VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY HYDERABAD
B.TECH. III YEAR
(ELECTRICAL AND ELECTRONICS ENGINEERING)

V SEMESTER **A19**

Course Code	Title of the Course	L	T	P	Contact Hours/ Week	Credits
A19PC1EE07	Power Electronics	3	0	0	3	3
A19PC1EE06	Power Systems – II	3	0	0	3	3
A19PC1EE05	Control Systems	3	0	0	3	3
A19HS1MG04	Principles of Management and Organizational Behaviour	3	0	0	3	3
	Professional Elective - I					
A19PE1EE01	Utilization of Electrical Energy	3	0	0	3	3
A19PE1EE02	Renewable Energy Systems					
A19PE1EE03	Special Machines and Control					
A19PC1IT05	Operating Systems					
A19PC1EC04	Signals and Systems					
	Open Elective - I	3	0	0	3	3
A19PC2EE04	Power Electronics Laboratory	0	0	2	2	1
A19PC2EE03	Control Systems Laboratory	0	0	2	2	1
A19PW4EE02	Internship*	0	0	2	2	1
Total		**18**	**0**	**6**	**24**	**21**
A19MN6HS02	Environmental Sciences	2	0	0	2	0

*** Internship to be pursued during summer break after IV semester and evaluated in V semester**

VI SEMESTER **A19**

Course Code	Title of the Course	L	T	P	Contact Hours/ Week	Credits
A19PC1EE08	Electrical Measurements and Instrumentation	3	0	0	3	3
A19PC1EC10	Microprocessors and Microcontrollers	3	0	0	3	3
A19PC1EE09	Electrical Drives	3	0	0	3	3
	Professional Elective - II					
A19PE1EE04	Power System Operation and Control	3	0	0	3	3
A19PE1EE05	Storage Technologies					
A19PE1EE06	Digital Control Systems					
A19PC1IT03	Computer Organization					
A19PE1EC02	MOS Circuits					
	Open Elective - II	3	0	0	3	3
A19PC2EC07	Microprocessors and Microcontrollers Laboratory	0	0	2	2	1.5
A19PC2EE05	Electrical Measurements and Instrumentation Laboratory	0	0	2	2	1.5
A19HS2EN05	Advanced English Communication Skills Laboratory	0	0	2	2	1
A19PW4EE03	Design Thinking	0	0	4	4	2
Total		**15**	**0**	**10**	**25**	**21**

L – Lecture T – Tutorial P – Practical

OE TRACKS BASED ON MEZZANINE TECHNOLOGIES:

OE TRACKS (Parent Department)	V SEMESTER	VI SEMESTER	VII SEMESTER	VIII SEMESTER
Smart Cities (CE)	Smart Cities Planning and Development **(A19OE1CE01)**	Green Building Technology **(A19OE1CE02)**	Smart Materials and Structures **(A19OE1CE03)**	Intelligent Transportation System **(A19OE1CE04)**
Waste Management (CE)	Solid Waste Management **(A19OE1CE05)**	Hazardous Waste Management **(A19OE1CE06)**	Waste to Energy **(A19OE1CE07)**	Intelligent Waste Management and Recycling System **(A19OE1CE08)**
Green Energy (EEE)	Renewable Energy Sources **(A19OE1EE01)**	Renewable Energy Technologies **(A19OE1EE02)**	Energy Storage Technologies **(A19OE1EE03)**	Energy Management and Conservation **(A19OE1EE04)**
3D Printing & Design (ME)	Elements of CAD **(A19OE1ME01)**	Introduction to 3D Printing **(A19OE1ME02)**	3D Printing - Machines, Tooling & Systems **(A19OE1ME03)**	Reverse Engineering **(A19OE1ME04)**
Internet of Things (ECE)	Sensors Transducers and Actuators **(A19OE1EC01)**	Introduction to Microcontrollers and Interfacing **(A19OE1EC02)**	Fundamentals of Internet of Things **(A19OE1EC03)**	Wireless Sensor Networks **(A19OE1EC08)**
Augmented Reality (AR) / Virtual Reality (VR) (ECE)	Introduction to C Sharp **(A19OE1EC04)**	Introduction to Signal Processing **(A19OE1EC05)**	Introduction to Image & Video Processing **(A19OE1EC06)**	Fundamentals of Augmented Reality & Virtual Reality **(A19OE1EC07)**
Artificial Intelligence (CSE)	Mathematics for Artificial Intelligence **(A19OE1MT01)**	Fundamentals of Artificial Intelligence **(A19OE1CS01)**	Machine Learning Techniques **(A19OE1CS02)**	Deep Learning **(A19OE1CS03)**
Blockchain Technologies (CSE)	Fundamentals of Computer Networks **(A19OE1CS04)** / Relational Data Base Management Systems **(A19OE1CS08)**	Distributed Data Bases **(A19OE1CS05)**	Cryptography and Network Security **(A19OE1CS06)**	Blockchain Technology **(A19OE1CS07)**
Robotics (EIE)	Fundamentals of Robotics **(A19OE1EI01)**	Kinematics and Dynamics of Robots **(A19OE1EI02)**	Drives and Control System for Robotics **(A19OE1EI03)**	Robot Programming and Intelligent Control Systems **(A19OE1EI04)**
Cyber Security (IT)	Fundamentals of Computer Networks **(A19OE1CS04)** / Relational Data Base Management Systems **(A19OE1CS08)**	Cryptography and Network Security **(A19OE1CS06)**	Essentials of Cyber Security **(A19OE1IT01)**	Computer Forensics **(A19OE1IT02)**
Data Sciences / Big Data & Analytics (IT)	Statistical Methods for Data Science **(A19OE1MT02)**	Computational Thinking using Python **(A19OE1IT03)**	Fundamentals of Data Mining **(A19OE1IT04)**	Data Analysis and Visualization **(A19OE1IT05)**
Autonomous Vehicles (AME)	Principles of Automobile Engineering **(A19OE1AE01)**	Modern Automotive Technologies **(A19OE1AE02)**	Electric, Hybrid and Fuel Cell Vehicles **(A19OE1AE03)**	Connected and Autonomous Vehicles **(A19OE1AE04)**

GENERAL POOL OF OE COURSES:

OE TRACKS (Parent Departments)	COURSES
General-Computing (CSE / IT)	• Programming through Java **(A19OE1IT06)** • Relational Data Base Management Systems **(A19OE1CS08)** • Computational Thinking using Python **(A19OE1IT03)** • Introduction to Data Analytics **(A19OE1IT07)** • Fundamentals of Computer Algorithms **(A19OE1CS11)**
General (H&S)	• Professional Ethics & Human Values (**A19OE1HS01**) • Entrepreneurship (**A19OE1HS02)** • Personality Development and Public Speaking (**A19OE1HS03)** • Foreign Language-French (**A19OE1HS04)**
General	• Smart Cities **(A19OE1CE09)** • Trends in Energy Sources for Sustainable Development **(A19OE1EE05)** • 3D Printing and Design **(A19OE1ME05)** • Embedded Systems for IoT **(A19OE1EC09)** • Artificial Intelligence - A Beginner's Guide **(A19OE1CS09)** • Blockchain Technology Essentials **(A19OE1CS10)** • Fundamentals of Robotics and Drones **(A19OE1EI05)** • Fundamentals of Cyber Security **(A19OE1IT08)** • Fundamentals of Data Science **(A19OE1IT09)** • Introduction to Advanced Vehicle Technologies **(A19OE1AE05)** • Introduction to Application Development with C# **(A19OE1CS12)** • Introduction to Application Development with Java **(A19OE1CS13)** • Introduction to Application Development with Python **(A19OE1CS14)**

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19PC1EE07) POWER ELECTRONICS

COURSE PRE-REQUISITES: Circuit Theory, Network Analysis, Electronic Devices and Circuits

COURSE OBJECTIVES:
- To design/develop suitable power converter for efficient control or conversion of power in drive applications
- To design / develop suitable power converter for efficient transmission and utilization of power in power system applications

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the operating characteristics of various power electronic devices and their protection
CO-2: Analyze operating principles of different converters and find their applications
CO-3: Understand the control range/ control methodologies for various power electronic converters

UNIT – I:
Power Semiconductor Devices: Thyristors – Silicon Controlled Rectifiers (SCR's) – BJT – Power MOSFET – Power IGBT and their characteristics
Basic theory of operation of SCR – Static and Dynamic characteristics of SCR - Salient points - Two transistor analogy-UJT firing circuit – Series and Parallel connections of SCRs - Snubber circuit details – Specifications and Ratings of SCRs, BJT, MOSFET, IGBT, Numerical problems, natural and forced commutation (Principle only).

UNIT – II:
Single Phase Controlled Converters: Single Phase Half Controlled Converters: Half controlled converters with R, RL and RLE loads – Derivation of average load voltage and current -with free- wheeling Diode – Numerical problems
Single Phase Fully controlled Converters: Bridge connections with R, RL and RLE loads- Derivation of average load voltage and current - Performance parameters of single phase full bridge converter, Effect of source inductance – Numerical problems.

UNIT – III:
Three Phase Controlled Converters: Three Phase Converters – Three pulse and six pulse converters – Bridge connections, average load voltage with R and RL loads – Effect of Source inductance – Numerical Problems.

UNIT – IV:
DC-DC Buck Converter: Elementary chopper with an active switch and diode, concepts of duty ratio and average voltage, power circuit of a buck converter, analysis and waveforms at steady state, duty ratio control of output voltage.
DC-DC Boost Converter: Power circuit of a boost converter, analysis and waveforms at steady state, relation between duty ratio and average output voltage.

UNIT – V:

Single-Phase Voltage Source Inverter: Power circuit of single-phase voltage source inverter, switch states and instantaneous output voltage, square wave operation of the inverter, concept of average voltage over a switching cycle, bipolar sinusoidal modulation and uni-polar sinusoidal modulation, modulation index and output voltage.

Three-Phase Voltage Source Inverter: Power circuit of a three-phase voltage source inverter, switch states, instantaneous output voltages, average output voltages over a sub-cycle, three-phase sinusoidal modulation.

UNIT – VI:

AC Voltage Controllers: Single phase AC voltage controllers with R and RL loads-wave forms – Modes of operation of Triac – Triac with R and RL loads – Derivation of RMS load voltage – Numerical problems

Cyclo Converters: Cyclo converters – Single phase midpoint cyclo converters with Resistive and inductive load (Principle of operation only)

TEXT BOOKS:

1. Power Electronics: Circuits, Devices and Applications, M. H. Rashid, Pearson Education, 2009
2. Power Electronics, P. S. Bimbhra, Khanna Publishers
3. Power Electronics: Converters, Applications and Design, N. Mohan and T. M. Undeland, John Wiley & Sons, 2007

REFERENCES:

1. Fundamentals of Power Electronics, R. W. Erickson and D. Maksimovic, Springer Science & Business Media, 2007
2. Power Electronics, P. C. Sen, Tata McGraw-Hill Education
3. Thyristorised Power Controllers, S. R. Doradla, A. Joshi, R. M. K. Sinha, G. K. Dubey, New Age Books
4. Power Electronics, M. D. Singh, K. B. Kanchandhani, 2nd Edition, Tata McGraw-Hill, 2006
5. Power Electronics: Essentials and Applications, L. Umanand, Wiley India, 2009

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19PC1EE06) POWER SYSTEMS-II

COURSE PRE-REQUISITES: Thorough knowledge of Power Systems-I, Circuit Theory and Electrical Machines

COURSE OBJECTIVES:
- To describe load flow methods
- To analyze symmetrical and unsymmetrical faults
- To describe stability types
- To learn different methods of stability analysis

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Develop network matrices and solve load flow problems using different methods
CO-2: Analyze symmetrical and unsymmetrical faults
CO-3: Evaluate steady state stability of synchronous machine
CO-4: Assess transient stability and understand its improvement methods

UNIT – I:
Power System Network Matrices: Graph Theory: Basic Concepts-Branch, Link, bus Incidence Matrix, Formation of Bus Admittance Matrix using direct inspection and singular transformation methods- Numerical Problems. Formation of Zbus: Algorithm for Modification of Zbus Matrix for addition of an element for the following cases- Addition of an element as a link, Addition of an element as a tree branch.

