustrate the different gaming algorithms and identify the importance of knowledge representation in Artificial Intelligence. **(Apply- L3)**

**CO5:** Describe the use of predicate logic to represent the knowledge in AI domain. **(Understand - L2)**

**UNIT I**

**Introduction:** What Is AI?, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

**UNIT II**

**Problem Solving:** Problem-Solving Agents, Example Problems, searching for Solutions, search algorithms terminologies, properties of search algorithms, types of search algorithms. Informed and Uninformed Search Strategies, **Informed (Heuristic) Search Algorithms**: Best first search, A* Algorithm, AO* Algorithm and Local Search Algorithms. Searching with Non deterministic Actions.

**UNIT III**

**Search Algorithms**: **Uniformed / Blind Search Algorithms**: Breadth- first Search, Depth-first Search, Depth-limited Search, Iterative deepening depth-first search, Uniform cost search, Bidirectional Search.

**UNIT IV**

**Adversarial Search/ Game Playing**: Introduction, Minimax algorithm, Alpha-Beta pruning. **Knowledge-Based Agent**: Architecture, Knowledge base Levels, Types , Knowledge Representation mappings, forward and backward chaining/Reasoning techniques of inference engine , Approaches of knowledge representation, issues in knowledge representation.

**UNIT V**

**Knowledge Representation Techniques**: Propositional Logic: A Very Simple Logic, Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, What is Reasoning? Types of Reasoning and Reasoning Systems for Categories, The Internet Shopping World.

**TEXTBOOKS:**

1. Stuart Russell, Peter Norvig,"Artificial Intelligence: A Modern Approach", 3rd edition, PrenticeHall,2009.Canalsouse 2nd Ed.,PearsonEducationInternational,2003.
2. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India,2011
3. Rich & Knight, Artificial Intelligence, second edition,Tata Mc GrawHill.

**REFERENCE BOOKS:**

1. Nils Nilsson, "Artificial Intelligence: A New Synthesis", Morgan Kaufmann, 1998.
2. David Poole, Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents",Cambridge Univ. Press, 2010.
3. Ronald Brachman, "Knowledge Representation and Reasoning", Morgan Kaufmann, 2004.
4. Frank van Harmelen, Vladimir Lifschitz, Bruce Porter (Eds), "Handbook of Knowledgerepresentation", Elsevier, 2008.
5. Ivan Bratko, "Prolog Programming for Artificial Intelligence", 4th Ed., Addison-Wesley, 2011.

**B.Tech.**

**20AD82-INTRODUCTION TO DATA SCIENCE**

| L | T | P | Cr. |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Pre-requisite** : Programming knowledge

**Course outcomes:**

**CO 1:** Identify basic building blocks of python to solve mathematical problems. **(Understand L-2)**

**CO 2**: Describe the key concepts in data science. **(Remember L-1)**

**CO 3**: Enumerate the fundamentals of NumPy**.(Understand L-2)**

**CO 4**: Demonstrate the fundamentals of Pandas**.(Understand L-2)**

**CO 5**: Demonstrate data analysis, manipulation and visualization of data using Python libraries**.(Apply L-3)**

**UNIT I**

**Introduction to Python**: Features of Python, Data types, Operators, Input and output, ControlStatements. Strings: Creating strings and basic operations on strings, string testing methods. Lists,Dictionaries, Tuples.

**UNIT II**

**What is Data science?** Data Science life cycle ,Datafication, Exploratory Data Analysis, The Data science process, A data scientist role in this process.

**UNIT III**

**NumPy Basics:** The NumPy ndarray: A Multidimensional Array Object, Creating ndarrays , Data Types for ndarrays, Basic Indexing and Slicing, Boolean Indexing, Fancy Indexing, Expressing Conditional Logic as Array Operations, Methods for Boolean Arrays Sorting , Unique.

**UNIT IV**

**Getting Started with pandas:** Introduction to pandas, Library Architecture, Features, Applications, Data Structures, Series, Data Frame, Index Objects, Essential Functionality Re indexing, Dropping entries from an axis, Indexing & selection, and filtering.

**UNIT V**

**Data Preprocessing:** Data Loading, Storage, and File Formats - Reading and Writing data in text format, binary data formats, interacting with html and web apis, interacting with databases; Data Wrangling: Clean, Transform, Merge, Reshape - Combining and Merging Data Sets, Reshaping and Pivoting, Data Transformation. String Manipulation; Data Aggregation.

**TEXT BOOKS:**

1. Wes McKinney, "Python for Data Analysis", O'REILLY, ISBN:978-1-449-31979-3, 1st edition, October 2012.
2. Rachel Schutt & O'neil, "Doing Data Science", O'REILLY, ISBN:978-1-449-35865-5, 1st edition, October 2013.
3. Python For Data Analysis ( O Reilly, Wes Mckinney)

**REFERENCE BOOKS:**

1. Python: The Complete Reference, Martin C. Brown, McGraw Hill Education
2. Joel Grus, "Data Science from Scratch: First Principles with Python", O'ReillyMedia, 2015
3. Matt Harrison, "Learning the Pandas Library: Python Tools for Data Munging, Analysis, and Visualization , O'Reilly, 2016.

**B.Tech.**

## 20AD83-INTRODUCTION TO MACHINE LEARNING

| L | T | P | Cr. |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Pre-requisite**: Probability and Statistics

**Course Educational Objective**: The objective of the course is to provide the basic concepts and techniques of Machine Learning and help to use recent machine learning approaches for solving practical problems. It enables students to gain experience to do independent study and research.

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

**CO1**: Identify the characteristics of machine learning. **(Understand- L2)**

**CO2:** Understand the Model building and evaluation approaches. **(Understand- L2)**

**CO3:** Apply regression algorithms for real-world Problems. **(Apply- L3)**

**CO4:** Handle classification problems via supervised learning algorithms. **(Apply-L3)**

**CO5:** Learn advanced learning techniques to deal with complex data. **(Apply- L3)**

**UNIT I**

**Introduction to Machine Learning -** Introduction, Types of Machine Learning, Applications of Machine Learning, Issues in Machine Learning. Preparing to Model- Introduction, Machine Learning Activities, Basic Types of Data in Machine Learning, Exploring Structure of Data, Data Quality and Remediation, Data Pre-Processing

**UNIT II**

**Modeling & Evaluation-** Introduction, selecting a Model, training a Model (for Supervised Learning), Model Representation and Interpretability, Evaluating Performance of a Model.

**Basics of Feature Engineering-** Introduction, Feature Transformation – Feature Construction, Feature Extraction, Principal Component Analysis (PCA), Singular Value Decomposition (SVD), Linear Discriminate Analysis (LDA), Feature Subset Selection

**UNIT III**

**Regression :** Introduction to regression analysis, Simple linear regression, Multiple linear regression, Assumptions in Regression Analysis, Main Problems in Regression Analysis, Improving Accuracy of the linear regression model, Polynomial Regression Model, Logistic Regression, Regularization, Regularized Linear Regression, Regularized Logistic Regression.

**UNIT IV**

**Supervised Learning:** Classification- Introduction, Example of Supervised Learning, Classification Model, and Classification Learning Steps.

Common Classification Algorithms - k-Nearest Neighbor (kNN), Support vector Machines (SVM), Random Forest model.

**UNIT V**

**Other Types of Learning :** Ensemble Learning- Bagging, Boosting, Stacking and its impact on bias and variance, Ada Boost, Gradient Boosting Machines, XG Boost. Reinforcement Learning - Introduction, Q Learning

**TEXTBOOKS**

1. Subramanian Chandra mouli, Saikat Dutt, Amit Kumar Das, "Machine Learning", Pearson Education India ,1st edition,2015.
2. Tom M. Mitchell, "Machine Learning', MGH, 1997.

**REFERENCE BOOKS**

1. Shai Shalev-Shwartz, ShaiBen David, "Understanding Machine Learning: From Theory to Algorithms", Cambridge.
2. Peter Harington, "Machine Learning in Action" , Cengage, 1st edition, 2012.
3. Peter Flach, "Machine Learning: The art and science of algorithms that make sense of data", Cambridge university press,2012.
4. Jason Brownlee, "Machine Learning Mastery with Python Understand Your Data, Create Accurate Models and Work Projects End-To-End", Edition: v1.4, 2011.

**B.Tech.**

## 20AD84- FUNDAMENTALS OF DEEP LEARNING

| L | T | P | Cr. |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Pre-requisite:** Probability and Statistics, Linear Algebra

**Course Outcomes:**

**CO1:** Demonstrate the mathematical foundation of neural network**. (Understand L-2)**

**CO2:** Describe the machine learning basics. **.(Understand L-2)**

**CO3:** Compare the different architectures of deep neural network. **.(Understand L-2)**

**CO4:** Build a convolution neural network**. (Apply L-3)**

**CO5:** Build and train RNN and LSTMs**. (Apply L-3)**

**UNIT I**

**Linear Algebra:** Scalars, Vectors, Matrices and Tensors, Matrix operations, types of matrices, Norms, Eigen decomposition, Singular Value Decomposition, Principal Components Analysis. **Probability and Information Theory**: Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, Expectation, Variance and Covariance, Bayes' Rule, Information Theory. Numerical Computation: Overflow and Underflow, Gradient- Based Optimization, Constrained Optimization, Linear Least Squares.

**UNIT II**

**Machine Learning:** Basics and Under fitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood, Bayesian Statistics, Supervised and Unsupervised Learning, Stochastic Gradient Descent, Challenges Motivating Deep Learning. Deep Feedforward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and other Differentiation Algorithms.

**UNIT III**

**Regularization for Deep Learning:** Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop and Manifold Tangent Classifier.

**UNIT IV**

**Convolutional Networks:** The Convolution Operation, Pooling, Convolution, Basic Convolution Functions, Structured Outputs, Data Types, Efficient Convolution Algorithms, Randomor Unsupervised Features, Basis for Convolutional Networks.

**UNIT V**

**Sequence Modeling:** Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Echo State Networks, LSTM, Gated RNNs, Optimization for Long-Term Dependencies, Auto encoders, Deep Generative Models.

**TEXT BOOKS:**

1. Ian Good fellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press,2016.
2. Josh Patterson and Adam Gibson, "Deep learning: A practitioner's approach", O'Reilly Media, First Edition, 2017.

**REFERENCE BOOKS:**

1) Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Nikhil Buduma, O'Reilly, Shroff Publishers, 2019.
2) Deep learning Cook Book, Practical recipes to get started Quickly, Douwe Osinga, O'Reilly, Shroff Publishers, 2019.

**E-RESOURCES:**

1) https://keras.io/datasets/
2) http://deeplearning.net/tutorial/deeplearning.pdf
3) https://arxiv.org/pdf/1404.7828v4.pdf
4) https://github.com/lisa-lab/DeepLearningTutorials

| B.Tech. | 20AE81- PRINCIPLES OF FLIGHT | L | T | P | Cr. |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Educational Objectives:** To learn basic aspects of aerodynamics, propulsive systems, function of flight vehicle structural components, performance of flight at unaccelerated and accelerated condition and concepts of stability requirements during flight.

**Course Outcomes:** At the end of the semester, the student will be able
**CO1:** To classify the various forces and moments acting on an aircraft [Understan d-L2]
**CO2:**. To describe the working principles of various aircraft engines systems [Understand L2]
**CO3:** To describe various structural elements of flight vehicle [Understand L2]
**CO4: :** To determine the performance parameters of flight during manoeuvring [Apply L3]
**CO5:** To apply the conditions of stability principles on aircraft [Apply L3]

**UNIT - I**
**AERODYNAMICS:** Components of Airplane and Their Functions, Classifications, Airfoils - Airfoil Nomenclature, Classifications of NACA Airfoils, Wing Geometry, Aerodynamic Forces, Lift, Drag and Moment Coefficients, Centre of Pressure, Aerodynamics Centre, Pressure Distribution Over Aerofoil, Types of Drag.

**UNIT - II**
**PROPULSION**: Air-breathing Engines - Engine Theory, Classification of Air-breathing Engine Propulsion system – Propeller, Jet propulsion – The thrust equation, Turbojet engine, Turbofan engine, Ramjet engine, Rocket Engine.

**UNIT-III**
**FLIGHT VEHICLE STRUCTURES:** Fuselage-Monocoque, Semi-Monocoque Structures, Components of Wing, Bulkheads, Aircraft Materials-Metallic and Non-Metallic Materials, Composite Materials

**UNIT - IV**
**AIRPLANE PERFORMANCE:** Level Flight, Drag Polar, Thrust required for level and unaccelerated flight, Power required for level and unaccelerated flight, Rate of Climb, Absolute and Service Ceilings, Time to Climb, Range and Endurance – Jet Airplane. Take-off and Landing Performance, Turning flight

**UNIT – V**
**STABILITY AND CONTROL:** Definition of Airplane's axes, Concept of Stability and Control, Moments on the Airplane, Criteria for Static Longitudinal Stability – Quantitative Discussions, Static Longitudinal Control - Calculation of Elevator angle to trim, Directional Static Stability and control, Lateral Static Stability and control

**REFERENCES:**

1. John D Anderson Jr., "Introduction to Flight"., McGraw-Hill Science/Engineering/Math; 7 editions, 2015
2. Robert C Nelson., "Flight Stability and Automatic Control"., TBS; Second 2nd Edition (2007)
3. Jan Roskam., "Airplane Flight Dynamics and Automatic Flight Controls"., Dar corporation (January 2003)
4. C. Kermode., "Mechanics of Flight"., Pearson Education Limited; III edition (December 4, 2012).