UNIT – II:
Power Flow Analysis: Introduction, Classification of buses, Formulation of static load flow equations, Solution techniques using Gauss Seidel Method- Algorithm and Flowchart. Newton Raphson Method in Rectangular and Polar Coordinates Form- Algorithm and Flowchart. Decoupled and Fast Decoupled Methods- Algorithm and Flowchart, Comparison of Different Methods.

UNIT – III:
Symmetrical Fault Analysis: Per-Unit System: p.u. Representation of a transformer, p.u. equivalent reactance network of Power System, Numerical Problems. Symmetrical fault Analysis: Short Circuit on NL Synchronous Machine – sub transient, transient and steady state models, Short Circuit on loaded Synchronous Machine. Short circuit Current and MVA Calculations, Fault limiting Reactors- Generator reactors, Bus bar Reactors and Feeder Reactors - Numerical Problems.

UNIT – IV:
Unsymmetrical Fault Analysis: Symmetrical Component Theory: Symmetrical Component Transformation and its power invariance, Sequence Networks: Positive, Negative and Zero sequence Networks for transformers, transmission line and synchronous machines - Numerical Problems.
Unsymmetrical Fault Analysis: LG, LL, LLG faults, Interconnection of sequence networks, effect of fault impedance, Numerical Problems.

UNIT – V:

Steady State Stability Analysis: Classification of Power system stability, Stability: Concept of steady state, Dynamic and Transient Stability. Dynamics of synchronous machine and its Inertia Constant, Derivation of Swing Equation. Equivalent Inertia Constant for two machine coherent system. Classical machine model, Power Angle Curve. Determination of Steady State Stability limit, Transfer Reactance, Synchronizing Power Coefficient, Numerical problems.

UNIT – VI:

Transient Stability Analysis: Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion: Sudden change in Mechanical Input, Sudden loss of one of parallel lines, Sudden short circuit on one of the lines-Short Circuit at one end, away from line and reclosure. Critical Clearing Angle Calculation, Solution of Swing Equation: Point-by-Point Method and transient stability improvement methods.

TEXT BOOKS:

1. Modern Power system Analysis, I. J. Nagrath and D. P. Kothari, 2nd Edition, Tata McGraw-Hill
2. Elements of Power System, Stevenson, Tata McGraw-Hill
3. Power System Analysis, B. R. Gupta, Wheeler Publications

REFERENCES:

1. Power System Analysis, Grainger and Stevenson, Tata McGraw-Hill
2. Power System Analysis, A. R. Bergen, Prentice Hall
3. Power System Analysis, Hadi Saadat, Tata McGraw-Hill
4. Computer Techniques in Power System Analysis, M. A. Pai, Tata McGraw-Hill

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19PC1EE05) CONTROL SYSTEMS

(Common to EEE, ECE & EIE)

COURSE PRE-REQUISITES: Ordinary Differential Equations and Laplace Transform

COURSE OBJECTIVES:

- To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response
- To assess the system performance using time domain analysis and methods for improving it
- To assess the system performance using frequency domain analysis and techniques for improving the performance
- To design various controllers and compensators to improve system performance

COURSE OUTCOMES: After completion of the course, the student should be able to

CO -1: Analyze the system steady state and transient performance

CO-2: Evaluate the effects of feedback on system performance

CO-3: Obtain the transfer function/ state space models

CO-4: Design suitable controller and compensator for the improvement of system performance

UNIT – I:

Introduction to Control Problem: Open-Loop and Closed-loop systems, benefits of Feedback. Mathematical models of physical systems. Transfer function models of linear time-invariant systems –RLC Circuits, DC and AC servo motors. Block diagram algebra and Signal Flow Graphs.

UNIT – II:

Time Response Analysis: Standard test signals. Time response of first and second order systems for standard test inputs. Application of initial and final value theorems. Design specifications for second-order systems based on the time- response.

UNIT – III:

Stability and Root Locus: Concept of Stability, Routh-Hurwitz Criterion, Relative Stability analysis. Root-Locus technique. Construction of Root-loci.

UNIT – IV:

Frequency-Response Analysis: Relationship between time and frequency response. Bode plots- transfer function from bode plot-phase and gain margins- stability analysis. Polar and Nyquist plots, Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margins.

UNIT – V:

Introduction to Controller Design: Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems. Root-loci method of feedback controller design- Application of Proportional, Integral and Derivative

Controllers. Design specifications in frequency-domain. Frequency domain methods of design- Lead and Lag compensators.

UNIT – VI:

State Space Analysis: Concepts of state variables. State space model - RLC circuits and DC motors. State Transition Matrix and its properties- Transformations: State space to Transfer function and vice versa. Eigenvalues and Stability Analysis. Concept of controllability and observability.

TEXT BOOKS:

1. Control Systems Engineering, J. Nagrath and M. Gopal, New Age International, 2009
2. Modern Control Engineering, K. Ogata, Prentice Hall, 1991

REFERENCES:

1. Modern Control Systems, Richard C. Dorf and Robert H. Bishop
2. Automatic Control System, B. C. Kuo, Prentice Hall, 1995
3. Control Systems: Principles and Design, M. Gopal, McGraw-Hill Education, 1997

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19HS1MG04) PRINCIPLES OF MANAGEMENT AND ORGANIZATIONAL BEHAVIOUR

COURSE PRE-REQUISITES: Engineering Economics and Accounting (EEA)

COURSE OBJECTIVES:

- To understand the principles, functions and theories of management and expose with a systematic and critical understanding of organizational theory, structures and design
- To comprehend the conceptual knowledge relating to Organizational Behaviour
- To provide a basic understanding of the behavior of individuals and groups in the organizations
- To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Apply theories to improve the practice of management and describe and assess the basic design elements of organizational structure and evaluate their impact on employees

CO-2: Analyse the behaviour of individuals and groups in organizations in terms of the key factors that influence organizational behaviour

CO-3: Appreciate the management challenges associated with high levels of change in the organizations

CO-4: Evaluate the appropriateness of various leadership styles, conflict management strategies and motivational strategies used in a variety of organizational settings

UNIT – I:

Introduction to Management:

Concepts of Management - Nature, Importance, and Functions of management; Taylor's Scientific Management Theory; Fayol's Principles of Management; Social Responsibilities of Management; Planning-definition and types of plans; decision making-definition and process

Organizing – Definition and Principles of Organization; Organization chart; Types of mechanistic and organic structures of organization - Line Organization, Line And Staff Organization, Functional Organization, Committee Organization, Matrix Organization, Virtual Organization, Cellular Organization, Team Structure, Boundaryless Organization, Inverted Pyramid Structure, And Lean And Flat Organization Structure; features and suitability.

UNIT – II:

Motivation and Leadership:

Motivation- Definition; Theories: Maslow's need of Hierarchy, Herzberg two Factor, Mc Gregor Theory X and theory Y and Alderfer's ERG.

Leadership- Definition; Styles and Theories: Trait, Behavioural and Contingency.

UNIT – III:

Introduction to Organizational Behaviour:

Organizational Behaviour- Definition; Historical Background; Nature, Scope and Importance; Linkages with other social Sciences; Approaches and Models.

UNIT – IV:

Perception and Personality:

Perception- Definition; Factors influencing; Perceptual Selectivity; Perceptual Organisation and Social Perception.

Personality- Definition; Determinants; Theories; Traits; Big Five Personality Model.

UNIT – V:

Interpersonal Skills:

Communication- Definition; Process; Direction; Interpersonal and Organizational and Barriers.

Teams and Groups- Definition; Types of teams and groups; Five-Stage Model; Characteristics of an effective teams; Johari Window & Transactional Analysis

UNIT – VI:

Organizational – Conflict, Stress Management, Change and Development:

Organizational Conflict- Definition; Reasons; Types and Levels; Handling Styles.

Stress Management-Definition; Types; Model; Consequences and Strategies to manage

Organizational Change - Definition; Types; Resistance; Overcoming and Approaches: Lewin's Three-Step Change Model, Kotter's Eight-Step Plan for Implementing Change.

Organizational Development- Definition; Nature and Interventions.

TEXT BOOKS:

1. Management, James Arthur, Finch Stoner, R. Edward Freeman, and Daniel R. Gilbert, 6th Edition, Pearson Education/Prentice Hall
2. Organizational Behaviour, Stephen P. Robbins, Prentice Hall, 2013
3. Organizational Behaviour, Fred Luthans, McGraw-Hill, 2013

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19PE1EE01) UTILIZATION OF ELECTRICAL ENERGY

COURSE PRE-REQUISITES: Electrical Machines, Circuit Theory

COURSE OBJECTIVES:

- To familiarize with electrical energy and its use when it is converted into several forms of energy
- To deal with the fundamentals of illumination and its classification and the electric heating and welding
- To learn the basic knowledge of electric drives
- To learn the different types of speed time curves in traction system

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand the basic principles of illumination and its design and electric welding and its types

CO-2: Describe various methods of electric heating and design of heating element

CO-3: Know types of electric drives, performance characteristics, braking methods and their applications

CO-4: Describe existing electric traction systems, Speed-time curves for different services

CO-5: Understand the Mechanics of Train movement and specific energy consumption

UNIT – I:

Illumination: Introduction, Terms used in illumination, laws of illumination, sources of light, Incandescent lamps, Discharge lamps-MV and SV lamps, fluorescent lamps, Effect of voltage variation on lamp efficiency – Comparison of Incandescent and Discharge lamps, Type of lighting schemes, factory lighting, flood lighting and street lighting.

UNIT – II:

Electric Heating: Electrical heating-advantages, methods and applications, Resistance heating, design of heating element, efficiency calculations. Induction heating: Core type and Core less furnaces and high frequency eddy current heating, dielectric heating: principle and applications – Problems.

UNIT – III:

Electric Welding: Electric welding-advantages, Types of welding-resistance and arc welding, Electric welding equipment, comparison between A.C and D.C Welding.

UNIT – IV:

Electric Drives: Introduction to Electric drive-advantages, Types of electric drives, choice of motor, starting and running characteristics, speed control, Methods of Electric Braking: Plugging, Rheostatic and Regenerative Braking. Temperature rise, particular applications of electric drives, types of industrial loads, continuous, intermittent and variable loads, load equalization.

UNIT – V:

Electric Traction – I: Electric traction--types, Review of existing electric traction systems in India. Special features of traction motor, Modern 25 KV A.C. single phase traction systems: advantages, equipment and layout of 25 KV single phase A.C. traction system. Simplified speed time curves, Average and scheduled speed - Quadrilateral and Trapezoidal speed time curves-Problems.

UNIT – VI:

Electric Traction – II: Mechanics of train movement: Adhesive Weight, coefficient of Adhesion, tractive effort and specific energy consumption, factors affecting specific energy consumption-problems.

TEXT BOOKS:

1. Utilization of Electric Energy, E. Openshaw Taylor, Orient Longman, 1971
2. Art & Science of Utilization of Electrical Energy, Partab, Dhanpat Rai & Sons
3. Utilization of Electric Power and Electric Traction, G. C. Garg, Khanna Publishers

REFERENCES:

1. Utilization of Electrical Power including Electric Drives and Electric Traction, N. V. Suryanarayana, New Age International,1996
2. Generation, Distribution and Utilization of Electrical Energy, C. L. Wadhwa, New Age International, 1997
3. Utilization of Electrical Power, J. B. Gupta, Kataria Publishers

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19PE1EE02) RENEWABLE ENERGY SYSTEMS

COURSE PRE-REQUISITES: Environmental Science and Physics

COURSE OBJECTIVES:
- To provide necessary knowledge about the modeling, design and analysis of various PV systems
- To show WECS environmentally sustainable alternative to the world's energy supplies
- To understand the power conditioning of PV & WECS system's power output

COURSE OUTCOME: After completion of the course, the student should be able to
CO-1: Model, analyze and design various photovoltaic systems
CO-2: Design appropriate power conditioning system for WECS system
CO-3: Design an efficient storage system for standalone Renewable Energy systems

UNIT – I:
Photovoltaic Energy Conversion: Photovoltaic Energy Conversion, Solar radiation and measurement -solar cells and their characteristics- types - equivalent circuit-modeling of solar cells including the effects of temperature, irradiation and series/shunt resistances on the open-circuit voltage and short-circuit current, I-V, P-V Characteristics. Solar cell arrays- PV modules-PV generators- shadow effects and bypass diodes- hot spot problem in a PV module

UNIT – II:
Solar PV Power Conditioning: Switching devices for solar energy conversion, DC Power conditioning converters - maximum power point tracking algorithms -AC power conditioners -Line commutated inverters -synchronized operation with grid supply - Harmonic problem, Battery charger operation –Applications.

UNIT – III:
Wind Energy Conversion (WEC): Basic Principle of wind energy conversion -nature of wind -wind survey in India -Power in the wind -components of a wind energy - conversion system -Performance of induction generators for WECS, Site selection, classification of WECS.

UNIT - IV:
Self-Excited & Grid Connected WECS: Self excited induction generator for isolated power generators -Theory of self-excitation -Capacitance requirements -Power conditioning schemes -Controllable DC Power from Self excited induction generators (SEIGs) -system performance.
Grid Connected WECS: Grid connectors concepts -wind farm and its accessories -Grid related problems

UNIT – V:
Storage Systems: Energy Storage Parameters -Lead–Acid Batteries –Ultra capacitors - Flywheels -Superconducting Magnetic Storage System -Pumped Hydroelectric Energy

Storage -Compressed Air Energy Storage -Storage Heat -Energy Storage as an Economic Resource.

UNIT – VI:

Estimation of Energy Storage and Feasibility Analysis: Background-Solar Power-Wind Power (Brief discussion), Estimation-daily residential load-daily available solar energy-daily available wind energy-Importance, Estimation of Storage sizing- Steps for Storage sizing- Grid connected residential PV-grid connected residential Wind-hybrid system, Feasibility analysis of Storage systems- Various Terms involved- Case study of comparison between Off grid and grid connected systems

TEXT BOOKS:

1. Non-conventional Energy Sources, Rai G. D., Khanna Publishers, 2002
2. Wind and Solar Power Systems, Mukund R. Patel, CRC Press, 2004
3. Energy Storage Technologies and Applications, Ahmed Faheem Zobaa, InTech Publishers, 2013

REFERENCES:

1. Solar Energy Utilization, Rai G. D., Khanna Publishers,1997
2. Wind Energy Systems, Gray L. Johnson, Prentice Hall Inc., 1985

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19PE1EE03) SPECIAL MACHINES AND CONTROL

COURSE OBJECTIVES:

- To know the use of special machines in different feed-back systems
- To understand the use of micro-processors for controlling different machines
- To know their applications as control systems components

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Use different special machines as part of control system components
CO-2: Use special machines as transducers for converting physical signals into electrical signals
CO-3: Use micro-processors for controlling different machines
CO-4: Select different special machines as control system components

UNIT - I:

Stepping Motors: Constructional features, principle of operation, modes of excitation, single phase stepping motors, torque production in variable Reluctance (VR) stepping motor, Dynamic characteristics, Drive systems and circuit for open loop control, Closed loop control of stepping motor, microprocessor-based controller.

UNIT – II:

Synchronous Reluctance Motors: Constructional features: axial and radial air gap Motors. Operating principle, reluctance torque – Phasor diagram, motor characteristics, linear induction motors.

UNIT – III:

Switched Reluctance Motors: Constructional features, principle of operation. Torque equation, Power controllers, Characteristics and control. Microprocessor based controller. Sensor less control.

UNIT-IV:

Permanent Magnet Brushless DC Motors: Commutation in DC motors, Difference between mechanical and electronic commutators, Hall sensors, Optical sensors, Multiphase Brushless motor, Square wave permanent magnet brushless motor drives, Torque and emf equation, Torque-speed characteristics, Controllers- Microprocessor based controller. Sensorless control.

UNIT-V:

Permanent Magnet Synchronous Motors: Principle of operation, EMF equation, power input and torque expressions, Phasor diagram, Power controllers, Torque speed characteristics, Self-control, Vector control, Current control schemes. Sensor less control.

UNIT-VI:

Axial Flux Machines: Principle of Operation, comparison between axial and radial flux machines, advantages, N-N and N-S type, single air-gap and multi air-gap machines,

sizing equations, power density comparison between axial and radial flux machines, applications.

TEXT BOOKS:

1. Brushless Permanent Magnet and Reluctance Motor Drives, T. J. E. Miller, Clarendon Press, 1989
2. Stepping Motors – A Guide to Motor Theory and Practice, P. P. Aearnley, Peter Perengrinus, 1982

REFERENCES:

1. Stepping Motors and Their Microprocessor Controls, T. Kenjo, Clarendon Press, 1984
2. Permanent Magnet and Brushless DC Motors, T. Kenjo and S. Nagamori, Clarendon Press,1988

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19PC1IT04) OPERATING SYSTEMS

COURSE OBJECTIVES:

- To study the basic concepts and functions of operating systems
- To summarize various approaches to solve the problem of process concurrency in an operating system
- To evaluate the memory usage trade-offs in terms of size (main memory, auxiliary memory) and processor speed
- To understand disk storage strategies and file strategies with protection and security issues

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Identify System calls and evaluate process scheduling criteria of OS
CO-2: Develop procedures for process synchronization and scheduling services of an OS
CO-3: Distinguish disk access, file systems supported by an OS
CO-4: Extend operating systems virtual memory, protection and security aspects

UNIT – I:
Computer System and Operating System Overview: Overview of Computer System hardware, Operating System Objectives and functions Operating System Services, System Calls, System Programs.
CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms and evaluation.

UNIT – II:
Linux Utilities: File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities and Backup utilities, sed – scripts, operation, addresses, commands, applications, awk – execution, fields and records, scripts are using system commands in awk.

UNIT – III:
Process Management: Process Description, Process Control Block, Process States, Threads Overview.
Concurrency: Cooperating Processes, Inter-process Communication, Principles of Concurrency, Mutual Exclusion, Software and hardware approaches, Semaphores, Monitors, Message Passing, Classic problems of synchronization.
Inter Process Communication: Introduction to IPC, Pipes, and FIFOs, Introduction to three types of IPC-message queues, semaphores and shared memory. Message Queues Kernel support for messages, client/server example.

UNIT – IV:
Principles of Deadlock: System Model, Deadlock Characterization, Methods for handling Deadlocks, Deadlock Prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlocks, Dining philosopher‘s problem.

UNIT-V:

Memory Management: Basic concepts, Swapping, Contiguous memory allocation, Paging, Segmentation, Virtual memory, Demand paging, Page-replacement algorithms, Thrashing.

Secondary Storage Structure: Disk structure; Disk scheduling, Disk management, Swap space Management, RAID structure, Stable-storage Implementation

Case studies: windows, Unix, Linux.

UNIT –VI:

File Management: File system-File concepts, File System Structure, Inodes, File Attributes, File types, Access methods, Symbolic links & hard links, Directory structure, Filesystem mounting, Implementing file systems-File system structure and implementation, Directory implementation, Allocation methods, Free-space management, Efficiency and performance

Protection & Security: Protection mechanisms, OS Security issues, threats, Intruders, Viruses,

Case Studies: windows, Unix, Linux.

TEXT BOOKS:

1. Operating System Principles, Abraham Silberchatz, Peter B. Galvin, Greg Gagne, 7th Edition, John Wiley
2. Unix Concepts and Applications, Sumitabha Das, 4th Edition, Tata McGraw-Hill, 2006

REFERENCES:

1. Modern Operating Systems, Andrew S. Tanenbaum, 2nd Edition, Pearson/PHI
2. Operating Systems – A Concept Based Approach, D. M. Dhamdhere, 2nd Edition
3. Unix System Programming using C++, T. Chan, PHI
4. Operating Systems - Internal and Design Principles, Stallings, 5th Edition, Pearson Education/PHI, 2005

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19PC1EC04) SIGNALS AND SYSTEMS

(Common to EEE, ECE & EIE)

COURSE PRE-REQUISITES: Calculus for Engineers, Linear Algebra and Advanced Calculus

COURSE OBJECTIVES:

- To understand various fundamental characteristics of signals and systems
- To study the importance of transform domain
- To analyze and design various systems
- To study the effects of sampling
- To understand Laplace and Z-transforms their properties for analysis of signals and systems

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Classify the signals and implement various operations on signals

CO-2: Analyze the spectral characteristics of signals and systems

CO-3: Understand the conditions for physical realizability of a system

CO-4: Identify the significance of sampling types and applications of correlation functions

CO-5: Discover the significance of LT, ZT and their relation

UNIT – I:

Representation of Signals: Continuous time and Discrete Time signals, Classification of Signals – Periodic and aperiodic, even and odd, energy and power signals, deterministic and random signals, causal and non-causal signals, complex exponential and sinusoidal signals. Concepts of standard signals. Various operations on Signals.

UNIT – II:

Signal Analysis: Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Closed or complete set of orthogonal functions.

Fourier Series Representation of Periodic Signals: Dirichlet conditions, Representation of Continuous time periodic signals using Trigonometric and Exponential Fourier series, Complex Fourier spectrum, Gibb's Phenomenon.

UNIT – III:

Fourier Transform: Fourier transform from Fourier series, Fourier transform of standard signals and periodic signals, properties of Fourier transform with proof, Inverse Fourier Transform.

Laplace Transform: Concept of Region Of Convergence (ROC) for Laplace transform, Properties of ROC, Inverse Laplace Transform, Relation between Laplace Transform and Fourier transform of a signal. Introduction to Hilbert Transform and its properties.

UNIT – IV:

Signal Transmission through Linear Systems: Classification of Continuous time and discrete time Systems, impulse response, Response of a linear system, Transfer function and Filter characteristics of an LTI system, Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley -Wiener criterion for physical realization.

UNIT – V:

Convolution and Correlation of Signals: Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Properties of Convolution, Concepts of correlation, properties of correlation. Relation between convolution and correlation, Detection of periodic signals in the presence of noise by correlation.

Sampling Theorem: Representation of continuous time signals by its samples - Sampling theorem – Reconstruction of a Signal from its samples, aliasing – discrete time processing of continuous time signals, sampling of band pass signals.

UNIT – VI:

Z –Transform: Basic principles of z-transform, region of convergence, properties of ROC, Properties of z-transform with proofs, Poles and Zeros. Inverse z-transform – Power series method, Residue Theorem method, Convolution Method and Partial fraction expansion method.

TEXT BOOKS:

1. Signals, Systems and Communications, B. P. Lathi, B. S. Publications, 2009
2. Signals and Systems, Alan V. Oppenheim, Alan S. Willsky and S. Hamid Nawab, 2nd Edition, PHI ,1997

REFERENCES:

1. Signals and Systems, A. Anand Kumar, 2nd Edition, PHI, 2012
2. Signals and Systems, Simon Haykin and Barry Van Veen, 2nd Edition, John Wiley, 1998

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	0	**2**	**1**

(A19PC2EE04) POWER ELECTRONICS LABORATORY

COURSE PRE-REQUISITES: Power Electronics

COURSE OBJECTIVES:
- To apply the concepts of power electronic converters for efficient conversion/control of power from source to load
- To design the power converter with suitable switches meeting a specific load requirement

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the operating principles of various power electronic converters
CO-2: Use power electronic simulation packages& hardware to develop the power converters
CO-3: Analyze and choose the appropriate converters for various applications

LIST OF EXPERIMENTS:

1. Characteristics of SCR, MOSFET & IGBT
2. Gate firing circuit for SCR using UJT, Gate drive circuits for MOSFET, IGBT
3. Single Phase fully controlled bridge converter with R and RL loads
4. DC-DC buck converter
5. DC-DC boost converter
6. Single Phase Bridge inverter with R and RL loads
7. Single Phase AC Voltage Controller with R and RL Loads
8. Single Phase Cyclo-converter with R and RL loads
9. (a) Simulation of single-phase Semi converter using R and RL loads
   (b)Simulation of single-phase full converter using R, RL and RLE loads
10. Simulation of three-phase full converter using R, RL and RLE loads
11. (a)Simulation of DC-DC buck converter
    (b) Simulation of DC-DC boost converter
12. (a)Simulation of single phase Inverter with PWM control
    (b) Simulation of three phase Inverter with PWM control

REFERENCES:

1. Simulation of Electric and Electronic Circuits using PSPICE, M. H. Rashid, PHI Publications
2. PSPICE A/D User's Manual, Microsim, USA
3. PSPICE Reference Guide, Microsim, USA
4. MATLAB and its Tool Box, User Manual, Mathworks, USA

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	0	**2**	**1**

(A19PC2EE03) CONTROL SYSTEMS LABORATORY

COURSE PRE-REQUISITES: Control Systems

COURSE OBJECTIVES:

- To understand the different ways of system representations such as Transfer function representation and state space representations
- To get the transfer functions of various physical and laboratory-based systems
- To design various controllers and compensators to improve system performance and test them in the laboratory
- To get the performance of various devices (Magnetic amplifiers, Servo motors and stepper motors etc.)