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| B.Tech. | 20AE82- SPACE SCIENCE | L | T | P | Cr. |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Educational Objectives:** To learn basic aspects of solar system, space vehicles, perturbations, an interplanetary trajectory issues, ballistic missile trajectories and material used of spacecraft.

**Course Outcomes:** At the end of the semester, the student will be able
**CO1:** To understand the basic aspects of avaition [Understand-L2]
**CO2:** To understand the working of space vehicles [Understand-L2]
**CO3:** To understand the basic asepcts of space mechanics [Understand-L2]
**CO4:** To understand the basic aspects orbital mechanics [Understand-L2]

**UNIT I**

**BASIC CONCEPTS:** History of Aviation – Types of Flying Machines – Aircraft, Rotorcraft, and space craft -- History of Spaceflight -– The Solar System and the Copernican Model -- Physical Properties and Structure of the Atmosphere: Temperature, Pressure and Altitude Relationships.

**UNIT II**

**SPACE VEHICLES:** Major Components of Rocket, Spacecraft, and their Functions -- Atmospheric Dynamics and its Influence on Flying Machines: Lift, Drag and Moment -- Kepler's Laws -- Newton's Law of Motions Applied to Aeronautics.

**UNIT III**

**BASIC ASPECTS OF SPACE MECHANICS:** Reference frames and Coordinate systems – The celestial sphere, The ecliptic, Motion of vernal equinox: Time and Calendar – Sidereal time, Solar time, Standard time – Space Environment.

**UNIT IV**

**ASCENT FLIGHT MECHANICS OF ROCKETS AND MISSILES:** Satellite orbits and its types -- Space mission – types – Launch vehicle selection – Trajectories of rockets and missiles – Introduction to Rocket propulsion – Solid propulsion rockets – Liquid propulsion rockets -- Staging in rockets.

**UNIT V**

**ORBITAL MECHANICS:** Two-body motion – Circular, Elliptic, Hyperbolic and Parabolic orbits – Basic Orbital Elements – Ground trace – Hohmann transfer – Bi-elliptic transfer

**REFERENCES**

1. W.E. Wiesel, "Spaceflight Dynamics", McGraw-Hill, 1997
2. Cornelisse, Schoyer HFR, Wakker KF, "Rocket Propulsion and Space Flight Dynamics", Pitman publications, 1984
3. Sutton. G.P and Oscar Biblarz "Rocket Propulsion Elements", Wiley-Interscience, 7th Edition., 2000.

| B.Tech. | 20AE83-AIRCRAFT SYSTEMS | L | T | P | Cr. |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Educational Objectives:** To learn the conventional and modern control systems and working principle of different types of hydraulic and pneumatic systems, engine systems, auxiliary systems.

**Course Outcomes:** At the end of the semester, the student will be able

**CO1:** To identify the various types of controls in the airplane design [Understand-L2]

**CO2:** To understand the performance of hydraulic and pneumatic systems in the aircraft operation [Understand-L2]

**CO3:** To understand the performance of various engine systems and auxiliary systems of an aircraft [Understand-L2]

**CO4:** To understand the general maintenance practices of aircraft operation [Understand-L2]

**UNIT - I**

**AIRPLANE CONTROL SYSTEMS:** Conventional Control Surfaces – Power Assisted and Fully Powered Flight Controls – Power Actuated Systems, Engine Control Systems (FADEC) – Modern control systems - Digital Fly by Wire Systems – Auto Pilot System, Active Control Technology.

**UNIT - II**

**AIRCRAFT SYSTEMS:** Hydraulic and Pneumatic Systems – Components – Advantages, Working Principles - Typical Air Pressure System – Brake System - Typical Pneumatic Power System - Components, Landing Gear Systems – Classifications.

**UNIT - III**

**ENGINE SYSTEMS:** Fuel Systems for Piston and Jet Engines, Components of Multi Engines. Lubricating Systems for Piston and Jet Engines - Starting and Ignition Systems, Typical Examples for Piston, and Jet Engines.

**UNIT - IV**

**AUXILIARY SYSTEM:** Basic Air Cycle Systems – Vapour Cycle Systems - Oxygen Systems, Fire Protection Systems, De-icing, and Anti-Icing System.

**UNIT - V**

**GENERAL MAINTENANCE PRACTICES:** Jacking, levelling, and mooring, refuelling, and defueling of aircraft, safety precautions. Hydraulic and fluid systems precautions against contamination. Identification color coding, symbols, and other markings to identify the fluid systems.

**REFERENCES**

1. McKinley. J. L, Bent. R.D, Aircraft Maintenance and Repair, McGraw-Hill, 1993.
2. General Hand Books of Airframe and Power Plant Mechanics, U.S. Dept. of Transportation, Federal Aviation Administration, The English Book Store, New Delhi1995.
3. Mekinley. J. L, Bent. R. D, Aircraft Power Plants, McGraw-Hill, 1993.
4. Pallet. E. H. J, Aircraft Instruments & Principles, Pitman & Co, 1993.
5. Treager. S, Gas Turbine Engine Technology, Third Edition, McGraw-Hill Education.

**B.Tech.** **20AE84-AIR TRANSPORTATION SYSTEMS**

| L | T | P | Cr. |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Educational Objectives:** To learn the fundamental of air transportation, airline economics and principles of airline scheduling

**Course Outcomes:** At the end of the semester, the student will be able

**CO1:** To understand Aviation Industry and Its Regulatory Authorities[Understand L2]
**CO2:** To understand the basic aspects of air traffic control system [Understand L2]
**CO3:** To understand the basic aspects of airline economics [Understand L2]
**CO4:** To understand the principles of airline scheduling [Understand L2]

**UNIT- I**

**Aviation Industry & Its Regulatory Authorities:** Introduction, history of aviation evolution, development, growth, challenges. Aerospace industry, air transportation industry economic impact- types and causes. The breadth of regulation- ICAO, IATA, national authorities (DGCA, FAA). Safety regulations- risk assessment- human factors and safety, security regulations, environmental regulations.

**UNIT-II**

**Airspace:** Categories of airspace- separation minima, airspace sectors- capacity, demand and delay. Evolution of air traffic control system- procedural ATC system, procedural ATC with radar assistance, first generation 'automated' ATC system, current generation radar and computer-based ATC systems.

**UNIT- III**

**Aircraft:** Costs- project cash-flow, aircraft price. Compatibility with the operational infrastructure. Direct and indirect operating costs. Balancing efficiency and effectiveness payload- range, fuel efficiency, technical contribution to performance, operating speed and altitude, aircraft field length performance. typical operating costs.

**UNIT- IV**

**Airports:** Setting up an airport- airport demand, airport siting, runway characteristics- length, declared distances, aerodrome areas, obstacle safeguarding. Runway capacity- evaluating runway capacity- sustainable runway capacity. Runway pavement length, Manoeuvring area airfield lighting, aprons, Passenger terminals-terminal sizing and configuration. Airport demand, capacity, and delay.

**UNIT - V**

**Airlines:** Setting up an airline- modern airline objectives. Route selection and development, airline fleet planning, annual utilization and aircraft size, seating arrangements. Indirect operating costs. Aircraft- buy or lease. Revenue generation, computerized reservation systems, yield management, Airline scheduling.

**REFERENCES:**

1. Hirst, M., *The Air Transport System*, Woodhead Publishing Ltd, Cambridge, England, 2008.
2. Wensven, J.G., *Air Transportation: A Management Perspective*, Eighth Edition, shgate, 2015.
3. Belobaba, P., Odoni, A. and Barnhart, C., *Global Airline Industry*, Second Edition, Wiley, 2015.
4. M. Bazargan, M., *Airline Operations and Scheduling*, Second Edition, Ashgate, 2010.
5. Nolan, M.S., *Fundamentals of Air Traffic Control*, 5th edn., Thomson Learning, 2011.
6. Wells, A. and Young, S., *Airport Planning and Management*, 6th edn., McGraw-Hill, 2011

## 20CE81 - BASICS OF CIVIL ENGINEERING

**B.Tech.**

| L | T | P | Cr. |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Prerequisites:** Nil

**Course Objectives:** This course deals with the importance of building planning, properties and applications of various building materials, soil classification and different types of foundations, important aspects of surveying, levelling operations and identify the terminology in roadway and railway networks, principles of water resources and environmental engineering.

**COURSE OUTCOMES**

**CO1:** Understand the importance of building planning for construction. (Understand-L2)
**CO2:** Identify the uses and characteristics of different building materials. (Remember-L1)
**CO3:** Understand the different types of soils and foundations required for specific usage. (Understand-L2)
**CO4:** Differentiate the basics of surveying and levelling operations for field application and categorize the important elements of roadway and railway networks (Understand-L2)
**CO5:** Understand the importance of quantity and quality aspects of water in the society (Remember-L1)

**UNIT I: BUILDING PLANNING**

**Role of a Civil Engineer**: Inter connection among specializations in Civil Engineering
**Elements of a Building:** Elements of a Building, Basic Requirements of a Building, Planning- Hot and dry climates, Hot and wet climates, Cold climatic conditions, Grouping, Privacy, circulation, Sanitation and ventilation, Orientation, Economy, Role of Bye-laws

**UNIT II: BUILDING MATERIALS**

Classification, Composition, Properties, Commercial forms, Uses of – Rocks, Bricks, Timber, Ply wood, Glass, Bitumen, Aluminium, Cement, Steel, Concrete, Mortar. - Concept of eco-friendly materials.

**UNIT III: SOIL CLASSIFICATION AND FOUNDATION**

Types of soils, soil classification, engineering properties, Bearing capacity of soil, purpose and methods of improving bearing capacity – Foundations – Requirements, Loads, Types - Foundation for special structures-water tanks, silos, chimneys, cooling towers, telecommunication towers, transmission line towers.

**UNIT IV: SURVEYING, LEVELLING & HIGHWAY NETWORK**

Objective of surveying– Principles, applications and uses of - chain surveying, theodolite, levelling, contour maps, Planimeter, EDM concept- linear distance and area measurement, Total station- GIS-Concept and applications in civil engineering.
Indian highways- Basic terminology- Classification of roads - PIEV theory - Traffic signs –
Indian railways –Permanent way and components of railway track- Gauges – Rails -Sleepers – Ballast.

**UNIT V: WATER RESOURCES AND ENVIRONMENTAL ENGINEERING**

Objectives of water supply system-Sources of water supply-Hydrologic cycle-Rainfall measurement - Purpose of dams, reservoirs, intakes, infiltration galleries – Water demands –Water quality parameters and their impacts - Principles of water treatment – Objectives and methods of water distribution systems –Wastewater characteristics and their impacts –Principles of sewage treatment – Disposal of sewage – Water quality standards for – drinking purpose, –irrigation.

**TEXT BOOKS**

1. M.S Palanichamy "Basic Civil Engineering", Tata McGraw Hill Publishing 2000.

**REFERENCE BOOKS**

1. S S Bhavikatti "Basic Civil Engineering", New age International Publications, 2010.
2. C P Kaushik& S S Bhavikatti "Basic Civil Engineering ", New age International Publications 2010.

| B.Tech. | 20CE82 - DISASTER MANAGEMENT | L | T | P | Cr. |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Prerequisites: Nil**

**Course Objectives:** This course deals with different types of disasters, impacts of disasters, importance of technology in handling disaster management situations, importance of planning and risk prevention in case of occurrence of disaster, importance of education and community approach for the responsive actions to be taken in case of occurrence of disaster.

**COURSE OUTCOMES:**

CO1: Identify the basic terms, types of disasters and their impact (Understand – L2)
CO2: Illustrate the role of technology in handling disaster management situations (Understand-L2)
CO3: Identify the stake-holders concerned and design the different action plans for responding in case of disaster occurrence (Understand – L2)
CO4: Evaluate the importance of education and community approach for the responsive actions to be taken in case of disaster occurrence (Understand – L2)

**UNIT-I: DEFINITIONS & TYPES OF DISASTER**

Definitions – types of Disasters- Concept of disaster management - Disaster Management Cycle. Vulnerability - Mitigation - Various types of disasters: *Natural:* Drought, cyclone, earthquake, and landslides. *Manmade and Industrial*: Engineering and Technical failure, Nuclear and Chemical disasters, Accident-Related Disasters. High Power Committee on Disaster Management in India-Disaster Management Act 2005

**UNIT – II: IMPACT OF DISASTERS**

Impact due to – Earthquake, Cyclone, landslides, Fire hazards, Life & livestock, Habitation, agriculture & livelihood loss - health hazards - malnutrition problems - contamination of water - impact on children - environmental loss.

**UNIT – III: ROLE OF TECHNOLOGY IN DISASTER MANAGEMENT**

Role of remote sensing – information systems and decision making tools – Disaster management for infra structures - electrical substations – roads and bridges – mitigation programme for earthquakes, geospatial information in agriculture drought assessment – multimedia technology in disaster risk management and training – transformable indigenous knowledge in disaster reduction.

**UNIT – IV: PLANNING & RISK PREVENTION**

Planning, early warning system-crisis intervention and management-Response and Rehabilitation after Disasters-temporary shelter – food and nutrition-safe drinking water –rehabilitation after cyclones- response to drought, response to river erosion, response after earthquake-response after Tsunami- Hunger and Disaster.

**UNIT – V: EDUCATION AND COMMUNITY PREPAREDNESS & CASE STUDIES**

Essentials of disaster education – school awareness and safety programs , Community based disaster recovery – voluntary agencies and community participation at various stages of disaster management -Building community capacity for action - Corporate sector and disaster risk reduction - A community focused approach, Case studies on different disasters in the world, Impacts, Technology usage, Risk prevention, Education and community preparedness

**TEXT BOOKS**

1. Tushar Bhattacharya, "Disaster Science and Management", Tata McGraw Hill Publications, New Delhi, 2012.
2. R.Subramanian, "Disaster Management ", Vikas Publishing house Pvt. Ltd, 2022.

**REFERENCES**

1. G.K. Ghosh, "Disaster Management", APH Publishing Corporation, 2006.
2. U.K. Chakrabarty, "Industrial Disaster Management and Emergency Response", Asian Books Pvt. Ltd., New Delhi 2007.
3. H K Gupta (Ed.), "Disaster Management", Universities Press, 2003
4. W.N. Carter, "Disaster Management: A Disaster Management Handbook", Asian Development Bank, Bangkok, 1991.
5. Government of India website on Disaster Management: www.ndmindia.nic.in

| B.Tech. | 20CE83 - FUNDAMENTALS OF GEOSPATIAL TECHNOLOGIES | L | T | P | Cr. |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites: Nil**

**Course Educational Objective:**
This course is designed to elucidate the principles, concepts and techniques of Geospatial technologies for engineering applications.

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

**CO1:** Discuss the principles and concepts of -modern surveying methods, -Remote Sensing, and GIS. (Understand-L2)
**CO2:** Interpret the various maps, satellite imagery and aerial photographs.(Understand-L2)
**CO3:** Explain the concepts of vector and raster data model for representation of topological earth features and its importance. (Understand-L2)
**CO4:** Describe the techniques of photogrammetry, remote sensing, and GIS for solving Engineering applications. (Understand-L2).
**CO5:** Elucidate the types of global position systems and exemplify the future trends of geo spatial technologies. (Understand-L2).

**UNIT-1 Modern Surveying Methods**
Principle and types of E.D.M. Instruments, Total station- advantages and Applications. Total station surveys, Photogrammetry Surveying- Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods.

**UNIT-2 Remote Sensing**
Definition and basic concepts, types of remote sensing, advantages and limitations, electromagnetic spectrum, energy interactions with atmosphere and with earth's features, types of sensors, satellite imagery and their resolution, satellite image interpretation, engineering applications of remote sensing.

**UNIT-3 Geographic Information Systems**
Introduction to GIS, Components of a GIS, Data types- Spatial data, Attribute data, Vector Data Model - representation of simple features, advantages, and disadvantages. Raster Data Model - elements of raster data model, advantages, and disadvantages. Applications of GIS ***Map*** - Introduction, Map numbering, rectangular grid system. ***Map projection***–Introduction, Classification of map projections.

**UNIT-4 Global Positioning Systems**
**Global positioning systems** – Introduction, Components of GPS, Operational principle, Facts, and limitations of GPS, GPS receivers. **Differential GPS** – Introduction, DGPS concepts, Types of DGPS, GPS applications – Areas of Application.

**UNIT-5 Future Trends in Geospatial Technologies**
Land cover and land use mapping; applications of GIS in agriculture, forestry, geology, geomorphology, urbanization, flood zone delineation and mapping.

**TEXT BOOK**

1. Srivastava G.S – "An Introduction to Geoinformatics" McGraw Hill Education (India) Private Limited, 2014
2. S. Kumar, "Basics of Remote sensing and GIS", Laxmi Publications, 2016.

**REFERENCES**

1. Sujit Choudhury, Deepankar Chakrabarti, Suchandra Choudhury, "An Introduction to Geographic Information Technology" I.K. International Publishing House Pvt. Ltd. 2009.
2. Kang – Tsung Chang, "Introduction to geographic information system", Tata McGraw- Hill Education Private Limited, 2007.
3. Shivangi Somvanshi, Maya Kumari, "A Introduction to Remote Sensing and Its Applications", S.K. Kataria& Sons 2014.
4. BasudebBhatta, "Remote sensing and GIS" Oxford University press, 2011.
5. Remote sensing and Geographical Information Technology, NPTEL video lectures and web notes

**B.Tech.** **20CE84 - ENVIRONMENTAL SANITATION**

| L | T | P | Cr. |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Pre-requisites: NIL**

**Course Educational Objective:** This course teaches the basic terminology of Environmental sanitation, different methods for control of Communicable and non-communicable diseases, the control techniques for rodent and vectors, sanitation measures that are required in few Institutions, sanitation management aspects due to rural and refuse wastes.

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

**CO1**: Explain the basic terminology of Environmental sanitation, different diseases, rural and refuse sanitation (Understand-L2)

**CO2:** Identify the impacts and ways to control Communicable and non-communicable diseases (Understand-L2)

**CO3:** Review and assess the control approaches for rodent and vectors (Understand-L2)

**CO4:** Classify the appropriate sanitation measures for several institutions (Understand-L2).

**CO5:** Select the appropriate measures to be taken for rural and refuse management (Understand-L2).

**UNIT-I: ENVIRONMENTAL SANITATION BASICS**

Introduction, History and evolution of sanitation practices, Role of Sanitary Engineer, Sanitation management aspects for liquid and solid wastes, Basic Definitions, Transmission of infectious agents, Types of diseases – Communicable, Non-communicable, Water borne diseases, Different modes of communicating diseases, Mortality rates.

**UNIT-II: CONTROL OF COMMUNICABLE AND NON-COMMUNICABLE DISEASES**

**Communicable Diseases:** Impacts, Control of Source (Agent Factors), Control of Mode of Transmission or Contributing Factor (Environmental Factors), Control of Susceptibles (Host Factors), Epidemic Control,

**Non-Communicable Diseases:** ***Respiratory Diseases***: Types, Impacts, Control approaches, ***Water- and Food borne Diseases***: Types, Impacts, Characteristics and Control of Water- and Food borne Diseases

**UNIT-III: INSECT VECTOR AND RODENT CONTROL**

Mosquitoes as carriers of diseases – Mosquito control – Drainage, subsurface drainage – Man made mosquito breeding centres –outdoor control of mosquitoes – Housefly as disease carrier Fly control – Rodent control, Control Diseases transmitted from Animals.

**UNIT-IV: INSTITUTIONAL SANITATION**

Sanitation measures in Hotels/restaurants, Public bathing ghats, Schools, Hospitals, Swimming pools, Prisons.

**UNIT-V: RURAL AND REFUSE SANITATION**

**Rural sanitation**: Aqua privy, Septic tank, Soak pit and sulabh mode of sanitation, Appropriate low cost rural sanitation techniques, Biogas generation from toilet.

**Refuse Sanitation:** Municipal garbage – sources, generation, collection, recovery and disposal options, Sanitation problems with regard to: Dumping and sanitary landfilling, mass firing of waste and incineration, Mosquito breeding, Leachate, Management issues.

**Ecological Sanitation:** Principle, Eco-sanitation as a sustainable approach

**Occupational health hazards:** Concept, Types, Safety aspects of sanitation workers

## TEXT BOOKS

1. Joseph. A. Salvato, Nelson N. Nemerow, Frankiln J. Agardy, "Environmental Engineering", John Wiley & Sons, 5th Edition, 2003.
2. I.M. Prahlad Edited, "Environmental Sanitation - Reflections from Practice, A Module for Community Health Practitioners", Society For Community Health Awareness Research and Action, 2015.

## REFERENCES

1. S.K. Garg, "Sewage Disposal and Air pollution engineering", Khanna Publishers, New Delhi, 2009.
2. K.V.S.G. Muralikrishna, "Environmental Sanitation", Reem Publications, Kakinada, 2003.

| B.Tech-CSE | 20CS81 – UNIX AND SHELL PROGRAMMING | L | T | P | Cr. |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

Pre-requisite **:** C programming language.

**Course Educational Objective:** The main objective of the course is that the students understands Interface commands to the open source operating system Unix/Linux.

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

**CO1:** Describe history, origin, feature, and architecture of UNIX operating system. (**Understand – L2)**

**CO2:** Interact with UNIX system easily. (**Understand – L2)**

**CO3:** Construct and edit files, search for any patterns using regular expressions**.( Apply – L3)**

**CO4:** Solve complex jobs using tools and utilities available in UNIX. (**Apply – L3)**

**CO5:** Design and develop various tasks by using Shell scripting. ( **Apply – L3)**

**UNIT – I**: **Introduction to UNIX**

UNIX operating system, Linux and GNU, The UNIX architecture, features of UNIX, POSIX and Single UNIX specification, Internal and External commands, Command structure, man browsing and manual pages on-line.

Vi editor: Basics, input mode, saving text and quitting, searching for a pattern (| and ? ), substitution- search and replace(:s).

**UNIT- II**

Vi editor: Basics, input mode, saving text and quitting, searching for a pattern (| and ? ), substitution- search and replace(:s).

Basic file attributes: ls: listing directory contents, the UNIX file system, ls –l, -d option, file ownership, file permissions, chmod, directory permissions, changing file ownership.

More file attributes: File systems and inodes, hard links, symbolic links and ln, the directory, umask, modification and access times, find

**UNIT -III PROCESS**

**Process basics:** ps: process status, system processes(-e or –a), mechanism of process creation, process states and zombies, running jobs in background, nice:job execution, job control.

**Simple filters:** pr, head, tail, cut, paste, sort, uniq, tr. Filters using regular expressions – grep and sed: grep, Basic Regular Expressions (BRE), Extended Regular Expressions (ERE) and egrep

**UNIT -IV :**

Simple filters: sed: the stream editor, line addressing using multiple instructions (-E and -F) context addressing, writing selected lines to a file (w), text editing, substitution (s), basic regular expression revisited. The shell: The shell's interpretive cycle, shell offerings, pattern matching, escaping and quoting, redirection, pipes, tee, command substitution, shell variables..

**UNIT -V SHELL PROGRAMMING**

Essential shell programming: Shell scripts, read using command line arguments, exit and exit status of command, the logical operators and ||, the if conditional, using test and {} to evaluate expression. The case conditional, expr, $0, while, for, debugging.

**TEXTBOOKS:**

1. Steven Holzner, ―PHP: The Complete Reference, McGraw-Hill Education, 2007.
2. Kevin Tatroe, Peter MacIntyre, RasmusLerdorf, ―Programming in PHP, O'Reilly, 3rd Edition, 2013.
3. Luke Welling, Laura Thomson, ―PHP and MySQL Web Development‖,Pearson Education, 5th Edition.

**REFERENCE BOOKS:**

**1.** HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery DT Editorial Services Dreamtech Publications
**2.** Lynn Beighley, Michael Morrison, ―Head First PHP & MySQL: A Brain-Friendly Guide‖, O'Reilly, 1st Edition.
**3.** David Powers, ―PHP Solutions: Dynamic Web Design Made Easy, Apress, 3rd Edition.
**4.** https://www.w3schools.com/php/php_intro.asp
**5.** https://www.tutorialspoint.com/php/php_introduction.htm
**6.** https://www.tutorialrepublic.com/php-tutorial/php-variables.php

| B.Tech. ( Sem.) | 20CS82- INTRODUCTION TO ALGORITHMS TECHNIQUES | L | T | P | Cr. |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

Pre-requisite : Programming language and Data structures.

**Course Educational Objective:** The Objective of the course is to learn various algorithm design techniques and analyze the computing resources of the algorithms ,and motivate the students to design new algorithms for various problems

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

**CO1:** Identify the characteristics of an algorithm and analyze its time and space complexity. **(Understand- L2)**

**CO2:** Apply the divide-and-conquer method for solving problems like searching and sorting. **(Apply- L3)**

**CO3:** Design Greedy algorithms for the optimization problems like knapsack problem, minimum cost spanning tree, single source shortest path problem. **(Apply - L3)**

**CO4:** Apply dynamic programming paradigm to solve optimization problems like travelling salesperson problem,0/1 knapsack problem, Optimal binary search tree. **(Apply - L3)**

**CO5:** Apply the backtracking method on optimization problems like N-queens, sum of subsets, Hamiltonian circuit and graph coloring. **(Apply - L3)**

**UNIT – I**

**Introduction**: Algorithm definition, Specifications, Performance Analysis- Time Complexity, Space Complexity. Asymptotic Notations-Big-Oh, Omega, Theta.