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Analyze the system steady state and transient performance
CO-2: Evaluate the effects of feedback on system performance
CO-3: Obtain the transfer function/ state space models
CO-4: Design suitable controller and compensator for the improvement of system Performance

LIST OF EXPERIMENTS:

1. Time response of second order system with different values of ζ
2. Effect of PID Controller on dynamic response of second order systems.
3. Design of lead compensator and its magnitude and phase plots
4. Design of lag compensator and its magnitude and phase plots
5. Transfer function of DC motor
6. Effect of feedback on performance of DC servo motor
7. Characteristics of AC servo motor
8. Temperature control using PID Controller
9. Simulation of PID controllers and its effects on system performance
10. Stability analysis using Root locus, Bode and Nyquist plots through Simulation
11. Root locus-based design of controllers for improving system performance through Simulation
12. Frequency domain-based design of compensators for improving system stability through Simulation

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING & TECHNOLOGY

B.Tech. V Semester	**L**	**T/P/D**	**C**
	0	**2**	**0**

(A19MN6HS02) ENVIRONMENTAL SCIENCE

COURSE PREREQUISITES: Basic knowledge of environmental issues

COURSE DESCRIPTION:
Environmental science is the study of patterns and processes in the natural world and their modification by human activity. We as human beings are not an entity, separate from the environment around us, rather we are a constituent seamlessly integrated and co-exist with the environment around us. To understand current environmental problems, we need to consider physical, biological and chemical processes that are often the basis of those problems. The course requires the students to identify and analyse natural and human- made environmental problems, evaluate the relative risks associated with these problems, and examine alternative solutions for resolving or preventing them. This course will survey some of the many environmental science topics at an introductory level, ultimately considering the sustainability of human activities on the planet. We are not an entity so separate from the environment that we can think of mastering and controlling it rather we must understand that each and every action of ours reflects on the environment and vice versa.

COURSE OBJECTIVES:
- To recognize the impacts of human interventions towards environment
- To list out the benefits in creating a sustainable environment
- To sketch out various activities in achieving a cleaner environment
- To emphasize the role of an individual for a better planet to live

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Gain a variety of experiences & acquire a basic knowledge about the environment & its allied problems
CO-2: Interpret the key components in safe guarding the environment
CO-3: Appraise the quality of environment in order to create a healthy atmosphere
CO-4: Familiarize with the individual responsibilities towards green revolution

MODULE 1: INTRODUCTION
Environmental Science: Introduction, Definition, scope and importance.

MODULE 2: AWARENESS ACTIVITIES
Small group meetings about:
- Water management
- Projects Vs Environment
- Generation of less waste
- Promotion of recycle use
- Impact of Science & Technology on Environment
- Avoiding electronic waste

MODULE 3: SLOGAN AND POSTER MAKING EVENT
- Food waste management
- Rain water harvesting

- Climate change
- Green Power
- Water conservation
- Green at work
- Role of IT in environment and human health
- Sustainable development

MODULE 4: EXPERT LECTURES ON ENVIRONMENTAL SCIENCE
- Environmental Impact Assessment
- Industrial waste treatment
- Organic farming/Vertical gardens/Hydroponics

MODULE 5: CLEANLINESS DRIVE
- Indoor air pollution
- Vehicular pollution
- VISUAL pollution
- Waste management at home
- Composting
- Plastic recycling

MODULE 6: CASE STUDIES
- HPCL disaster in Vizag
- Oleum gas leak in Delhi
- Mathura Refinery & Taj Mahal
- Conservation of Hussain Sagar lake
- The Cleanliest city of India-Surat
- Green Buildings in India
- KBR park in Hyderabad (Environmental protection Vs Development)
- Fluorosis
- Ecotourism & its impacts

TEXT BOOKS:
1. Environmental Studies for UG Courses, Erach Bharucha, UGC Publications, Delhi, 2004
2. Textbook of Environmental Studies, Deeksha Dave, S. S. Katewa, Cengage Delmar Learning India Pvt., 2012

REFERENCES:
1. Introduction to Environmental Science, Y. Anjaneyulu, B. S. Publications, 2004
2. Environmental Studies, Anubha Kaushik & C. P. Kaushik, 4th Edition, New Age International

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B.Tech. VI Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19PC1EE08) ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

COURSE PRE-REQUISITES: Circuit Theory, Electrical Machines – II, Electro Magnetic Field Theory

COURSE OBJECTIVES:
- To introduce the basic concepts related to the operation of electrical and electronic measuring instruments
- To measure high voltages & high currents in distribution systems using Instrument transformers
- To measure unknown inductance, resistance, capacitance using DC bridges & AC bridges
- To know the operation of AC and DC potentiometers

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply the knowledge about the instruments to use them more effectively
CO-2: Suggest the kind of instrument suitable for typical measurements
CO-3: Apply the knowledge about transducers to use them effectively
CO-4: Apply the knowledge about instrument transformers to use them more effectively in distribution systems

UNIT – I:
Introduction to Measuring Instruments: Static characteristics of instruments- Accuracy, Precision, Linearity, Sensitivity, Dead time, Dead zone &Resolution. Types of errors, Random error analysis, Probable error or tolerance
Introduction to Measuring Instruments: Classification of measuring Instruments-operating forces in measuring instruments & systems to provide Deflecting, Control and Damping Torques.

UNIT – II:
Measurement of Voltage, Current, Power, Power Factor and Energy: PMMC, Moving iron type instruments-Expression for the deflecting torque and control torque Extension of range using shunts and series resistance, dynamometer type instruments, single phase energy meter, errors and calibration, Measurement of Power and Energy, Power factor meter.

UNIT – III:
Measurement of Resistance, Inductance and Capacitance: Measurement of low, medium and high resistances, insulation resistance measurement, Megger.
AC bridges Inductance Measurement: Maxwell's inductance bridge, Maxwell's inductance-Capacitance Bridge, Anderson's bridge, Owen's bridge, Hay's bridge.
Capacitance Measurement: Desauty's bridge, Shearing bridge, High voltage shearing bridge, Wien's bridge.

UNIT – IV:
Instrument Transformers and Potentiometers: Current and Potential transformers, ratio and phase angle errors, turns compensation, measurement of power using instrument transformers.

Potentiometers: DC potentiometers, Calibration of Voltmeters, Ammeters and UPF watt meter using D.C potentiometers.

UNIT – V:

Electronic Measurements: Digital voltmeters & types, digital multimeters, CRO: calculation of deflection sensitivity, Deflection factor, Frequency and phase angle measurements using CRO, Digital storage oscilloscope, electronic timer & counter for frequency & time measurement.

UNIT – VI:

Instrumentation: Transducers, classification of transducers, strain gauges, Types of strain gauges, inductive & capacitive transducers, piezoelectric and Hall-effect transducers for displacement measurement, thermistors, thermocouples, Introduction to smart sensors.

Data Acquisition Systems: Types of instrumentation systems, components of analog data acquisition systems.

TEXT BOOKS:

1. Electrical and Electronics Measurements and Instrumentation, A. K. Sawhney, Dhanpat Rai & Co.
2. Electrical Measurement and Measuring Instruments, Golding E.W, 3rd Edition, Sir Issac Pitman and Sons, 1960
3. Modern Electronic Instrumentation and Measurement Techniques, Helfrick Albert D, Cooper William D., Prentice-Hall of India, 1992

REFERENCES:

1. Instrumentation Measurement and Feedback, Jones B.E, Tata McGraw-Hill, 1986

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B.Tech. VI Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19PC1EC10) MICROPROCESSORS AND MICROCONTROLLERS

(Common to ECE, EEE & EIE)

COURSE PRE-REQUISITES: Digital System Design, Computer Organization

COURSE OBJECTIVES:

- To understand architectures of various microprocessors and microcontrollers
- To understand basic programming concepts and software development tools
- To learn interfacing techniques necessary for designing processor/ controller based real time systems

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand the evolution and architectures of 8086 & ARM Cortex-M3

CO-2: Analyse and understand the instruction set of 8086 & ARM Cortex-M3

CO-3: Understand the exception, interrupts and interrupt handling schemes

CO-4: Analyse and interface various peripherals for the design of processor/ controller-based systems

UNIT – I:

Introduction to 8086 Microprocessor:

Architecture of 8086 Microprocessor: Introduction to microprocessor family, Microprocessors Vs Microcontrollers, 8086 Internal Architecture, Addressing modes

Instruction Set: Data transfer instructions, String instructions, Logical instructions, Arithmetic instructions, Control transfer instructions, Process control instructions.

UNIT – II:

Hardware & Software details of 8086 Microprocessor:

Programming 8086 Microprocessor: Assembler directives, Procedures and Macros, Simple assembly language programs

Operating Modes: Basic 8086 Configurations - Minimum mode and Maximum mode, System bus timing - Timing diagrams for minimum mode and maximum mode systems.

UNIT – III:

IO Interfaces:

Parallel I/O Interface: Parallel I/O Interface 8255A - Internal block diagram and System connections, Operational modes and initialization, Interfacing with 8086, Interfacing Analog to Digital Converters (ADCs) and Digital to Analog Converters (DACs) with 8086

Serial I/O Interface: Serial data communication, Serial data transmission methods and standards - RS-232C, Intel 8251A- USART architecture and interfacing with 8086.

UNIT – IV:

ARM Processors:

Introduction to ARM Processors: ARM Cortex-M3 Processor, Background of ARM and ARM Architecture - Architecture Versions, Processor Naming, Instruction Set Development, Thumb-2 Technology and Instruction Set Architecture, Applications

ARM Cortex-M3 Organization: ARM Cortex-M3 Block diagram, Bus Interfaces, Core Registers, Special Registers, Operation Modes, Nested Vectored Interrupt Controller, Exceptions and Interrupts, Memory map, Stack implementation, Two-Stack Model, Reset Sequence

UNIT – V:

ARM Cortex-M3 Instruction Set and Memory System:

Instruction Sets: ARM Cortex-M3 16-bit and 32-bit Instruction Set, Unified Assembler Language, Data Processing Instructions, Branch Instructions, Load and Store Instructions

Memory System: Memory Maps, Memory Access Attributes, Default Memory Access Permissions, Bit-Band Operations, Unaligned Transfers, Exclusive accesses, Pipeline

UNIT – VI:

ARM Cortex-M3 Firmware Development Ecosystem:

Cortex-M3 Programming:

Overview, Typical Development Flow, C Programming for Cortex-M3, Using C and Assembly, CMSIS (Cortex Microcontroller Software Interface Standard) -Organization of CMSIS, Benefits of CMSIS.