**UNIT – II**

**Divide and Conquer**: General Method, Binary Search, Finding Maximum and Minimum, Merge Sort, Quick sort, Strassen's matrix multiplication, Closest Pair of Points using Divide and Conquer algorithm

**UNIT – III**

**The Greedy Method** – General Method, Knapsack Problem, Job sequencing with deadlines, Minimum-cost spanning trees, Optimal storage on tapes, Single source shortest paths, Huffman coding.

**UNIT - IV**

**Dynamic Programming** - General method, Multistage graph, All pairs shortest path, Single Source Shortest path, Optimal Binary search trees, 0/1 Knapsack, Reliability design, the travelling salesman problem.

**UNIT-V**

**Back tracking** - The General Method, The 8-Queens Problem, Sum of subsets, Graph Coloring, Hamiltonian cycles.

**TEXTBOOK(S)**:

1. Ellis Horowitz, SartajSahni, S Rajasekaran , "Fundamentals of Computer Algorithms", University press, 2nd edition, 2012. [**units – 1,2,3,4,5**]

**REFERENCES:**

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson, 3rd edition , 2007.
2. Aho, Hopcroft & Ullman, "The Design and Analysis of Computer Algorithms", Addison Wesley publications, 2008.
3. Thomas H.Corman et al, "Introduction to Algorithms", PHI, 3rd edition, 2008
4. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", PEA,
5. P. H. Dave, H. B. Dave, "Design and Analysis of Algorithms‖, Pearson Education", 2008

**B.Tech. (III Sem.)**

**20CS83 – PRINCIPLES OF COMPUTER ARCHITECTURE**

| L | T | P | Cr. |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Pre-requisite:** Fundamentals of computer hardware

**Course Educational Objective** The objective of the course is to learn about the functional blocks and data representation of computer system, and understands the design principles of processor and organization and management of memory and peripheral devices.

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

**CO1:** Identify the functional blocks of a computer and Instruction set architecture of CPU. **(Understand-L2)**

**CO2:** Demonstrate the data representation and perform computer arithmetic operations. **(Understand - L2)**

**CO3:** Illustrate the design principles of control unit and pipelining. **(Understand-L2)**

**CO4:** Analyze the memory hierarchy in a computer system. **(Analyze-L4)**

**CO5:** Discuss the working principles of peripheral devices, their interfaces, and characteristics. **(Understand-L2)**

## UNIT – I

**Functional blocks of a computer**: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU–registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some common CPUs.

## UNIT-II

**Data representation**: signed number representation, fixed and floating-point representations, character representation. Computer arithmetic – integer addition and subtraction, carry look- a head adder. Multiplication – shift-and add, Booth multiplier. Division restoring and non- restoring techniques, floating point arithmetic.

## UNIT-III

**CPU control unit design**: hardwired and micro-programmed design approaches. Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards.
**Parallel Processors**: Introduction to parallel processors, Concurrent access to memory and cache coherency.

## UNIT-IV

**Memory system design**: semiconductor memory technologies, memory organization. Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions.

## UNIT-V

**Peripheral devices and their characteristics**: Input-output subsystems, I/O device interface, I/O transfers–program controlled, interrupt driven and DMA, privileged and non-privileged instructions.

**TEXT BOOKS:**

1. M. Morris Mano, "Computer Systems Architecture", Pearson Education publishers,3rd Edition, 2015.
2. Carl Hamacher, ZvonksVranesic,SafeaZaky, "Computer Organization", TMH publications,5th Edition, 2017.

**REFERENCE BOOKS:**

1. William Stallings, "Computer Organization and Architecture", Pearson/PHI publishers,6thEdition,2005.
2. Andrew S. Tanenbaum, "Structured Computer Organization", Pearson/PHI publishers, 4th edition, 2012.
3. SivaraamaDandamudi, "Fundamentals or Computer Organization and Design", Springer publishers, 2011.

| L | T | P | Cr. |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**B.Tech. ( Sem.)** **20CS84– PHP PROGRAMMING**

Pre-requisite **:** Students should have the knowledge of OOP language, web technologies.

**Course Educational Objective:** The main objective of the course is that the students will gain the knowledge necessary to design and develop dynamic, database-driven Web applications using PHP.

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

**CO1:** Identify the basic programming constructs of PHP. **(Understand - L2)**

**CO2:** Develop programs using functions, strings and arrays. ( **Apply – L3)**

**CO3:** Apply object oriented principles in PHP. ( **Apply – L3)**

**CO4:** Design interactive web pages by using JQuery & AJAX. ( **Apply – L3).**

**CO5:** Design data driven applications by using PHP. ( **Apply – L3)**

**UNIT – I**: **Introduction to PHP**

Introduction to PHP: History, Web Browser, Web Server – Xampp, Installation and Configuration files. Evaluation of PHP, Basic syntax, Defining variable and constant, PHP Data types, Operators and Expressions. Decisions and loops: Making Decisions, doing Repetitive task with looping, Mixing decisions and looping with HTML.

**UNIT- II FUNCTIONS, STRING & ARRAY**

Functions: What is a function, Define a function, Call by value and Call by reference and Recursive functions. String: Creating and accessing String, Searching & Replacing String, Formatting String, String Related Library functions Array: Anatomy of an Array, Creating Index based and Associative array, Accessing array element, Looping with Index based array, Looping with associative array using each() and foreach(), some useful library functions.

**UNIT -III ADVANCE PHP**

Introduction: Objects, Declaring a class, the new keyword and constructor, Destructor, Access method and properties using $this variable. Public, private, protected properties and methods, Static properties and method, Class constant, Inheritance & code, reusability, Polymorphism, Parent::& self:: keyword, Instance of operator, Abstract method and class, Interface, Final. Exception Handling: Understanding Exception and error. Try, catch, and throw.

**UNIT -IV PHP SCRIPT**

**JQuery:** Introduction to JQuery, Validation using JQuery, JQuery Forms, JQuery Examples.
**AJAX:** Introduction to AJAX, PHP with AJAX, Working with database.

## UNIT -V PHP WEB SERVICES

Handling HTML form with PHP: Capturing Form Data, Dealing with Multi-value file, generating File uploaded form, redirecting a form after submission. Web Features: Sessions, Forms GET and POST data, Cookies, HTTP Headers. Database Connectivity with

**MySQL** :Introduction to RDBMS, Connection with MySQL Database, Performing basic database operations (DML) (Insert, Delete, Update, Select), Setting query parameter, Executing query.

## TEXTBOOKS:

1. Steven Holzner, ―PHP: The Complete Reference, McGraw-Hill Education, 2007.
2. Kevin Tatroe, Peter MacIntyre, RasmusLerdorf, ―Programming in PHP, O'Reilly, 3rd Edition, 2013.
3. Luke Welling, Laura Thomson, ―PHP and MySQL Web Development‖,Pearson Education, 5th Edition.

## REFERENCE BOOKS:

1. HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery DT Editorial Services Dreamtech Publications
2. Lynn Beighley, Michael Morrison, ―Head First PHP & MySQL: A Brain-Friendly Guide‖, O'Reilly, 1st Edition.
3. David Powers, ―PHP Solutions: Dynamic Web Design Made Easy, Apress, 3rd Edition.
4. https://www.w3schools.com/php/php_intro.asp
5. https://www.tutorialspoint.com/php/php_introduction.htm
6. https://www.tutorialrepublic.com/php-tutorial/php-variables.php

| B.Tech. (I Sem.) | 20CS85 – OBJECT ORIENTED SOFTWARE ENGINEERING | L | T | P | Cr. |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

Pre-requisite **:** Programming for Problem solving using C.

**Course Educational Objective:** The Objective of the course is to make learn the basic elements of C programming, control structures, derived data types, Modular programming, user defined structures, basics of files and its I/O operations.

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

**CO1:** Discuss about software development process models. **(Understand - L2)**

**CO2:** Identify the contemporary issues and discuss about coding standards. **(Understand - L2)**

**CO3:** Recognize the knowledge about testing methods and comparison of various testing techniques. **(Understand - L2)**

**CO4:** Use the concept and standards of quality and getting knowledge about software quality assurance group. . **(Understand - L2).**

**CO5:**

**UNIT – I**: **Introduction**

Introduction to Software Engineering - Software Development process models – Agile Development - Project & Process - Project management - Process & Project metrics - Object Oriented concepts, Principles & Methodologies.

**UNIT- II Planning & Scheduling**

Software Requirements Specification, Software prototyping - Software project planning - Scope - Resources - Software Estimation - Empirical Estimation Models – Planning - Risk Management - Software Project Scheduling - Object Oriented Estimation & Scheduling.

**UNIT -III Analysis**

Analysis Modeling - Data Modeling - Functional Modeling & Information Flow - Behavioral Modeling-Structured Analysis - Object Oriented Analysis - Domain Analysis-Object oriented Analysis process - Object Relationship Model - Object Behaviour Model, Design modelling with UML.

**UNIT -IV Design**

Design Concepts & Principles - Design Process - Design Concepts - Modular Design - Design Effective Modularity - Introduction to Software Architecture - Data Design - Transform Mapping - Transaction Mapping - Object Oriented Design - System design process- Object design process - Design Patterns.

**UNIT -V Implementation, Testing & Maintenance**

Top - Down, Bottom-Up, object oriented product Implementation & Integration. Software Testing methods-White Box, Basis Path-Control Structure - Black Box - Unit Testing - Integration testing - Validation & System testing - Testing Tools – Software Maintenance & Reengineering.

**TEXTBOOKS:**

1. Roger. S. Pressman and Bruce R. Maxim, "Software Engineering – A Practitioner's Approach", seventh Edition, McGraw Hill, 2015.
2. Ian Sommerville, "Software Engineering", eighth edition, Pearson Education, New Delhi, 2011.

**REFERNCE BOOKS:**

1. Bill Brykczynski, Richard D. Stutz ,"Software Engineering Project Management", Wiley India Edition, IEEE computer society, 2007.
2. Craig Larman, Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development (3rd Edition), Pearson Education, 2008.

**B.Tech.** **20EC81 - SATELLITE TECHNOLOGY**

| L | T | P | Cr. |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Pre-Requisites:** Dynamics, Kinematics, Thermodynamics.

**Course Educational Objective:** This course provides the knowledge on laws associated with the motion of a satellite, launching a satellite into orbit with launch vehicles, subsystems, structures, spacecraft control and applications.

**Course Outcomes (COs):** At the end of the course, student will be able to

| | |
|---|---|
| CO1 | **List** out the operational bands, space craft control mechanisms **,** sensors and navigational aids for satellite applications **(Remember-L1)** |
| CO2 | **Summarize** the functions of satellite space segment, earth segment, multiple access techniques and satellite services. **(Understand-L2)** |
| CO3 | **Illustrate** the operational principles of satellite power system and space craft control mechanism. **(Understand-L2)** |
| CO4 | **Outline** the concepts of orbital mechanics & satellite communication and its application**(Understand-L2)** |

**UNIT I** **[8Hrs]**

**Introduction to Satellite Systems**: Need of space communication, Common satellite applications and missions, General structure of satellite communication system, Types of spacecraft orbits, Launch vehicles, Satellite subsystems and their functions –structure, thermal mechanisms, power, propulsion, guidance and control, bus electronics.

**UNIT - II** **[8Hrs]**

**Orbital Mechanics**: Fundamentals of orbital dynamics – Kepler's laws, Orbital parameters, Orbital perturbations-need for station keeping, Co-ordinate systems, GPS System- architecture, principle, merits, demerits and applications, Ground/Earth station network requirements.

**UNIT – III** **[8Hrs]**

**Power System and Bus Electronics**: Solar panels: Silicon and Ga-As cells, power generation capacity, efficiency; Space battery systems-battery types, characteristics and efficiency parameters; Power electronics. Telemetry, Tracking, Command and monitoring, Control functions. Communication bands- characteristics and applications.

**UNIT – IV** **[10Hrs]**

**Spacecraft Control:** Control requirements: attitude control and station keeping functions, type of control maneuvers, Stabilization schemes: spin stabilization, gravity gradient, 3 -ax is stabilization, control systems: mass expulsion systems, Momentum exchange Systems; Gyro and magnetic torque-sensors, star and sun sensor, earth sensor, magnetometers and inertial sensors.

**UNIT – V** **[8Hrs]**

**Satellite Services &Applications**: Global Positioning System architecture and location principle, Direct to Home, Home receiver, Satellite Mobile Services, VSAT, MSAT, RADARSAT, IRNSS constellation, Satellite structures and materials.

**TEXT BOOKS**

1. Timothy Pratt, Charles Bostian, Jeremy Allnutt , "Satellite communications", John Wiley & Sons,2nd edition, 2003.
2. Dennis Roddy,"Satellite communications", Tata McGraw Hills, 4th Edition, 2009.

**REFERENCE BOOKS**

1. M. Richharia, "Satellite Communications Systems: Design principles", BS Publications, 2nd Edition, 2005.
2. D.C Agarwal , "Satellite communications", Khanna Publications, 5th Edition,2006.

| B.Tech. | 20EC82 -ELEMENTS OF COMMUNICATION SYSTEMS | L | T | P | Cr. |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites:** Concept of signals and modulation theory.

**Course Educational Objective:** This course provides the knowledge on fundamental properties of systems, radio transmitters, receivers, and noise present in the communication channel and transmission lines and antennas used in communication systems.

**Course Outcomes (COs):** At the end of the course, students will be able to

| | |
|---|---|
| **CO1** | **Summarize** the properties of systems and concepts of noise in communication systems. **(Understand-L2).** |
| **CO2** | **Outline** the concepts of communication system, transmission lines, antennas, and response of linear systems **(Understand-L2).** |
| **CO3** | **Apply** the knowledge of systems, transmission and reception concepts for communication systems in the presence of noise. **(Apply-L3).** |
| **CO4** | **Interpret** the response of linear systems and performance of RF transmitters, receivers, transmission lines and antennas **(Understand L2).** |

**UNIT-I: Introduction to Systems** **[8Hrs]**

Definition, Classification, Properties of Systems - Linear and Non-Linear, Time Invariant and Variant, Causal and Non-Causal, Stable and Unstable; Signal and System Bandwidth.

**UNIT-II: Response of Linear Systems** **[8Hrs]**

Transfer Function, Impulse Response, Distortion less Transmission through a system, transmission of a signal through LTI system, elements of a communication system and its description.

**UNIT-III: Noise in Communication Systems** **[9Hrs]**

Concepts, external noise, internal noise, White noise, Band limited white noise, Colored noise, noise calculations, noise figure, noise temperature, noise equivalent bandwidth, Narrow band noise and its mathematical representation, power spectral density of in phase and quadrature components of noise.

**UNIT-IV:** **[8Hrs]**

**Radio Transmitters:** AM transmitter, FM transmitter- Direct method of FM transmission, indirect method of FM transmission.

**Radio Receivers:** Types of radio receivers-Tuned Radio frequency receiver and its limitations, Super heterodyne receiver.

**UNIT-V:** **[9Hrs]**

**Transmission lines:** Fundamentals, characteristic impedance, losses in transmission lines, standing waves, Quarter & half wavelength lines and reactance properties.

**Antennas:** Basics, Directional High Frequency Antennas: Dipole Arrays, Folded dipole and applications, UHF and Microwave Antennas: Antennas with parabolic reflectors, Horn antennas, Lens antennas. (Qualitative Analysis Only)

**Text Books:**

1. Simon Haykin, Communication Systems, Second Edition, John Wiley & Sons Publications, Singapore, 1983.

2. Kennedy, Davis, Electronic Communication Systems, 4th edition, Tata McGraw-Hill Publications, 2009

**Reference Books:**

1. Herbert Taub , Donald L. Schilling, "Principles of Communication Systems", Second Edition, Tata McGraw-Hill, New Delhi, 1991.
2. B.P.Lathi, "Modern Digital and Analog Communication Systems", Third Edition, Oxford University

| B.Tech. | 20EC83 -MICROPROCESSORS AND INTERFACING | L | T | P | Cr. |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre requisite:** Digital Circuits,

**Course Educational Objective:** In this course student will learn about the register organization and architecture of 8086 Microprocessor, programming using assembly language, interfacing the memory chips, various Peripherals with 8086 Microprocessor, concepts of Interrupts and Serial Communication using 8086 processor.

**Course Outcomes: (COs):** At the end of the course, students are able to :

CO 1 Outline the architecture of 8086 and peripheral devices. **(Understand – L2)**
CO 2 Apply 8086 instructions for microprocessor based applications. **(Apply – L3)**
CO 3 Analyze the operation and programming of peripheral devices. **(Analyze – L4)**
CO 4 Design of 8086 based system by interfacing memory, peripherals and I/O devices. **(Apply – L3)**

**UNIT – I:** **[8Hrs]**

**Architecture of 8086 Microprocessor**

Introduction to Microprocessors, 8086 - Pin configuration, Block diagram, Register organization, Special functions of general purpose registers, Flag register.

**UNIT – II:** **[8Hrs]**

**Programming using 8086 Instructions**

Instruction set, Addressing modes, Assembler directives, assembly language programs involving logical, branch and call instructions, sorting, evaluation of arithmetic expressions, string manipulation, procedures and macros.

**UNIT – III:** **[8Hrs]**

**Memory and I/O Interfacing with 8086**

Minimum mode and maximum mode of operation with read and write timing diagrams, Memory organization, Memory mapped I/O and I/O mapped I/O. Interfacing of RAM and EPROMs.

**UNIT – IV:** **[9Hrs]**

**Interfacing with Peripherals – I**

8255 PPI block diagram – modes of operation and interfacing to 8086, Interfacing - 4x4 Matrix keyboard, seven segment Displays, Stepper Motor with 8086 through 8255, DAC types- 0800 & AD7523 with 8086 to generate waveforms - Saw tooth, Triangle and Square waves, Interfacing ADC 0808 with microprocessor. Serial data transfer schemes, RS-232C cable pin configuration, 8251 USART architecture and interfacing with 8086 to transfer and receive data.

**UNIT – V:** **[9Hrs]**

**Interfacing with Peripherals – II**

8257 - DMA Controller, data transfer methods using DMA controller, Interfacing 8257 with 8086, Programming using 8257. Interrupt structure of 8086, Interrupt Vector table, Interrupt service routines, DOS and BIOS interrupts, 8259 Programmable Interrupt Controller - operation, ICWs & OCWs of 8259 and Programming using 8259 to interface with 8086.

TEXT BOOKS:

**T1** A. K. Ray and K. M. Bhurchandi, "Advanced Microprocessor And Peripherals", 3rd Edition TMH Publishers.

**T2** Douglas V. Hall, "Micro Processors & Interfacing", TMH, 2007.

**REFERENCE BOOKS:**

**R1** J. K. Uffenbeck, "The 8088 and 8086 Micro Processors", PHI, 4th Edition, 2003.

**R2** Microcomputer systems-The 8086 / 8088 Family – Y.C. Liu and G. A. Gibson, 2E PHI -2003

| B.Tech. | 20EC84 -ANALOG AND DIGITAL COMMUNICATIONS | L | T | P | Cr. |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites: Differentiation and Integration of signals.**

**Course Educational Objective:** This course provides the knowledge on fundamental characteristics of signals in time and frequency domain. The course will give an idea about various analog modulation techniques like amplitude, frequency, phase, pulse modulations. The course also gives the complete information regarding digital modulation.

**Course Outcomes (COs):** At the end of the course, students will be able to

| | |
|---|---|
| **CO1** | **Describe** the concepts of analog and digital modulation **(Understand-L2)** |
| **CO2** | **Understand** the waveform coding techniques, modulation techniques used in communication systems **(Understand-L2)** |
| **CO3** | **Examine** the performance of analog and digital modulation techniques. **(Apply-L3).** |
| **CO4** | **Apply** the transmission and detection techniques for communication system applications **(Apply-L3)** |

**UNIT-I: [9 Hrs]**

**Introduction to Communication System:** Elements of Communication System, Need for Modulation.

**Amplitude Modulation:** Time and Frequency Domain Representation of AM, Power relations in AM wave, Generation of AM waves: Switching Modulator, Demodulation of AM wave: Envelope detector. DSBSC: Time and Frequency domain representation, Generation of DSBSC using balanced modulator and Coherent Detection of DSBSC wave, SSBSC: Time and Frequency domain representation Generation of SSBSC using Phase-shift Method, Coherent detection of SSB wave.

**UNIT-II: [8 Hrs]**

**Angle Modulation:** Types, Frequency Modulation: Time domain representation, Single tone Frequency Modulation, Time and Frequency Domain representation of Narrow Band Frequency Modulation and wide band Frequency Modulation, Transmission power and Band width of FM wave, Generation of FM waves: Indirect FM, Direct FM. Demodulation of FM wave: Frequency Discrimination method: Simple slope detector, Phase Discrimination method: Foster Seeley Discrimination method.

**UNIT-III: [8 Hrs]**

**SAMPLING THEORY AND PULSE MODULATION**: Sampling process: Sampling theorem, Aliasing Phenomenon, Sampling Techniques, Aperture effect. Performance comparison of various Sampling techniques Analog Pulse Modulation Methods: Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation Comparison of various Pulse Analog Modulation Methods,

**UNIT-IV: [9 Hrs]**

**WAVEFORM CODING TECHNIQUES**: Elements of a Digital Communication System, Quantization process: Classification of Quantization, Uniform Quantization, Quantization characteristics, Pulse Code Modulation-operations in the transmitter, Differences between waveform

coding and source coding, Encoding in PCM, Multiplexing in PCM, Advantages of Differential Pulse-Code Modulation. Delta Modulation, Digital Multiplexers: Time-Division Multiplexing.

**UNIT-V:** **[8 Hrs]**

**DIGITAL MODULATION TECHNIQUES**: Binary ASK: Generation and detection, BPSK :Generation and coherent detection, Differential Phase-Shift Keying: Generation and Detection, QPSK: Generation and coherent detection, Binary FSK.

**Text Books:**

**1** Simon Haykin, *"Communication Systems"*, John Wiley & Sons, 2nd Edition,1983

**2** Dr.Sanjay Sharma "Analog and Digital Communication" S. K. Kataria &Sons

.

**Reference Books**

1. Herbert Taub , Donald L. Schilling, Principles of Communication Systems, Second Edition, Tata McGraw-Hill, New Delhi, 1991.
2. B.P.Lathi, Modern Digital and Analog Communication Systems, Third Edition, Oxford University

| B.Tech. | 20EC85 - SYSTEMS AND SIGNAL PROCESSING | L | T | P | Cr. |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisite: Differentiation and Integration.**

**Course Educational Objective:** This course provides basic knowledge on signals, operations, representation of signals in frequency domain using Fourier series , Fourier transform and Z transform. This course introduces underlying concepts of sampling & reconstruction, types of systems and filter design.

**Outcomes (COs):** At the end of the course, students will be able to

**CO1** Discuss the classification of signals and systems along with their properties and the concepts of sampling. **(Understand – L2)**

**CO2** Apply the concepts of Fourier series, Fourier Transform and Z Transform on signals. **(Apply – L3**)

**CO3** Describe the systems and observe the response of Linear Systems. **(Understand – L2)**

**CO4** Design IIR Digital Filters by applying Approximation Procedures and FIR Digital Filters through Window Techniques. **(Apply – L3)**

**UNIT – I** **[8 Hrs]**

**Signal Analysis:** Concept of Signal, Types of Signals, Representation of elementary Signals.
**Operations of Signals**: Time Shifting, Time Scaling, Time Reversal, Amplitude Scaling, Properties of Signals- Even & Odd, Causal & Non causal, Bounded & Unbounded, Periodic & Aperiodic, Energy & Power, Deterministic & Random Signals.

**UNIT – II** **[8Hrs]**

**Fourier Series:** Concept of Fourier Series, Trigonometric Fourier Series, Exponential Fourier Series (Proofs Not Expected)
**Fourier Transforms:** Existence of Fourier Transform, Properties of Fourier transform. (Proofs Not Expected)
**Sampling Theorem:** Sampling theorem for band limited signals, Effect of under sampling-Aliasing.

**UNIT – III** **[9 Hrs]**

**Signal Transmission Through Linear Systems:** Definition of System, Classification of Systems - Linear and Nonlinear, Time Invariant and Variant, Causal and Non causal, Stable and Unstable; Response of Linear Systems-Convolution (Continuous and discrete).
**Z Transform:** Region of Convergence and Properties of Z Tranform; Inverse Z Transform through partial fractions(Proofs Not Expected)

**UNIT – IV** **[8 Hrs]**

**Discrete Fourier Transform:** Introduction to DTFT**,** Concept of DFT, Properties of DFT, circular convolution (Proofs Not Expected)
**Fast Fourier Transform:** Need of FFT, Radix-2 Decimation in Time FFT Algorithm, Radix-2 Decimation in Frequency FFT Algorithm, Inverse FFT. (Derivations not expected)

**UNIT – V** **[9 Hrs]**

**Filters:** Concept, Characteristics, Classification - LPF, HPF, BPF, BEF.
**IIR Filter Design:** Specifications, Design of Analog Butterworth Filter-Impulse Invariant Transformation, Bilinear Transformation.(Derivations not expected)

**FIR Filter Design:** Design of FIR filters- Fourier series method, Windowing Techniques- Rectangular Window, Hanning Window, Hamming Window(Derivations not expected).

**TEXT BOOKS**


1. A V Oppenheim, A S Wilsky and IT Young, "*Signals and Systems*", PHI/Pearsonpublishers, 2nd Edition.
2. John G. Proakis, "*Digital Signal Processing, Principles, Algorithms & Applications*", Pearson education, Fourth edition , 2007


**REFERENCES**


1. A.Anand Kumar, "*Signals and Systems*", 2nd Edition, PHI, 2012.
2. B P Lathi, "*Signals, Systems and Communications*", BSP, 2003, 3rd Edition.

| B.Tech. | 20EC86 - CELLULAR TECHNOLOGY | L | T | P | Cr. |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites:** Analog &Digital Communication

**Course Educational Objective:** This course gives knowledge on mobile communications, cellular technology fundamentals, radio propagation models, modulation and multiple access techniques, Mobile Wireless Systems & Standards for cellular systems.