Exception Programming: Using Interrupts, Exception/Interrupt Handlers, Software Interrupts, Vector Table Relocation

TEXT BOOKS:

1. Microprocessors and Interfacing, Douglas V. Hall, 2nd Edition, Tata McGraw-Hill, 1999
2. The Definitive Guide to the ARM Cortex-M3, Joseph Yiu, 2nd Edition, Elsevier, 2010

REFERENCES:

1. Advanced microprocessors and Peripherals – A. K. Ray and K. M. Bhurchandi, Tata McGraw-Hill, 2000
2. Microcomputer Systems - The 8086/8088 Family Architecture, Programming and Design, Y. Liu and G. A. Gibson, 2nd Edition, PHI
3. Embedded Systems with ARM Cortex-M Microcontroller in Assembly Language and C, 3rd Edition, 2017

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B.Tech. VI Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19PC1EE09) ELECTRICAL DRIVES

COURSE PRE-REQUISITES: Power Electronics, Electrical Machines – I, II & III

COURSE OBJECTIVES:

- To introduce the drive system and operating modes of drive and its characteristics
- To understand Speed –torque characteristics of different motor drives by various Power converter topologies
- To understand the motoring and braking operations of drive
- To understand the differences between DC drives and AC drives

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the characteristics of DC motors and induction motors
CO-2: Discriminate the methods of speed-control for dc motors and induction motors
CO-3: Apply power electronic converters for the speed control of dc motor and induction motor

UNIT – I:
Fundamentals of Electric Drive: Introduction to electric drives – block diagram-advantages of electric drives -classification of electric drives- Speed-torque conventions and multi-quadrant operations- Types of load torque: components, nature and classification-Steady state stability.

UNIT – II:
Control of DC Drives by Phase Controlled Converters: Introduction to DC motor drives-constant torque and constant power operation- Orthogonal relationship between field and armature currents - Single phase semi and fully controlled converters connected to DC separately excited motor – continuous current operation – output voltage and current waveforms – Speed and Torque expressions – Speed – Torque Characteristics-Problems.
Three phase semi and fully controlled converters connected to DC separately excited motor– output voltage and current waveforms – Speed and Torque expressions – Speed – Torque characteristics – Problems. Closed loop control of separately excited dc motor drive(Block diagram only).

UNIT – III:
Multi-Quadrant Chopper fed DC Drive: Introduction to chopper controlled DC drives--Electric Braking – Plugging, Dynamic and Regenerative Braking operations-Analysis of single quadrant chopper drives -Two quadrant chopper drives- Four quadrant chopper drives- Continuous current operation – Output voltage and current wave forms – Speed torque expressions – Speed torque characteristics- Problems.

UNIT – IV:
Induction Motor Characteristics: Review of induction motor equivalent circuit and torque-speed characteristic, variation of torque-speed curve with applied voltage, applied frequency and applied voltage and frequency, typical torque-speed curves

of fan and pump loads, operating point, constant flux operation, flux weakening operation.

UNIT – V:

Scalar Control or Constant V/F Control of Induction Motor: V/f control of induction motor, steady-state performance analysis based on equivalent circuit, speed drop with loading, slip regulation.

Control of Slip Ring Induction Motor: Impact of rotor resistance of the induction motor torque-speed curve, operation of slip-ring induction motor with external rotor resistance, starting torque, power electronic based rotor side control of slip ring motor, Performance of slip power recovery schemes.

UNIT – VI:

Synchronous Motor Drives: Operation of self -controlled synchronous motors by VSI, CSI- Closed Loop control operation of synchronous motor drives (Block Diagram Only)

Special Drives – Permanent magnet synchronous motor -Brushless DC motor – principle of operation- control of permanent magnetic drives-converter circuits- modes of operation.

TEXT BOOKS:

1. Fundamentals of Electrical Drives, G. K. Dubey, CRC Press, 2002
2. Electric Motor Drives: Modeling, Analysis and Control, R. Krishnan, Prentice Hall, 2001
3. Modern Power Electronics and AC Drives, B. K. Bose, PHI

REFERENCES:

1. Thyristor Control of Electric Drives, Vedam Subramanyam, Tata McGraw-Hill
2. A First course on Electrical Drives, S. K. Pillai, 2nd Edition, New Age International
3. Thyristor DC Drives, P. C. Sen, Wiley-Blackwell

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B.Tech. VI Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19PE1EE04) POWER SYSTEM OPERATION AND CONTROL

COURSE PRE-REQUISITES: Through knowledge of Power Systems, Control Systems and Electrical Machines

COURSE OBJECTIVES:

- To understand the formulation of load-flow problems applying different methods and carryout load-flow studies and compare
- To understand the importance of economic operation of power systems including losses
- To understand the importance of load frequency control in the operation of power systems
- To understand the importance of reactive power and FACTS devices for stable operation of power systems

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Analyze the optimal operation of hydro and thermal power plants
CO2: Develop the transfer function models and block diagrams of single and two area systems
CO3: Evaluate the performance of single and two area systems with and without Controllers
CO4: Analyze the behavior of reactive power compensation devices

UNIT – I:

Economic Operation of Power Systems: Optimal operation of Generators in Thermal Power Stations, - heat rate Curve – Cost Curve – Incremental fuel and Production costs, input-output characteristics, Optimum generation allocation with line losses neglected. Optimum generation allocation including the effect of transmission line losses – Loss Coefficients, General transmission line loss formula.

UNIT – II:

Unit Commitment and Hydrothermal Scheduling: Optimal unit commitment: Constraints in unit commitment- Spinning Reserve, Thermal unit constraints and Hydro constraints. Cost function formulation: start-up cost consideration and shut-down cost consideration. Dynamic programming method for the solution of UC Problem - Algorithm.

Optimal scheduling of Hydrothermal System: Mathematical formulation and solution Technique with Algorithm. Analysis of Large systems through system tearing

UNIT – III:

Modeling of Turbines and Excitation System: Basic Generator Control loops – ALFC and AVR loops and cross coupling between two loops. Modeling of Turbine: First order Turbine model, Block Diagram representation of Steam Turbines and Approximate Linear Models. Mathematical Modeling of Speed Governing System – Governor Characteristics, Regulation of two generators, Derivation of small signal transfer

function. Generator load model, Modeling of Excitation System: Fundamental components of an Excitation system, Transfer function, Block Diagram Representation of IEEE Type-1 Model.

UNIT –IV:

Single Area Load Frequency Control: Necessity of keeping frequency constant, Definitions of Control area, coherency, concept of control area, Incremental power Balance of a control area, – Single area control – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response – Uncontrolled case. Proportional plus Integral control of single area and its block diagram representation and steady state and dynamic response.

UNIT –V:

Two-Area Load Frequency Control: ALFC of Multi-Area Systems-Advantages of pool Operation. Two area system - Modelling of a tie-line, Development of block diagram of a two area system. Mechanical analog of two area system and its Static and dynamic responses. Tie-line bias control, Automatic Generation Control and Economic dispatch control.

UNIT – VI:

Reactive Power Compensation: Overview of Reactive Power control – Reactive Power compensation in transmission systems Shunt and Series Compensation, Synchronous Condenser – advantages and disadvantages of different types of compensating equipment for transmission systems. Fundamentals of FACTS Controllers: Working and VI Characteristics of TCR, FC-TCR, TSC-TCR, TCSC and STATCOM.

TEXT BOOKS:

1. Modern Power System Analysis, I. J. Nagrath and D. P. Kothari, 2nd Edition, Tata McGraw-Hill
2. Electric Energy systems Theory, O. I. Elgerd, 2nd Edition, Tata McGraw-Hill
3. Operation and Control in Power Systems, P. S. R. Murthy, 2nd Edition, B. S. Publications, 2011

REFERENCES:

1. Power System Analysis and Design, J. Duncan Glover and M. S. Sarma. 3rd Edition, Thompson
2. Power System Operation and Control, S. Sivanagaraju and G. Sreenivasan, 5th Edition, Pearson
3. Power System Analysis, Grainger and Stevenson, Tata McGraw-Hill
4. Power System Analysis, Hadi Saadat, Tata McGraw-Hill
5. Electrical Power Systems, C. L. Wadhwa, 3rd Edition, New Age International

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B.Tech. VI Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19PE1EE05) STORAGE TECHNOLOGIES

COURSE PRE-REQUISITES: Power Electronics, Circuits and Power Systems

COURSE OBJECTIVES:
- To understand the storage technologies available for energy
- To understand electro chemical secondary batteries characteristics
- To understand efficiency improvement techniques in storage systems
- To appreciate various applications of storage systems

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Learn mechanical, magnetic and electrostatic storage systems
CO-2: Enumerate merits and demerits of various secondary batteries
CO-3: Study characteristics of lead acid batteries
CO-4: Improve the efficiency of storage systems
CO-5: Apply knowledge on storage technologies in EV and Power systems

UNIT – I:
Nonelectrical Storage Systems: Flywheel, Energy Relations, Flywheel System Components, Benefits of Flywheel over Battery, Superconducting Magnet Energy Storage, Compressed Air Energy storage, Overview Thermal Energy Storage. Capacitor bank storage, Comparison of storage Technologies Transient response of energy storage devices.

UNIT – II:
Electro Chemical Storage: History, General battery concepts- Types of Batteries- Primary, secondary- Battery Vs Cell, Nickel-Cadmium -Nickel-Metal Hydride, Nickel hydrogen, Lithium-Ion- Lithium-Polymer, Fuel cells, Flow Batteries.

UNIT – III:
Specifications and Characteristics: Domains of applications of Energy storage- Starter-Traction-stationary-mobile or nomadic, Review of storage requirements, Definitions of characteristics, Terminology of States, Battery Design, Battery Charging, Charge Regulators, Battery Management, General Equivalent Electrical Circuit, Performance Characteristics

UNIT – IV:
Sealed-Lead Cells and Batteries: Discharge Characteristics, Charging-Importance-characteristics-charge acceptance-over charging, Types of charging- Constant voltage charging- Constant current charging- Taper charging-special charging-Charging power sources, storage, Testing, safety.

UNIT – V:
Electrical Energy Storage System Efficiency Improvement: Hybrid Electrical Energy storage – Design Considerations- Architecture- Charge management- components

Modeling of Power Conversion, Reconfigurable EES Array Architecture, Cycle Efficiency and Capacity Utilization of EES Bank, General Bank Reconfiguration Architecture, Dynamic Reconfiguration Algorithm, Cycle Efficiency and Capacity Utilization Improvement. Mathematical modelling of Battery. Concepts of SOC and rates of charging and discharging.

UNIT – VI:

Storage Applications: Electric Vehicle application- Regenerative Brake- PV module assistance-Storage bank reconfiguration- Overall cost analysis, Energy storage in Transient regimes of Power system-Problem formulation-modeling- steady state stability analysis with storage-storage Parameters to ensure transient stability, Battery rating calculations for standalone system.

TEXT BOOKS:

1. Energy Storage for Power Systems, A. Ter-Gazarian, Peter Peregrinus Ltd., 1994
2. Design and Management of Energy-Efficient Hybrid Electrical Energy Storage Systems, Young Hyun Kim, Naehyuck Chang, Springer, 2014
3. Rechargeable Batteries Applications Handbook, EDN Series of Design Engineers, Elsevier

REFERENCES:

1. Lithium Batteries and Other Electrochemical Storage Systems, Christian Glaize, Sylvie Geniès
2. Wind and Solar Power Systems, Mukund R. Patel, 2nd Edition, CRC Press, 2006

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19PE1EE06) DIGITAL CONTROL SYSTEMS

COURSE PRE-REQUISITES: Control Systems, Linear Control Systems

COURSE OBJECTIVES:
- To introduce the components of digital control system and to study the Z-transforms
- To provide knowledge on pulse transfer functions and their analysis
- To introduce state variable analysis and stability concepts in discrete domain
- To educate on tuning of PID controllers in discrete domain

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Expose to the concepts of Digital control systems
CO-2: Provide adequate knowledge of discrete systems in state variable analysis
CO-3: Learn the concept of stability analysis and design of discrete time systems
CO-4: Provide comprehensive knowledge of optimal control

UNIT – I:
Introduction Sampling and Reconstruction: Introduction, Examples of Data control systems – Digital to Analog conversion and Analog to Digital conversion, sample and hold operations.
Z – Transforms: Introduction, Linear difference equations, pulse response, Z – transforms, Theorems of Z – Transforms, the inverse Z – transforms, Modified Z- Transforms

UNIT – II:
Z-Plane Analysis Of Discrete-Time Control System: Z-Transform method for solving difference equations; Pulse transforms function, block diagram analysis of sampled – data systems, mapping between s-plane and z-plane: primary strips and complementary strips.