**Course Outcomes (COs):** At the end of the course, students will be able to
**CO1: Understand** the concepts of cellular system and wireless standards **(Understand- L2)**.

**CO2: Summarize** the evolution of cellular technologies from 1G to 5G systems and interference in cellular systems **(Understand-L2)**.

**CO3: Examine** the multiple access techniques and architectures of 2G/3G/4G/5G systems **(Apply-L3).**

**CO4: Characterize** the advanced cellular technologies LTE, OFDMA, mm Wave, MIMO, NOMA. **(Understand-L2)**

**UNIT – I:** **[8 Hrs]**

**Introduction to Mobile Communication** : Fundamentals of wireless & cellular communications: evolution of cellular systems, requirements, goals, and vision of the next generation wireless communication systems, Examples of Wireless Communication Systems, operation of basic Cellular telephone System, performance metrics.

**UNIT – II:** **[9 Hrs]**

**Cellular Concepts and Interference:** Frequency reuse, frequency management, channel assignment, handoff mechanism, Interference, types of interferences in cellular system, C/I ratio, Interference reduction methods and system capacity im provement: cell splitting, cell sectoring, microcell zone concept.

**UNIT– III:** **[8 Hrs]**

**2G and 3G Cellular Technologies:** Multiple access techniques: FDMA, TDMA, CDMA, 2G digital cellular Technology: GSM, GSM services, GSM architecture, comparison of analog and digital cellular systems. 3G cellular Technology: CMDA2000, WCDMA.

**UNIT – IV:** **[9 Hrs]**

**4G Cellular Technology:** Need and Opportunities for 4G, features provided by 4G, LTE: LTE architecture, mobility management, Evolution of VoLTE, OFDMA: OFDM, OFDMA in 4G, advantages of OFDMA.

**5G Cellular Technology:** Need of 5G, 5G mobile network architecture, Features of 5G technology. Small cells: Past, present, and future trends of cellular networks coverage and capacity of small cell networks.

**UNIT – V:** **[8 Hrs]**

**Advanced Cellular Technologies:** Challenges in migration from 4G to 5G, Set of 5G requirements, mm Wave: Applications, radio wave propagation, Massive MIMO: Point-to-point MIMO, Virtual MIMO (relaying), challenges, Beam forming, NOMA. Wireless energy harvesting, visible light communication.

**Text Books:**

1. Theodore S. Rappaport, "wireless communications Principles and Practices", PHI, 2005.
2. R. Vannithamby and S. Talwar, *Towards 5G: Applications, Requirements and Candidate Technologies.*, John Willey & Sons, West Sussex, 2017.

**Reference Books:**

1. Manish, M., Devendra, G., Pattanayak, P., Ha, N., *5G and Beyond Wireless Systems PHY Layer Perspective*, Springer Series in Wireless Technology.
2. Lee W.C.Y, "Mobile communication Engineering Theory and Applications", 2/e McGraw-Hill, New York, 2003

| B.Tech. | 20EE81 - LINEAR CONTROL SYSTEMS | L | T | P | Cr. |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre Requisite: None**

**Course Educational Objective:** The objective of this course is to introduce to the students the principles and applications of control systems in everyday life. It deals with the basic concepts of block diagram reduction, time domain analysis solutions to time invariant systems the different aspects of stability analysis of systems in frequency domain and time domain.

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

**CO1.** Develop mathematical model of linear time invariant systems. **(Apply-L3)**

**CO2.** Realize transfer function representation of system from conventional and state space approach **(Apply-L3)**

**CO3.** Analyze linear time invariant systems in Time domain **(Apply-L3)**

**CO4.** Analyze time invariant systems in Frequency domain**(Apply-L3)**

**UNIT – I: INTRODUCTION-MATHEMATICAL MODELLING OF CONTROL SYSTEM**

Concepts of Control Systems- Classification of control systems, Open Loop and closed loop control systems - Different examples of control systems.

Mathematical models – Differential equations, Impulse Response and transfer functions – Translational and Rotational mechanical systems, Block diagram representation of systems - Block diagram algebra, Signal flow graph - Reduction using Mason's gain formula.

**UNIT – II: TIME RESPONSE ANALYSIS-I**

Standard test signals, Time response of first order systems, Time response of second order systems, Time domain specifications, Steady state errors and error constants.

**UNIT – III: TIME RESPONSE ANALYSIS-II**

The concept of stability – R-H stability criterion, The root locus concept - construction of root loci & Relative stability analysis

**UNIT – IV: FREQUENCY RESPONSE ANALYSIS**

Introduction, Frequency domain specifications, Polar Plot, Bode diagrams, Stability Analysis from Bode Plots, Nyquiat stability criterion, Nyquist Plot -Phase margin and Gain margin.

**UNIT – V: STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS**

Concepts of state, state variables and state model, Canonical state space models, solving the Time invariant state Equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability.

**TEXT BOOKS:**

1. B. C. Kuo , "Automatic Control Systems" , John wiley and sons ,9th edition, 2014
2. I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International (P) Limited, 6th edition , 2017

**REFERENCE:**

1. Katsuhiko Ogata , "Modern Control Engineering", Prentice Hall of India Pvt. Ltd., 3rd edition,1998.
2. Norman S. Nise, "Control Systems Engineering" , John Wiley, New Delhi, 6th edition, 2012
3. Richard C Dorf and Robert H Bishop, "Modern control systems" , Prentice Hall Pearson education, Inc.) New Delhi, 12th edition, 2003.

**B.Tech.** **20EE82 - BASICS OF ELECTRICAL MEASUREMENTS**

| L | T | P | Cr. |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

Prerequisite: None

**Course Educational Objective:** This course enables the students to understand the construction and working principle of different types of meters. It also provides knowledge of calculation of parameters of electrical network..

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

**CO1**: Compare the performance of PMMC, Moving iron and dynamometer types of measuring instruments and energy meters. **(Understand-L2)**

**CO2**: Determine the circuit parameters using appropriate method of measurement**. (Apply-L3)**

**CO3:** Understand working principle of special purpose instruments **(Understand-L2)**

**CO4**:. Understand principles of magnetic measurements **(Understand-L2)**

**UNIT-1: MEASURING INSTRUMENTS**

Classification-deflecting, control and damping torques-Ammeters and Voltmeters-PMMC, Moving iron type instruments-expression for deflecting and controlling torque-errors and compensation, extension of range using shunts and series resistance, electrostatic voltmeters-electrometer type and attracted disc type.

**UNIT-II: MEASUREMENT OF RESISTANCE, INDUCTANCE, CAPACITANCE**

Method of measuring low, medium, high resistance- Wheatstone bridge, Kelvin double bridge, loss of charge method, Method of measuring Inductance- Mawell Inductance-Capacitance Bridge, Carey-Foster slide Wire Bridge. Method of measuring Capacitance and loss angle-Weins'bridge, Schering bridge

**UNIT-III: MEASUREMENT OF POWER & ENERGY**

Measurement of Power-Single phase dynamometer Wattmeter-LPF, UPF, errors and compensation, measurement of active and reactive power. Measurement of Energy-single phase Energy meter- driving and braking torques, errors and compensation.

**UNIT-IV: SPECIAL PURPOSE MEASURING INSTRUMENTS**

Instrument transformers: construction, connection of CT and PT in the circuit, Power factor meter, Frequency meter: Resonance type and Weston type

Potentiometers: Principle and operation of DC Potentiometer, standardization, measurement of resistance, current and voltage.

**UNIT-V: MAGNETIC MEASUREMENTS**

Ballistic galvanometer, equation of motion, flux meter- constructional details, comparison with Ballistic galvanometer, Determination of B-H loop-method of reversals, magnetic testing under a.c conditions.

**TEXT BOOKS**

1. A. K. Sawhaney, DhanpatRai& Sons "A Course in Electrical and Electronic measurements & Instrumentation" , Education & Technical publishers New Delhi , 4th Edition 2015.
2. U.A.Bakshi,&A.V.Bakshi "Electrical measurement" Technical publications Pune, 2nd Edition 2010.

**RREFERENCE:**

1. Nakra&Chaudhari "Instrumentation: Measurement and Analysis" TMH, New Delhi, 4th edition, 2006.
2. D.V.S. Moorthy, "Transducers and Instrumentation", PHI Ltd New Delhi 2nd edition 2011.

| B.Tech. | 20EE83 - UTILIZATION OF ELECTRICAL ENERGY | L | T | P | Cr. |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites:** Basic Electrical Engineering

**Course Educational Objective:** This course enables the student to acquire knowledge on methods of Electric Heating and welding, different lighting schemes. It also introduces the concepts of Electric Drives for Industrial and traction system, and also different tariff methods.

**COURSE OUTCOMES (COs):** At the end of the course, students are able to

**CO1:** Understand mechanism of electric heating and electric welding. **(Understand-L2)**

**CO2:** Analyze performance of various lighting schemes. **(Understand-L2)**

CO3: Analyze the performance of electric drive systems. **(Understand-L2)**

**CO4:** Illustrate the different schemes of traction and its main components **(Understand-L2)**

**CO5:** Understand various tariff methods and power factor improvement techniques. **(Understand-L2)**

**UNIT-1: ELECTRIC HEATING AND WELDING**

**Electric Heating :** Advantages and methods of electric heating–Resistance heating induction heating and dielectric heating – Arc furnaces – Direct and indirect arc furnaces.

**Electric Welding**: Electric welding–Resistance and arc welding–Electric welding equipment–Comparison between AC and DC Welding.

**UNIT-II: ILLUMINATION ENGINEERING**

Introduction, Nature of light &Laws of illumination, Lighting schemes, sources of light, Fluorescent Lamp, CFL and LED, Sodium Vapour Lamp, Neon lamps, mercury vapour lamps, Comparison between tungsten & fluorescent tubes, Requirements of good lighting & Street lighting

**UNIT-III :ELECTRIC DRIVES**

Introduction, Factors affecting selection of motor, Types of loads, Steady state characteristics of drives, Transient characteristics, Size of motor, load equalization, Industrial applications,

**UNIT-IV: ELECTRIC TRACTION**

Introduction, requirements of an ideal traction system, System of electric traction and track electrification–the traction motor– train movement, Mechanics of train movement–Speed–time curves for different services – Trapezoidal and quadrilateral speed time curves

**UNIT-V: TARIFF AND POWER FACTOR IMPROVEMENT**

**Tariff**: Desirable characteristics, types - Flat rate, block-rate, KVA maximum demand and Time of Day tariff.

**Power factor**: Disadvantages of low power factor, advantages of improved p.f.,without using p.f. improvement devices, power factor improvement using; static capacitor, most economical power factor, location of power factor improvement devices from consumer.

**TEXT BOOKS:**

1. C.L.Wadhwa "Generation,Distribution and Utilization of Electrical energy, New Age International Publishers,3rd Edition,2015.
2. N.V.Suryanarayana "Utilization of electric power including electric drives and electric traction,New age international publishers New Delhi,2nd edition 2014.

**RREFERENCE:**

**1.** V K Mehta & Rohit Mehta, "Principles of Power System", Revised Edition, S.Chand Publications, 2022.
2. A.Chakrabarthi, M.L.Soni, P.V.Gupta and U.S.Bhatnagar, "A Textbook on Power system Engineering", Dhanpat Rai Publishing Company (P) Ltd., 2008.

| B.Tech. | 20EE84 - ELECTRIC VEHICLES | L | T | P | Cr. |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisites:** Basic Electrical Engineering

**Course Educational Objective:** This course enable the students to acquire knowledge on basic concepts related to mechanics, kinetics and dynamics of electric vehicles, technical characteristics and properties of batteries. It also introduces the concepts of different configurations of drive trains.

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

**CO1**: illustrate propulsion system for an electric vehicle.

**CO2**: Understand characteristics and properties of batteries. **(Understand-L2)**

**CO3**: Analyze ratings and requirements of electrical machines. **(Understand-L2)**

**CO4**: Analyze mechanism of electrical vehicle drive train. **(Understand-L2)**

**CO5**: Understand configuration of hybrid electric vehicles. **(Understand-L2)**

**UNIT I : ELECTRIC VEHICLES**

Introduction, Components, vehicle mechanics – Roadway fundamentals, vehicle kinetics, Dynamics of vehicle motion - Propulsion System Design.

**UNIT II; BATTERY**

Basics – Types, Parameters – Capacity, Discharge rate, State of charge, state of Discharge, Depth of Discharge, Technical characteristics, Battery pack Design, Properties of Batteries.

**UNIT III: DC & AC ELECTRICAL MACHINES**

Motor and Engine rating, Requirements, DC machines, Three phase A.C machines, Induction machines, permanent magnet machines, switched reluctance machines.

**UNIT IV: ELECTRIC VEHICLE DRIVE TRAIN**

Transmission configuration, Components – gears, differential, clutch, brakes regenerative braking, motor sizing.

**UNIT V : HYBRID ELECTRIC VEHICLES**

Types – series, parallel and series, parallel configuration – Design – Drive train, sizing of components.

**TEXT BOOKS:**

1. IqbalHussain, “Electric & Hybrid Vehicles – Design Fundamentals”, Second Edition, CRC Press, 2011.

2. James Larminie, “Electric Vehicle Technology Explained”, John Wiley & Sons, 2003.

**REFERENCE :**

1. MehrdadEhsani, YiminGao, Ali Emadi, “Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals”, CRC Press, 2010.

2. SandeepDhameja, “Electric Vehicle Battery Systems”, Newnes, 2000

| B.Tech. | 20IT81-OOPS through JAVA | L | T | P | Cr. |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisite:** Programming for Problem Solving Using C

**Course Educational Objective:** Concentrates on the methodological and technical aspects of software design and Programming based on Object-Oriented Programming (OOP). Acquire the basic knowledge and skills necessary to implement Object-Oriented Programming Techniques in software development through JAVA.

**Course Outcomes (COs):** At the end of the course, the student will be able to:

- **CO1:** Understand Object Oriented Programming Concepts through constructs of JAVA. **(Understand - L2)**
- **CO2:** Apply the concepts of Inheritance and Polymorphism on real-world applications. **(Apply-L3)**
- **CO3:** Implement reusability using interface and packages. (**Understand - L2)**
- **CO4:** **C**onstruct robust applications using exception handling. **(Apply-L3)**
- **CO5:** Understand multi-threading concepts. **(Understand - L2)**

**UNIT – I: Introduction to OOP & JAVA:**

**Java Basics**: Java Buzzwords/Features OOP Concepts, Java History, Advantages, Data types, operators, expressions, control statements, methods and recursion, sample programs.

**Java Anatomy:** Java Objects and References, Constructors, this keyword, Arrays (single and multi-dimensional), String, StringBuffer, StringTokenizer Classes.

**UNIT – II: Extending Classes/ Reusability:**

**Inheritance:** Introduction, Derived Classes, Advantages and Types of Inheritance, Implementation, Inheritance and Member Accessibility. Overriding, super keyword, Abstract Classes and Methods, final keyword, Final Classes and Final Methods, Dynamic Binding, Polymorphism.

**UNIT – III: Interfaces & Packages:**

**Interfaces:** Differences between classes and interfaces, defining an interface, implementing interface, variables in interface, extending interfaces.

**Packages:** Defining, Creating and Accessing a Package, importing packages, access controls (public, protected, default and private). Wrapper Classes (Like Integer, Float, Double).

**UNIT – IV: Exception Handling:**

**Exception Handling:** Concepts of exception handling, benefits of exception handling, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception.

**UNIT – V: Multithreading:**

**Multithreading:** Thread life cycle, creating threads, synchronizing and intercommunication of threads.

## TEXT BOOKS

1. Java Fundamentals – A comprehensive Introduction, Herbert Schildt and Dale Skrien, TMH.

## REFERENCES

1. The Java™ Programming Language: Ken Arnold, James Gosling, Pearson.
2. Introduction to Java Programming 7/e, Brief version, Y.Daniel Liang, Pearson
3. Java for Programmers, P.J.Deitel and H.M.Deitel, Pearson education (OR) Java: How to Program P.J.Deitel and H.M.Deitel, PHI

| B.Tech. | 20IT82-Web Technologies using PHP | L | T | P | Cr. |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Prerequisite:** Students should have basic knowledge in programming using C**.**

**Course Educational Objective (CEO):** The main objective of the course is that the students will gain the knowledge necessary to design and develop dynamic, database-driven Web applications using PHP.

**Course Outcomes (COs):** After the completion of this course, student will be able to:

**CO1:** Design web pages by using HTML and DHTML. **(L3-Apply).**
**CO2:** Identify the basic programming constructs of PHP. **(L2-Understand).**
**CO3:** Develop programs using functions, strings and arrays. **(L3-Apply).**
**CO4:** Apply object-oriented principles in PHP. **(L3-Apply).**
**CO5:** Design data driven applications by using PHP. **(L3-Apply).**

**UNIT – I: HTML & DHTML**

**HTML**: Introduction, Text Formatting Tags, Lists, Tables, Images, links, marquee, Forms, Frames. CSS: Types of Cascading Style sheets; CSS Selectors, Properties: Text, Backgrounds, Font, Links, Borders, Margins, Cell padding, Layouts.

**JAVASCRIPT:** Introduction to JavaScript, Objects in Java Script, Dynamic HTML with Java Script, Form validation using JavaScript.

**UNIT – II: INTRODUCTION TO PHP:**

**Introduction to PHP**: History, Web Browser, Web Server – Xampp, Installation and Configuration files. Evaluation of PHP, Basic syntax, defining variable and constant, PHP Data types, Operators and Expressions.
**Decisions and loops:** Making Decisions, doing Repetitive task with looping, mixing decisions and looping with HTML.

**UNIT – III: FUNCTIONS, STRING & ARRAY:**

**Functions:** What is a function, define a function, Call by value and Call by reference and Recursive functions.
**String:** Creating and accessing String, Searching & Replacing String, Formatting String, String Related Library functions
**Array:** Anatomy of an Array, Creating Index based and Associative array, Accessing array element, Looping with Index based array, Looping with associative array using each() and foreach(), some useful library functions.

**UNIT – IV: ADVANCED PHP:**

**Introduction**: Objects, declaring a class, the new keyword and constructor, Destructor, Access method and properties using $this variable. Public, private, protected properties and methods, Static properties and method, Inheritance & code, reusability.
**Exception Handling:** Understanding Exception and error. Try, catch, and throw.

**UNIT – V: PHP WEB SERVICES:**

**Handling HTML form with PHP:** Capturing Form Data, Dealing with Multi-value file, generating File uploaded form, redirecting a form after submission.
**Web Features:** Sessions, Forms GET and POST data, Cookies, HTTP Headers.

**Database Connectivity with MySQL:**Introduction to RDBMS, Connection with MySQL Database, Performing basic database operations (DML) (Insert, Delete, Update, Select), Setting query parameter, Executing query.

**TEXTBOOKS:**


1. Steven Holzner, ―PHP: The Complete Reference‖, McGraw-Hill Education, 2007.(Unit 1 to 5)
2. Kevin Tatroe, Peter MacIntyre, RasmusLerdorf, –Programming in PHP‖, O'Reilly, 3rd Edition, 2013. (Unit 1,2 & 5)
3. Luke Welling, Laura Thomson, –PHP and MySQL Web Development‖, Pearson Education, 5th Edition. (Unit 5)


**REFERENCES:**


1. HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQueryDT Editorial Services Dreamtech Publications
2. Lynn Beighley, Michael Morrison, –Head First PHP & MySQL: A Brain-Friendly Guide‖, O'Reilly, 1st Edition.
3. David Powers, –PHP Solutions: Dynamic Web Design Made Easy, Apress, 3rd Edition.
4. https://www.w3schools.com/php/php_intro.asp
5. https://www.tutorialspoint.com/php/php_introduction.htm
6. https://www.tutorialrepublic.com/php-tutorial/php-variables.php

| B.Tech. | 20IT83-Mobile Application Development | L | T | P | Cr. |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Pre-requisite : Knowledge Java Programming**

**Course Educational Objective:**

This course introduces mobile application development on the Android platform. Students will be imparted with the skills for creating and deploying Android applications, with particular emphasis on components and concepts that define the Android platform. To develop skills required to produce and maintain a high-quality mobile software product. It will help to gain a breadth of knowledge for developing applications with the Android SDK and to know and execute principles and concepts of software requirements engineering, particularly as it relates to mobile software product development

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

**CO1:** Identify the design limitations of mobile applications based on android features. **Understand - L2)**
**CO2:** Apply android technology features for user interface design and other activities. **(Apply-L3)**
**CO3:** Experiment with Intents, Broadcasts and Actionbars in Android Studio (**Apply-L3)**
**CO4:** Illustrate methods of accessing data in local databases. **(Apply – L3)**
**CO5:** Apply data base services for the development of Android Applications **(Apply - L3)**

**UNIT-I: Introduction to Android Operating System**

**Android OS design and Features** – Android development framework, SDK features, Installing and running applications on Android Studio.
**Android application components** – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages.

**UNIT-II: Android User Interface:**

**Measurements** – Device and pixel density independent measuring UNIT - s Layouts – Linear, Relative, Grid and Table Layouts
**User Interface (UI) Components** – Editable and non-editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers
**Event Handling** – Handling clicks or changes of various UI components
Fragments – Creating fragments, Lifecycle of fragments, Fragment states.

**UNIT-III: Intents and Broadcasts:**

**Intent** – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities.
**Broadcast Receivers** – Using Intent filters to service implicit Intents, Resolving Intent filters.
**Notifications** – Creating and Displaying notifications, Displaying Toasts

**UNIT-IV: Persistent Storage:**

**Files –** Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference

**UNIT-V: Database:**

Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

**TEXTBOOKS**

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

**REFERENCE BOOKS**

Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

| B.Tech. | 20IT84-Cyber Security & Digital Forensics | L | T | P | Cr. |
|---|---|---|---|---|---|
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**Pre-requisite**: Understanding of digital logic, operating system concepts, Computer hardware knowledge.

**Course Educational Objective:**

The objective of the course is to provide the basic concepts of Cybersecurity and Digital Forensics which help to protect ourselves from various kinds of cyber-attacks. Digital forensics is a branch of forensic science encompassing the recovery and investigation of material found in digital devices, often in relation to computer crime. It enables students to gain experience to do independent study and research.

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

**CO1:** Understand the implications of cybercrime. **(Understand- L2)**
**CO2:** Identify key Tools and Methods used in Cybercrime. **(Remember- L1)**
**CO3:** Understand the concepts of Cyber Forensics. **(Understand- L2)**
**CO4:** Apply Cyber Forensics in collection of digital evidence and sources of evidence. **(Apply – L3)**
**CO5:** Analyze the cyber forensics tools for present and future. **(Analyze – L4)**

**UNIT I**

**Introduction to Cybercrime**: Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrime, Cyberstalking, Cybercafe and Cybercrimes, Botnets. Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Network and Computer Attacks.

**UNIT II**

**Tools and Methods**: Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, Sniffers, Spoofing, Session Hijacking Buffer overflow, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Identity Theft (ID Theft), Port Scanning.

**UNIT-III: Cyber Forensics** Definition, Disk Forensics, Network Forensics, Wireless Forensics, Database Forensics, Malware Forensics, Mobile Forensics, Email Forensics.

**UNIT-IV: Digital Evidence**, Introduction to Digital Evidence and Evidence Collection Procedure, Sources of Evidence, Operating Systems and their Boot Processes, File System, Windows Registry, Windows Artifacts, Browser Artifact, Linux Artifacts, Digital Evidence on the Internet, Impediments to Collection of Digital Evidence, Challenges with Digital Evidence.

**UNIT – V : Cyber Forensics—The Present and the Future** Forensic Tools, Cyber Forensic Suite, Drive Imaging and Validation Tools, Forensic Tool for Integrity Verification and Hashing, Forensic Tools for Data Recovery, Forensic Tools for Encryption/Decryption, Forensic Tools for Password Recovery, Forensic Tools for Analyzing Network, Forensic Tools for Email Analysis.

**TEXTBOOKS**

1. Dejey, Dr.Murugan, "Cyber Forensics", Oxford University Press, India, 2018.
2. Sunit Belapure Nina Godbole "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", WILEY, 2011.

## REFERENCE BOOKS

**Reference Books:**

1) Michael T. Simpson, Kent Backman and James E. Corley, "Hands on Ethical Hacking and Network Defence", Cengage, 2019.
2) Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
3) Alfred Basta, Nadine Basta,Mary Brown and Ravinder Kumar "Cyber Security and Cyber Laws" , Cengage,2018.

**e-Resources:**

4) CERT-In Guidelines- http://www.cert-in.org.in/
5) https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks [ Online Course]
6) https://computersecurity.stanford.edu/free-online-videos [ Free Online Videos]
7) Nickolai Zeldovich. 6.858 Computer Systems Security. Fall 2014. Massachusetts Institute of Technology: MIT OpenCourseWare, https://ocw.mit.edu. License: Creative Commons BY-NC-SA.

| B.Tech. | 20ME81 - RENEWABLE ENERGY SOURCES | L | T | P | Cr. |
|---|---|---|---|---|---|
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**Pre-requisites:** Nil

**Course Educational Objective:**

To provide the insights on different non-conventional energy sources, potential, salient features and utilization of solar, wind, geothermal, ocean thermal energy, bio energy and direct energy conversion systems.

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

**CO1:** Compute the performance of solar energy harnessing devices and its energy scenario. **(Applying– L3)**

**CO2:** Apply the principles of energy conversion for wind and geothermal power generating plants. **(Applying - L3)**

**CO3:** Compare the power generating capacities of tidal energy, wave energy and ocean thermal energy plants. **(Understanding - L2)**

**CO4:** Illustrate the various biomass power generation system technologies. **(Understanding - L2)**

**CO5:** Comprehend the direct energy power generation systems. **(Understanding - L2)**

**UNIT - I**

**GLOBAL AND NATIONAL ENERGY SCENARIO:** Over view of conventional & renewable energy sources, need & development of renewable energy sources, types of renewable energy systems.