UNIT – III:
State Space Analysis: State space representation of discrete time systems, Pulse Transfer Function Matrix solving discrete time state space equations, State transition matrix and it's Properties, Methods for Computation of State Transition Matrix, Discretization of continuous time state – space equations

UNIT – IV:
Controllability and Observability: Concepts of Controllability and Observability, Tests for controllability and Observability. Duality between Controllability and Observability, Controllability and Observability conditions for Pulse Transfer Function of state feedback controller through pole placement – Necessary and sufficient conditions, Ackerman's formula. State Observers – Full order and Reduced order observers.

UNIT – V:
Stability Analysis: Mapping between the S-Plane and the Z-Plane – Primary strips and Complementary Strips – Constant frequency loci, Constant damping ratio loci, Stability Analysis of closed loop systems in the Z-Plane. Jury stability test – Stability

Analysis by use of the Bilinear Transformation and Routh Stability criterion. Stability analysis using Liapunov theorems.

UNIT – VI:

Design of Discrete Time Control System by Conventional Methods: Transient and steady – State response Analysis – Design based on the frequency response method –Bilinear Transformation and Design procedure in the w- plane, Lead, Lag and Lead-Lag compensators and digital PID controllers.

TEXT BOOKS:

1. Discrete-Time Control Systems, K. Ogata, Pearson Education/PHI, 2nd Edition
2. Digital Control and State Variable Methods, M. Gopal, Tata McGraw-Hill

REFERENCES:

1. Digital Control Systems, Kuo, 2nd Edition, Oxford University Press, 2003
2. Digital Control Engineering, M. Gopal, New Age International
3. Digital Control Engineering Analyses and Design, M. Sami Fadali and Antoni Visioli, AP Academic Press

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING & TECHNOLOGY

B.Tech. VI Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19PC1IT03) COMPUTER ORGANIZATION

(COMMON TO EEE, ECE, CSE & IT)

COURSE OBJECTIVES:

- To describe the functional blocks of a computer to interpret the instructions and various addressing modes for the execution of instruction cycle
- To perform Arithmetic micro-operations on integers and floating-point numbers
- To analyze the cost performance and design trade-offs in designing and constructing a computer processor including memory
- To discuss the different ways of communicating with I/O devices & interfaces and the design techniques to enhance the performance using pipelining, parallelism

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Interpret the functional architecture of computing systems

CO-2: Explore memory, control and I/O functions

CO-3: Impart the knowledge on micro programming

CO-4: Analyze instruction level parallelism, Concepts of advanced pipeline techniques

UNIT – I:

Functional Blocks of a Computer: CPU, memory, input-output subsystem, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.

Case study – Instruction set of some common CPUs

UNIT – II:

Data Representation: Signed number representation, fixed and floating point representations, character representation.

Computer Arithmetic: Integer Addition and Subtraction - Ripple carry adder, carry look- ahead adder. Multiplication – Shift-and add, Booth multiplier, carry save multiplier. Division – Restoring and non-restoring techniques, floating point arithmetic.

UNIT – III:

Microprogrammed Control: Control memory, address sequencing, micro program example, and design of control unit, hardwired control, and micro programmed control.

UNIT – IV:

Memory System Design: Semiconductor memory technologies. SRAM vs DRAM.

Memory Organization: Memory interleaving, concepts of hierarchical memory organization, cache memory, cache size vs block size, mapping functions, replacement algorithms, write policies, virtual memory, secondary storage.

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, software interrupts and exceptions. Programs and

processes – role of interrupts in process state transitions, I/O device interfaces – SCSI, USB.

UNIT – VI:

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction pipe line, RISC pipeline Vector Processing, Array Processors

TEXT BOOKS:

1. Computer Organization and Design: The Hardware/Software Interfaces, 5th Edition by David A. Patterson and John L. Hennessy, Elsevier
2. Computer Organization and Embedded Systems, Carl Hamacher, 6th Edition, McGraw-Hill

REFERENCES:

1. Computer System Architecture, M. Morris Mano, 3rd Edition
2. Computer Architecture and Organization, John P. Hayes, 3rd Edition, WCB/McGraw-Hill
3. Computer Organization and Architecture: Designing for Performance, William Stallings, 10th Edition, Pearson Education
4. Computer System Design and Architecture, Vincent P. Heuring and Harry F. Jordan, 2nd Edition, Pearson Education

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19PE1EC02) MOS CIRCUITS

COURSE PRE-REQUISITES: Electronic Devices and Circuits, Analog Circuits

COURSE OBJECTIVES:
- To learn the MOS device physics
- To know the design procedure of various analog application of MOSFET
- To know the design procedure of various digital application of MOSFET
- To understand the concepts semiconductor memories

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the operation and sizing issues of MOSFET
CO-2: Design basic analog applications of MOSFET
CO-3: Design basic digital applications of MOSFET
CO-4: Conceptualize the memory classification and designing of memory circuits

UNIT – I:
Basic MOS Device Physics: MOSFET as a switch, MOS I vs V Characteristics, second-order effects, MOS device models-MOS device capacitances, MOS small signal-model, Scaling and Short channel effects.

UNIT – II:
MOS Single Stage Amplifiers: Common source amplifier with different loads, source follower, Common gate amplifier, Cascode Amplifier, Folded cascade amplifier, Frequency Response of Amplifiers - CG, CS, and CD amplifiers.

UNIT – III:
Analog MOS Sub-Circuits: Current Mirrors- Basic current mirrors, Active current mirrors. Differential Amplifiers: Single-ended and Differential operation, Basic Differential pair, Common Mode Response, Differential pair with MOS Loads.

UNIT – IV:
Operational Amplifiers: One-stage Op-Amp, Two-stage Op-Amp, Precision Rectification, ADC, and DAC.
Sampling Circuits using NMOS, PMOS, CMOS Switches, and Switch capacitor circuit, Switched capacitor integrator.

UNIT – V:
MOS Inverters: Introduction, The static CMOS Inverter an intuitive Perspective, Static and Dynamic behaviour of CMOS Inverter, Noise margins, switching characteristics, calculation of delay times, effect of load on switching characteristics and driving large loads, logical effort of paths.

UNIT – VI:
Memory and Array Subsystems: Types of memory, ROM Organization, RAM organization, DRAM Types and Operation, refresh operation, SRAM types and operation, FLASH Memory.

TEXT BOOKS:

1. Design of Analog CMOS Integrated Circuits, Behzad Razavi, Tata McGraw-Hill, 2016
2. Digital Integrated Circuits, Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, 2nd Edition, Pearson Education, 2016

REFERENCES:

1. CMOS Analog Circuit Design, Philip E. Allen and Douglas R. Holberg, Oxford University Press, International 2nd Edition/Indian Edition, 2010
2. Analog Integrated Circuit Design, David A. Johns, Ken Martin, Wiley, 2013
3. CMOS: Circuit Design, Layout and Simulation, Baker, Li and Boyce, PHI, 2012
4. Principles of CMOS VLSI Design, Neil H. E. Weste and Kamran Eshraghian, 2nd Edition, Addition Wesley, 1998

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	0	**3**	**1.5**

(A19PC2EC07) MICROPROCESSORS AND MICROCONTROLLERS LABORATORY

(Common to ECE, EEE & EIE)

COURSE PRE-REQUISITES: Digital System Design

COURSE OBJECTIVES:

- To provide practical knowledge on programming 8086/8051 to perform various operations
- To interface various I/O devices to 8086/8051
- To design and develop digital systems for embedded applications and know the process to meet desired needs within realistic constraints

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Write programs for 8086/ARM architectures to carry out various operations

CO-2: Apply the knowledge of interfacing techniques to design processor-based systems

CO-3: Apply the knowledge of interfacing techniques to design controller-based systems

LIST OF EXPERIMENTS:

PART A

Experiments on 8086 microprocessor

1. Programs for 16-bit arithmetic operations using Various Addressing Modes.
2. Program for sorting an array for 8086.
3. Program for searching for a number or character in a string for 8086.
4. Program for string manipulations for 8086
5. Program to define and call a subroutine which calculates the average of three numbers.
   a) Interfacing ADC to 8086.
   b) Interfacing DAC to 8086
   c) Interfacing stepper motor to 8086.

PART B

Experiments on ARM development boards

1. Programs to perform arithmetic operations
2. Control ON/OFF of LEDs using switches involving delays.
3. Controlling an LED using switch by polling method/Interrupt method
4. Implementation of PWM to change duty cycle.
5. Communication through UART.

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B.Tech. VI Semester	**L**	**T/P/D**	**C**
	0	**3**	**1.5**

(A19PC2EE05) ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LABORATORY

COURSE PRE-REQUISITES: Electrical Measurements and Instrumentation

COURSE OBJECTIVES:

- To calibrate LPF Watt Meter, energy meter, P.F Meter using electro dynamo meter type instrument as the standard instrument
- To determine unknown inductance, resistance, capacitance by performing experiments on DC bridges & AC bridges
- To determine three phase active & reactive powers using single wattmeter method practically
- To determine the ratio and phase angle errors of current transformer and potential transformer

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Get the ability to choose instruments
CO-2: Can test any instrument
CO-3: Can find the accuracy of any instrument by performing experiment
CO-4: Can calibrate PMMC instrument using D.C potentiometer

LIST OF EXPERIMENTS:

1. Measurement of batch of resistances and estimation of statistical parameters
2. Measurement of (i) low resistance using Kelvin's double bridge (ii)earth resistance and insulation resistance using Megger
3. Measurement of L and C using Anderson Bridge, Schering bridge, and LCR meter
4. Calibration of D.C voltmeter Ammeter & watt meter using dc potentiometer
5. Calibration of dynamometer type power factor meter & energy meter
6. Measurement of Three phase Active and Reactive power
7. Testing of Dielectric strength of transformer oil
8. Measurement of Three phase power using instrument transformers
9. Measurement of current using Shunts, C.T and Hall sensors
10. Measurement of Linear Displacement with the help LVDT
11. Measurement of different ranges of temperatures using i) RTD ii) Thermo couple
12. Measurement of load with the help of strain gauges
13. Measurement of % ratio error and phase angle of given C.T. by Silsbee's method
14. Measurement of % ratio error and phase angle of given P.T by Silsbee's method

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B.Tech. VI Semester	**L**	**T/P/D**	**C**
	0	**2**	**1**

(A19HS2EN05) ADVANCED ENGLISH COMMUNICATION SKILLS LABORATORY

(Common to all branches)

COURSE OBJECTIVES:

- To enable students to understand the principles and process of Technical Writing
- To train students to write technical documents such as Applications, Resumes, SOPs, Proposals and Technical Reports
- To train students to speak accurately and fluently for participation in Presentations, Group Discussions and interviews
- To train students in soft skills to make them effective individuals

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Summarize and synthesize information and produce technical writing that is required in academics as well as in the engineering profession

CO-2: Employ principles of TW and writing process to produce technical documents such as cover letters, resume, SOP, Project Proposals and Technical Reports

CO-3: Actively participate in group discussions/interviews and prepare & deliver effective presentations

CO-4: Become an effective individual through goal setting & Career Planning & function effectively in multi-disciplinary and heterogeneous teams through the knowledge of teamwork, Inter-personal relationships, conflict management and leadership quality

UNIT – I:

The Concept of Technical Communication:

1. Understanding the concept of Technical Communication
2. Technical Writing (TW)- Definition, Principles and Processes
3. Summarizing and Synthesizing
4. Editing

UNIT – II:

Application Writing:

1. Formal Letters (Indian and Western styles); Cover Letter
2. Resumé and SoP Writing
3. E-Correspondence and Netiquette

UNIT – III:

Presentation Skills:

1. SWOC Analysis
2. Self -Introduction
3. Oral Presentations
4. Powerpoint Presentations

UNIT – IV:

Report Writing:

1. Technical Report —Categories, Formats, Styles and Types
2. Proposal Writing
3. Writing Agenda & Minutes

UNIT – V:

Employability Skills-1:

1. Self Assessment; Values & Beliefs; Self Esteem
2. Nonverbal Communication
3. Group Discussions

UNIT – VI:

Employability Skills-2:

1. Personal goal setting & Career Planning
2. Interview Skills – Face to Face
3. Interview Skills – Telephonic / Video

TEXT BOOKS:

1. Technical Writing Essentials, Suzan Last, University of Victoria, 2019
   (Technical Writing Essentials by Suzan Last is licensed under a Creative Commons Attribution 4.0 International License)
2. Technical Communication: A Practical Approach, William S. Pfeiffer, 7th Edition, Longman, 2012
3. Reports In Paul V. Anderson's Technical Communication: A Reader-Centered Approach, Anderson, Paul V. 5th Edition, Boston Heinle 2003

REFERENCES:

1. Communication in the workplace: What can NC State students expect?, J. Swartz, S. Pigg, J. Larsen, J. Helo Gonzalez, R. De Haas, and E. Wagner, Professional Writing Program, North Carolina State University, 2018 [Online] Available:https://docs.google.com/document/d/1pMpVbDRWIN6HssQQQ4MeQ6U-oB-sGUrtRswD7feuRB0/edit ↲
2. Technical Communication, Burnett, Rebecca, 5th Edition, Heinle 2001
3. Technical Writing Process and Product, Gerson Sharon J. and Steven Gerson: 3rd Edition, New Jersey: Prentice Hall 1999
4. Technical Communication: Situations and Strategies, Markel, Mike, 8th Edition 2006-2007
5. https://kupdf.net/download/learner-english-pdf
   1pdf_59beb5ec08bbc55c18686ee6_pdf

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B.Tech. VI Semester	**L**	**T/P/D**	**C**
	0	**4**	**2**

(A19PW4EE03) DESIGN THINKING

COURSE OBJECTIVES:

- To inculcate core design principles and applied creativity to develop innovative strategies that better connect engineers with their end users
- To build mindset leading to flow of creative ideas, validating those ideas and prioritizing the best ones
- To incorporate tools that designers need to take a design project from inspiration and insights to ideation and implementation
- To instill full scope of organizational innovation and strategy through knowledge, insight and analytical skills

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Use design thinking and hypothesis-driven innovation processes to develop viable solutions to user challenges
CO-2: Use multiple brainstorming techniques to find innovative solutions
CO-3: Develop and test a business model or business case to support the viability of the solution
CO-4: Prototype a solution to a user challenge
CO-5: Investigate the cultural, emotional, technological and business factors relevant to developing new product or service design concept

MODULE 1: Revisiting Design Thinking
Creative thinking as basis of innovation; Empathy process for deep understanding of challenge with practical ingenuity; Making sense of observations and insights; Defining a point of view and context
Design thinking skills for Problem Discovery, Definition, and Ideation – Identifying problems in daily lives and in the world at large, Understanding user and customer perspectives, Thinking from the problem before thinking of a solution

MODULE 2: Ideation Process
Clear Articulation of problem statement with focus on latent needs; Brainstorming potential solutions; Ideation methods with case-study based approach to using Systematic Inventive Thinking (SIT) Methods such as Addition, Subtraction, Multiplication, Division and Task Unification
Strategic Innovation for competition in future: Linear Innovation vs. non-linear innovation, Understanding and identifying weak signals, 3-box thinking, 3-Box framework and Box-3 ideation

MODULE 3: Designing Customer Experience
Understanding Innovation through Design Thinking; Enhancing Customer Experience; Service Design and Development Process and Case Studies; Service Experience Cycle and Case Studies

MODULE 4: Sustainable Design Approaches
Concern for Environment and Sustainability in Design, Case Studies to understand good Design For Environment (DFE) Decisions; Design Considerations in the five stages of the Product Life Cycle

MODULE 5: Integrative Engineering Design Solutions
Identifying and resolving issues with working in diverse teams, Modularising, prototype building by different engineering disciplines within the team, validated learning with accessible metrics

MODULE 6: Capstone Project (Interdisciplinary)
Applying Design Thinking Principles and Methods for Ideation and Prototyping, Testing Solution, Refining Solution, and Taking the Solution to the Users

TEXT BOOKS:

1. 101 Design Methods: A Structured Approach for Driving Innovation in Your Organization, Vijay Kumar, John Wiley & Sons, 2012
2. Living with Complexity, Donald A Norman, MIT Press, 2016
3. Design Thinking for Entrepreneurs and Small Businesses: Putting the Power of Design to Work, Beverly Rudkin Ingle, A Press, 2013

REFERENCES:

1. Emotionally Durable Design: Objects, Experiences and Empathy, Jonathan Chapman, 2nd Edition, Routledge, 2015
2. Innovation Design: How Any Organization Can Leverage Design Thinking to Produce Change, Drive New Ideas, and Deliver Meaningful Solutions, Thomas Lockwood, Edgar Papke, New Page Books, 2017
3. Design Thinking Business Analysis: Business Concept Mapping Applied, Thomas Frisendal, Springer, 2012
4. Chapter 1: A Simple Framework for Leading Innovation, The Three Box Solution, HBR Press, 2016
5. Design a Better Business: New Tools, Skills and Mindset for Strategy and Innovation, Patrick Van Der Pijl, Justin Lokitz, Lisa Kay Solomon, Erik van der Pluijm, Maarten van Lieshout, Wiley, 2016

OPEN ELECTIVE COURSES

SMART CITIES

SMART CITIES

In the twenty-first century, engineers are being tasked with solving ever more complex and subtle societal challenges – from climate change to unprecedented urbanisation that is materially affecting the lives of many urban populations. As engineers become ever more interdisciplinary and the boundaries of disciplines soften, they need to reflect as a community as to the appropriateness of the engineering paradigm to address these needs. Currently the engineering community is pointing to the digital technologies and the 'smart city' as a deliverer of efficiency and resilience without fully acknowledging the intricate socio-political context in which it is situated.

The domain of EIE was developed to modernise and automate these operations using the technological advancements in the realm of electronics. Even outside the industry, common household appliances — such as washing machine, air-conditioner, geyser, and microwave oven — cannot attract customers without features such as auto cut-off after certain time or temperature, which is again an example of instrumentation. The field of Instrumentation Engineering is also core to the recent advances such as smart home appliances, smart cities and automobiles. It is thus not far from the truth to claim that the fourth industrial revolution.

The world population is continuously growing and reached a significant evolution of the society, where the number of people living in cities surpassed the number of people in rural areas. This puts national and local governments under pressure because the limited resources, such as water, electricity, and transports, must thus be optimized to cover the needs of the citizens. Therefore, different tools, from sensors to processes, service, and artificial intelligence, are used to coordinate the usage of infrastructures and assets of the cities to build the so-called smart cities.

Different definitions and theoretical models of smart cities are given in literature. However, smart city can usually be modelled by a layered architecture, where communication and networking layer plays a central role. In fact, smart city applications lay on collecting field data from different infrastructures and assets, processing these data, taking some intelligent control actions, and sharing information in a secure way. Thus, a two-way reliable communications layer is the basis of smart cities. This chapter introduces the basic concepts of this field and focuses on the role of communication technologies in smart cities. Potential technologies for smart cities are discussed, especially the recent wireless technologies adapted to smart city requirements.

What is the concept of a smart city?

There is no universally accepted definition for a smart city because people can interpret different meanings for it. Hence, it means different things to different people. Here, you will get a basic definition that captures the essence of what a smart city is and what it does. While the concept varies from area to area depending on the resources, the basic idea behind it remains the same. A smart city aims to bring various components together to live harmoniously and attempts to do with the least environmental damage or impact. In other words, a smart city is a place with high standards of living, which survives and thrives on eco-friendly means. The size and amenities within a smart city vary according to geography, resources available, geopolitical scenario and investment received.

Growth in Global population continues to drive citizens from rural areas to cities. With rapid expansion of urban areas, cities need to become intelligent to handle this large scale urbanization. This is driving city operators to look at smarter ways to manage

complexities, increase efficiencies and improve quality of life. Today we need cities that monitor& integrate infrastructure to better optimize resources while maximizing service to its citizens. So to meet all the needs we need our cities to be smarter which brings a concept "**Smart cities**" Smart cities optimize the use of technology in the design & operation of infrastructure and buildings in such a way which meets the current and future needs of their citizens. To be truly smart they also require consideration of governance &growth, urban development and infrastructure, the environment & natural resources, society and community.

Smart city programs provide a range of technologies that can be applied to solve infrastructure problems associated with ageing infrastructure and increasing demands. The potential for infrastructure and urban improvement remains unrealized, however, due to technical, financial, and social constraints and criticisms that limit the implementation of smart cities concepts for infrastructure management. The discussion presented here provides a review of smart technologies including sensors, crowdsourcing and citizen science, actuators, data transmission, Internet of Things, big data analytics, data visualization, and blockchain, which can be used for infrastructure management. Smart infrastructure programs are reviewed to explore how enabling technologies have been applied across civil engineering domains, including transportation systems, water systems, air quality, energy infrastructure, solid waste management, construction engineering and management, structures, and geotechnical systems.

Making cities "smarter" by efficient management of resources and infrastructure, greener environment, and smart governance resulting in a better quality of living of its citizens. This can be enabled by the effective use of information and communication technologies (ICTs) tools, which have the ability to provide eco-friendly and economically viable solutions for cities.

Setting up a smart city is more than improving the old system with technology by simply adding sensors, remote supervision, and control to essential city services. It should be a complete shift of a paradigm in daily life when using new technologies, especially new ICT leading to smart outcomes.

Smart solutions

Another important feature of smart cities is that they will provide smart solutions to modern problems. These include:

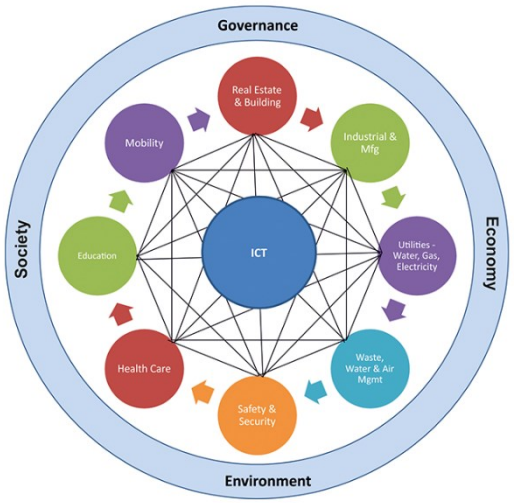
- Public information systems
- Redressal of grievances
- Electronic service delivery
- Maximum engagement of citizens
- Reduced energy and fuel usage
- Reduces the development of wastes
- Smart water monitoring
- Treatment of wastewater
- Sustainable monitoring water quality
- Maximum utilization of renewable energy sources
- Usage of green building techniques
- Smart parking to reduce clutter
- Intelligent traffic management system.

Advantages of a smart cities,

1. Promotion of mixed land usage resulting in higher efficiency and reduced wastage of land.
2. Expanded housing opportunities.
3. Reduced congestion, air pollution and resource depletion.
4. Helps to boost local economies by promoting localized trade and interactions.
5. Efficient use of public transport to reduce fuel wastage.
6. Safe and secure localities.
7. Preservation of open spaces.
8. Reduction in urban heating.
9. Promotion of transit-oriented development.
10. Making governance more people-friendly and cost-effective.

Here's a look at some projects that have taken inspiration from the concepts used for the design of smart cities. These projects will help you build energy-efficient systems that will help heal the world.

1. **Home Automation using IoT**
2. **Smart Irrigation System**
3. **Smart Building using IoT**
4. **Smart Energy Meter using GSM**
5. **Solar and Smart Energy Systems**
6. **Smart Water Monitoring**
7. **Automated Street Lighting**
8. **Automated Railway Crossing**
9. **Intelligent Transportation Systems**
10. **Smart Sewage Maintenance Systems.**



To develop new smart cities and to transform our cities into smart cities the engineers in particular are stepping up as leaders.

Civil & Environmental Engineers are working to harness the potential of latest technologies and data for our urban infrastructure, which is among the most complex system in the world. They provide sustainable, resilient and advanced means of transportation system, green building, better water management system and better waste management system. This not only develop physical infrastructure but also develop institutional & social infrastructure that enable our societies to function. Modelling these systems of systems will require managing data at an unprecedented scale.