**SOLAR ENERGY HARNESSING DEVICES:** Energy available from Sun, Solar radiation data, solar energy conversion into heat, Flat plate and Concentrating collectors, Mathematical analysis of Flat plate collectors and collector efficiency, Solar water Heating, Space Heating – Active and Passive heating – solar stills and ponds–basic principle of power generation in photovoltaic cell.

**UNIT - II**

**WIND ENERGY:** Wind – characteristics – wind energy conversion systems – types – Betz model – Interference Factor – Power Coefficient – Torque Coefficient and thrust coefficient, site selection requirements.

**GEOTHERMAL ENERGY:** Structure of Earth – Geothermal Sources – Hot springs – Hot Rocks – Interconnection of geothermal fossil systems.

**UNIT - III**

**TIDAL ENERGY:** Introduction, Origin of Tides, Tidal Power generation, Classification of Tidal Power Plant, Site requirements.

**WAVE ENERGY:** Introduction, Wave energy and Power, Wave Energy devices – Merits and Demerits

**OCEAN THERMAL ENERGY:** Introduction, Working principle of Ocean Thermal Energy Conversion, OTEC Systems, Advantages and Disadvantages of OTEC plants.

**UNIT - IV**

**BIO – ENERGY:** Introduction, Biomass Energy Sources –Biomass Wastes – Aerobic and Anaerobic bio-conversion processes – Raw Materials and properties of Bio-gas. Bio-gas plant Technology and Status-Biomass gasification, Types and application of gasifier.

**UNIT - V**

**DIRECT ENERGY CONVERSION SYSTEMS:** Introduction to direct energy conversion systems, Peltier effect, seebeck effect, Thomson effect, Fuel Cells-types, efficiency of Fuel Cells– Thermionic and Thermoelectric Generation – MHD Generator-Open and Closed Systems, applications of direct energy conversion systems.

**TEXT BOOKS:**

1. G.D.Rai, Non-Conventional Energy Sources, 5th Edition 2011, Khanna Publishers, New Delhi, India.
2. Kreith, F and Kreider, J. F., Principles of Solar Engineering, McGraw-Hill, 1978.

**REFERENCE BOOKS:**

1. John Twidell&Tony Weir, Renewable Energy Resources – 2 nd Edition, Taylor & Francis.
2. G.N.Tiwari, Solar Energy – Fundamentals, Design, Modelling and Applications – Narosa Publication Ltd.,2000.
3. Ashok V Desai, Non-Conventional Energy- Wiley Eastern, 2000.

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**B.Tech.** **20ME82 - ROBOTICS IN AUTOMATION**

**Prerequisite:** Nil

**Course Educational Objective:**

The objective of this course is to impart knowledge about basic mathematics related to industrial robots for their control, design, and application in robotics & automation Industries.

**Course Outcomes:** After completion of the course student will be able to:

**CO1:** Comprehend the anatomy of robots, end effectors. (**Understanding-L2)**

**CO2:** Categorize various actuators and sensors employed in industrial robots. **(Understanding-L2)**

**CO3:** Formulate transformations using DH parameters for kinematics and dynamics of robots. **(Applying-L3)**

**CO4:** Illustrate the control system and develop the robotic programming. **(Understanding-L2)**

**CO5:** Outline the robotic applications in present and future industrial scenario. **(Understanding-L2)**

**UNIT - I**

**ROBOT ANATOMY:** History of robots, Laws of robotics, Classification of robots, Present status, and future trends, basic components of robotic system, links, joints, configurations of robots, Accuracy, Repeatability, Resolution, Degree of freedom. Mechanisms and transmission,

**END EFFECTORS**: End effectors, Grippers-different methods of gripping, Mechanical grippers, Magnetic grippers, Vacuum grippers, Specifications of Robot.

**UNIT – II**

**DRIVE SYSTEMS:** Drive systems - hydraulic, pneumatic, and electric systems, Advantages, limitations, Industrial applications

**SENSORS**: Sensors in robots – Touch sensors, tactile sensor, Proximity and range sensors, Robotic vision sensor, Force sensor, Light sensors, Pressure sensors, working principle, applications.

**UNIT – III**

**KINEMATICS OF ROBOTS:** 2D, 3D Transformation, rotation, translation, homogeneous coordinates multiple transformation, matrix representation, homogeneous transformations, inverse of transformations, forward and inverse kinematics of robots, D-H representation of robots.

**DYNAMICS OF ROBOTS:** Introduction, Robot Arm dynamics, significance, Force and torque requirements for two degrees of freedom robotic arm.

**UNIT – IV**

**TRAJECTORY PLANNING AND ROBOT CONTROL:** Basics of Trajectory Planning, Point to point control, Continuous path control, Interpolations, Control system for robot joint, Control actions, Feedback devices, Adaptive control.

**ROBOT PROGRAMMING:** Introduction to Robotic Programming, online and off-line programming, programming examples

**UNIT – V**

**ROBOT APPLICATIONS:** Robot Applications-Material handling, Machine loading and unloading, assembly, Inspection, Welding, Spray painting. Applications in unmanned systems, defence, medical, industries, etc.,

**AUTOMATION AND INDUSTRY 4.0:** Robotics and Automation for Industry 4.0, Robot safety and social robotics.

**TEXT BOOKS**

1. Mikell P Groover, Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, “Industrial Robotics, Technology programming and Applications", McGraw Hill, 2012.
2. Saeed B.Niku, Introduction to robotics- analysis ,systems &application, Second Edition, Willy India Private Limited, New Delhi,2011.

**REFERENCES**

1. S.R. Deb, “Robotics Technology and flexible automation”, Tata McGraw-Hill Education., 2009.
2. Craig. J. J. “Introduction to Robotics- mechanics and control”, Addison- Wesley, 2009.
3. Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, "Robotics Engineering an Integrated Approach", PHI Learning, 2009.
4. Fu. K. S., Gonzalez. R. C. & Lee C.S.G., “Robotics control, sensing, vision and intelligence”, McGraw Hill Book co, 2007.

| B.Tech. | 20ME83 - OPERATIONS RESEARCH TECHNIQUES | L | T | P | Cr. |
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**Prerequisite:** Nil

**Course Educational Objective:**

The objective of this course is to introduce the concepts of formulating an engineering problem into a mathematical model to develop an optimal solution.

**Course Outcomes:** After completion of the course student will be able to:

**CO 1:** Apply linear programming approach for optimizing the objectives of industrial oriented problems. **(Applying -L3)**

**CO 2:** Formulate and solve Transportation Models and assignment Models. **(Applying -L3)**

**CO 3:** Implement the strategies in competitive situations and able to sequence the jobs to be processed on machines. **(Applying -L3)**

**CO 4:** Identify the replacement period of the equipment and analyze the waiting situations in an organization. **(Applying -L3)**

**CO 5:** Determine the optimum inventory level and resolve the complex problem into simple problems by dynamic programming approach and apply optimum strategies. **(Applying -L3)**

**UNIT - I**

**INTRODUCTION:** Introduction to Operations Research, Development, Definition, Characteristics and Phases – Types of models – Operations Research models – applications.

**LINEAR PROGRAMMING:** Linear Programming Problem Formulation, Graphical solution, Simplex method, artificial variables techniques, Two–phase method, Big-M method.

**UNIT - II**

**TRANSPORTATION PROBLEM:** Formulation, Optimal solution, unbalanced transportation problem, Degeneracy.

**ASSIGNMENT PROBLEM:** Introduction, optimal solution, Variants of Assignment Problem-Travelling Salesman problem.

**UNIT - III**

**GAME THEORY:** Minimax (maximin) Criterion and optimal strategy, Solution of games with saddle points, rectangular games without saddle points, 2 X 2 games – dominance principle – mX2 and 2 X n games, mxn games.

**JOB SEQUENCING** – Introduction – Flow –Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through ‘m’ machines-graphical model.

**UNIT – IV**

**THEORY OF REPLACEMENT:** Introduction, Replacement of Equipment that Deteriorates Gradually, Replacement of Equipment that fails suddenly, Group Replacement.

**WAITING LINES:** Single Channel – Poisson arrivals – exponential service times – with infinite population and finite population models.

**UNIT – V**

**INVENTORY MODELS:** Introduction, terminology, EOQ, deterministic models — Instantaneous Production, finite production, continuous demand, no set up cost, shortages are not allowed – purchase inventory models with one price break and multiple price breaks.

**DYNAMIC PROGRAMMING:** Introduction, Bellman's Principle of optimality, Applications of dynamic programming, capital budgeting problem, shortest path problem, linear programming problem.

**TEXTBOOKS**

1. S.D Sharma, ―Operation Research‖, Kedar Nath and RamNath - Meerut, 2008.
2. Operations Research / N.V.S. Raju / SMS, 2009.

**REFERENCES**

1. Singiresu S Rao, Engineering Optimization: Theory and Practice, A Wiley- Interscience Publication, 4th edition, 2009.
2. Hiller & Libermann, Introduction to O.R (TMH), 9TH EDITION, 2009.
3. Kantiswarup. P.K.Gupta, Man Mohan, Operations Research, Sultan Chand & Sons, Educational Publications, New Delhi, 14th Edition, 2008.
4. A.M.Natarajan, P.Balasubramani, A. Tamilarasi, Operations Research, Pearson Education, 2ndedition, 2014.
5. Taha, Introduction to O.R .PHI, 9th edition, 2010.

| B.Tech. | 20ME84 - ELEMENTS OF AUTOMOBILE ENGINEERING | L | T | P | Cr. |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Prerequisites:** Nil

**Course Educational Objective:**

The main objective of the course is to familiarize the concepts like lubricating systems, cooling systems, transmission systems, steering system, braking system, suspension system, ignition system, charging system, wheels and tyres, air conditioning and lighting system in automobiles.

**Course Outcomes:** After the completion of the course students are able to

**CO1:** Label the various components of engine systems and sub-systems of an automobile. **(Remembering-L1)**

**CO2:** Comprehend the ignition, charging and starting systems of automobile. **(Understanding-L2)**

**CO3:** Outline the features and functions of steering and braking system. **(Understanding-L2)**

**CO4:** Describe the transmission system in automobile.**(Understanding-L2)**

**CO5:** Identify the safety measures and pollution issues of automobile. **(Remembering-L1)**

**UNIT-I**

**ENGINE:** Basic terminology and working principle of engines, Essential engine components, Firing Order, Turbo charging.

**LUBRICATING SYSTEM AND COOLING SYSTEMS:** Functions and need of lubrication and cooling system, methods of lubrication- pressure type, mist lubrication. Characteristics of effective cooling system, types of cooling system, thermostat cooling system

**UNIT-II**

**IGNITION SYSTEM:** Introduction, Need of ignition systems and types - Battery Ignition system, Magneto Ignition system, Electronic Ignition system-Capacitive discharge Ignition system.

**CHARGING SYSTEM & STARTING SYTEMS:** Introduction, need of Charging and starting system, Starting Motor, Starting drives, Bendix drive mechanism, and Solenoid switch.

**UNIT-III**

**STEERING SYSTEM:** Introduction, Functions of steering mechanism, steering gear box types, wheel geometry and power steering systems

**BRAKING SYSTEM:** Introduction, functions of braking system and classification of braking system-Hydraulic braking system-Pneumatic braking system, constructional and operation of Antilock braking system

**UNIT-IV**

**TRANSMISSION SYSTEM:** Introduction, Types of gear boxes, functions and types of front and rear axles, types and functions, components of the clutches, fluid couplings, design considerations of Hotchkiss drive torque tube drive, function and parts of differential and traction control.

**UNIT-V**

**SAFTEY MEASURES OFAN AUTOMOBILE**: Introduction-Safety belt, Airbags, wind screen wipers, rear vehicle cameras, bumper design safety.

**AUTOMOBILE POLLUTION:** Emissions from Automobiles- Nitrogen oxides, Soot, Carbon monoxide, Hydrocarbons, Particulates, Emission Regulations

**TEXT BOOKS**

1. Dr. Kirpal Singh, Automobile Engineering-Vol. I& II, 13thEdition, Standard Publishers Distributors, 2014.
2. R.B.Gupta, Automobile Engineering, 8th edition, Tech India publication series, 2013.

**REFERENCES**

1. Srinivasan.S, Automotive Mechanics, 2nd Edition, Tata McGraw-Hill, 2003.
2. Crouse and Anglin, Automotive Mechanism, 9th Edition. Tata McGraw-Hill, 2003.
3. Jack Erjavec, A Systems Approach to Automotive Technology, Cengage Learning Pub., 2009.
4. V.A.W Hillier and David R.Rogers, Hillier‘s Fundamentals of Motor Vehicle Technology, Book1, 5th edition- 2007.
5. Heinz Heisler, Advanced Vehicle Technology, 2ndedition, Butterworth-Heinemann Series, 2002.
6. David A Crolla, Automotive Engineering,1st edition, Butterworth-Heinemann series, 2009.