To support them Computer and **Electronics & Communication Engineers** help in creating future cities that are digital, build and operate cities ICT landscape across application and infrastructure like IOT (Internet of Things), e-payment, e-market, the latest communication devices etc which is leveraging next generation technologies. They create a platform for conveyance of different city services, leverage big data analytics to manage city performance and proactive crisis management.

Electrical Engineers developing new renewable source of energy to meet ever increasing power demands. They also develop methods of effective power transmission with minimum losses which is more economical and safer. They also work on developing microchips to micro sensors which are helping in making our households, institution efficient and safer.

Conclusion

It is clear that dreaming of a smart city without active contribution of engineers is a myth. So, there will always be demand of Engineers and because of which even after crises in the placement scenario still the maximum science students choose Engineering as their first career choice in hope of a better future.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1CE01) SMART CITIES PLANNING AND DEVELOPMENT

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

- To Introduce students on smart city basic concepts, global standards and Indian context of smart cities
- To understand smart community, smart transportation and smart buildings
- To understand energy demand, green approach to meet energy demand and their capacities
- To identify smart transportation technologies in cities and concepts towards smart city

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Recognize smart city concepts and their international and national standards
CO-2: Recognize smart community, transportation and building concepts
CO-3: Develop and calibrate energy demand and their capacity limits
CO-4: Predict the various smart urban transportation systems and the transition from existing city towards a smart city

UNIT – I:
Introduction to Smart Urban Infrastructures and Smart Cities: Introduction to City Planning - Understanding Smart Cities - Dimensions of Smart Cities - Global Experience of Smart Cities – Global Standards and Performance Benchmarks, Practice Codes - Indian scenario - India "100 Smart Cities" Policy and Mission.

UNIT – II:
Smart Cities Planning and Development: Introduction to Smart Community - Smart community concepts: Concept of Smart Community - Smart Transportation - Smart Building and Home Device - Smart Health - Smart Government - Smart Energy and Water – Cyber Security, Safety, and Privacy - Internet of Things, Blockchain, Artificial Intelligence, Alternate Reality, Virtual Reality.

UNIT – III
Smart Urban Energy Systems – I: Conventional vs. Smart, City components, Energy demand, Green approach to meet Energy demand, Index of Indian cities towards smartness – A statistical analysis -Meeting energy demand through direct and indirect solar resources - Efficiency of indirect solar resources and its utility, Capacity limit for the indirect solar resources - Effectiveness in responsive environment in smart city; Smart communication using green resources.

UNIT – IV:
Smart Urban Energy Systems – II: Introduction to PV technology - PV of various scale for smart city applications - Energy efficiency - Policies of Solar PV in smart domains

(RPO, REC, Carbon credit, etc.) Definition, Structure of Smart Grid- Indian Perspective- Advantage & limitation.

UNIT – V:

Smart Urban Transportation Systems: Smart Transportation Technologies - Driverless and connected vehicles - Ride sharing solutions - The "improve" pathway - The "shift" pathway – Smart Roads and Pavement systems.

UNIT – VI:

Towards Smart Cities: The transition of legacy cities to Smart -. Right transition process - The benefit of citizens, cities to adopt effective management and governance approaches - Factors in the transition phase of legacy cities to smart cities and their managerial implications.

TEXT BOOKS:

1. Internet of Things in Smart Technologies for Sustainable Urban Development, G. R. Kanaga Chidambaresan, R. Maheswar, V. Manikandan, K. Ramakrishnan, Springer, 2020
2. Society 5.0: A People-centric Super-smart Society, Hitachi-U, Tokyo Laboratory (H-U Tokyo Lab), Springer, 2020
3. The Routledge Companion to Smart Cities, Katharine S. Willis, Alessandro Aurigi, Routledge International Handbooks, 2020

REFERENCES:

1. Smart Cities in Asia: Governing Development in the Era of Hyper-Connectivity Yu-min Joo, Yu-Min Joo, Teck-Boon Tan, Edward Elgar Pub, 2020
2. Urban Systems Design: Creating Sustainable Smart Cities in the Internet of Things Era, Yoshiki Yamagata, Perry P. J. Yang, Elsevier, 2020
3. Smart Cities and Artificial Intelligence: Convergent Systems for Planning, Design, and Operations, Christopher Grant Kirwan, Zhiyong Fu, Elsevier, 2020

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1CE02) GREEN BUILDING TECHNOLOGY

COURSE PRE-REQUISITES: Smart Cities Planning and Development

COURSE OBJECTIVES:

- To expose the students to green buildings, their features and importance in the present context of sustainable development
- To introduce various sustainable building materials for green buildings
- To acquire knowledge on various design concepts and construction aspects of green buildings
- To learn the various policies and incentives for green buildings and also different green building rating systems and codes

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Explain the importance, features and requisites of a green building
CO-2: Identify suitable sustainable building materials for construction of green building
CO-3: Plan and design various systems for green buildings
CO-4: Explain various codal provisions of green buildings and accordingly rate a building

UNIT – I:
Introduction: Definition of Green Buildings - Typical features of green buildings - Benefits of Green Buildings - Green Building Materials and Equipment in India - Key Requisites for Constructing a Green Building - Important Sustainable features for Green Building - Climate responsive buildings - Carbon footprint and eco footprints of buildings.

UNIT – II:
Green Building Materials: Introduction to sustainable building materials – Sustainable Concrete – Partial replacements in concrete - Natural building materials - Bio materials - Mycelium - Engineered Wood - Structural insulated panels (SIPs) - Natural Fiber - Nontoxic materials: low VOC paints, organic paints, coating and adhesives - Use of waste materials such as paper, Cellulose, glass bottles, tires, shipping containers - Use of industrial waste such as fly-ash, bags, building demolition waste.

UNIT – III:
Design of Green Buildings: Indoor environmental quality requirement and management: Thermal comfort - HVAC - Visual perception - Illumination requirement - Auditory requirement – Energy Efficiency - Lighting and day lighting - Steady and non-steady heat transfer through the glazed window and the wall – Indoor air quality - Local climatic conditions – temperature, humidity, wind speed and direction.

UNIT – IV:

Construction of Green Buildings: IoT Integrated Automated Building Systems - Synthetic Roof Underlayment - Green Roofs - Grid Hybrid System - Passive Solar - Greywater Plumbing Systems - Electrochromic Glass - Solar Thermal Cladding - Structural 3D Printing - Self-healing Concrete - Bird Friendly Design - Landscaping for Parking Lot Runoff - Composting Toilets - Proactive Maintenance - Green Cleaning.

UNIT – V:

Green Building Policies and Incentives: Green products and material certification - parameters making products green - products transparency movement - Cradle to cradle certification - Product emission testing - Carbon trust - carbon credit - returns on investments - savings Policies towards electrical power in India – Case study - Tax credits & Grants - Green construction guide.

UNIT – VI:

Green Building Rating Systems and Codes: Green building rating systems: BREAM, LEED and GRIHA, ISO 14020 – Green building codes: ECBC and NBC 2016 - Green materials: Standard specifications – Case Studies: Dockland Building in Hamburg, SOKA Building in Wiesbaden, KSK Tuebingen, Nycomed, Constance, DR Byen, Copenhagen.

TEXT BOOKS:

1. Green Building Handbook, Tom Woolley and Sam Kimings, 2009
2. Sustainable Construction: Green Building Design and Delivery, Charles J. Kibert, 2012

REFERENCES:

1. Green Building Fundamentals-II, Mike Montoya, Pearson, 2010
2. Sustainable Construction - Green Building Design and Delivery, Charles J. Kibert, John Wiley & Sons, 2008
3. Sustainable Construction and Design-II, Regina Leffers, Pearson / Prentice Hall, 2009
4. Introduction to Environmental Economics, Nick Hanley, Jason, F. Shogren and Ben White, Oxford University Press, 2001

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1CE03) SMART MATERIALS AND STRUCTURES

COURSE PRE-REQUISITES: Smart Cities Planning and Development, Green Building Technology

COURSE OBJECTIVES:

- To introduce the students to various smart materials and their working principles
- To acquire knowledge on different measuring techniques
- To learn about various smart sensors, actuators and their application in structural health monitoring
- To acquire knowledge on different smart composite materials and their modelling concepts
- To learn about the data acquisition and processing and their application in engineering domain

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Explain the different smart materials and their principles

CO-2: Explain and understand different measuring techniques

CO-3: Identify suitable smart sensors and actuators for a specific engineering application

CO-4: Gain the knowledge on data acquisition and processing and advantages in smart materials and smart structures

UNIT – I:

Introduction: Introduction to Smart Materials and Structures – Instrumented structures functions and response – Sensing systems – Self-diagnosis – Signal processing consideration – Actuation systems and effectors.

UNIT – II:

Measuring Techniques: Measuring techniques: Strain Measuring Techniques using Electrical strain gauges, Types – Resistance – Capacitance – Inductance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes.

UNIT – III:

Sensors: Sensing Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain measurement – Inductively Read Transducers – LVDT – Fiber optic Techniques- Absorptive chemical sensors – Spectroscopes – Fibre Optic Chemical Sensing Systems and Distributed measurement, Application of Smart Sensors for Structural Health Monitoring (SHM), System Identification using Smart Sensors

UNIT – IV:

Actuators: Actuator Techniques – Actuator and actuator materials – Piezoelectric and Electrostrictive Material – Magneto structure Material – Shape Memory Alloys – Electro

rheological fluids – Electromagnetic actuation – Role of actuators and Actuator Materials - IPMC and Polymeric Actuators, Shape Memory Actuators

UNIT-V:

Signal Processing and Control Systems: Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors – Signal Processing – Control System – Linear and Non-Linear

UNIT –VI:

Advances in Smart Structures & Materials: Self-Sensing Piezoelectric Transducers, Energy Harvesting Materials, Autophagous Materials, Self-Healing Polymers, Intelligent System Design, Emergent System Design

TEXT BOOKS:

1. Smart Materials and Structures, Gandhi M. V. and Thompson B. S., Chapman & Hall, Madras, 1992
2. Dynamics and Control of Structures, Meirovitch L., John Wiley, 1992

REFERENCES:

1. Smart Structures: Analysis and Design, A. V. Srinivasan, D. Michael McFarland, Cambridge University Press, 2009
2. Smart Materials and Technologies: For the Architecture and Design Professions, Michelle Addington and Daniel L. Schodek, Routledge, 2004
3. Smart Structures and Materials, Brian Culshaw, Artech House – Borton, 1996

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B.Tech. VIII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1CE04) INTELLIGENT TRANSPORTATION SYSTEM

COURSE PRE-REQUISITES: Smart Cities Planning and Development, Green Building Technology, Smart Materials and Structures

COURSE OBJECTIVES:

- To understand ITS architecture and standards
- To apply appropriate ITS technology depending upon site specific conditions
- To design and implement ITS components
- To understand concept and application of Automated Highway Systems

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Differentiate different ITS user Services
CO-2: Apply ITS for road user safety
CO-3: Interpret importance of AHS in ITS
CO-4: Extend future research and special project

UNIT – I:

Introduction To ITS: System Architecture, Standards, Database – Tracking Database – Commercial Vehicle Operations – Intelligent Vehicle Initiative - Metropolitan ITS – Rural ITS – ITS for Rail network.

UNIT – II:

ITS Travel Management: Autonomous Route Guidance System – Infrastructure based systems – Telecommunications – Vehicle – Roadside communication – Vehicle Positioning System – Electronic Toll Collection – Electronic Car Parking

UNIT – III:

ITS Designs: Modeling and Simulation Techniques - Peer – to – Peer Program – ITS for Road Network – System Design – Mobile Navigation Assistant – Traffic Information Center – Public Safety Program.

UNIT – IV:

Introduction to Automated Highway Systems: Evolution of AHS and Current Vehicle Trends - Vehicles in Platoons – Aerodynamic Benefits - Integration of Automated Highway Systems – System Configurations - Step by Step to an Automated Highway System.

UNIT – V:

Evaluation and Assessment of AHS: Spacing and Capacity for Different AHS Concepts – Communication Technologies for AHS - The Effects of AHS on the Environment – Regional Mobility - Impact Assessment of Highway Automation.

UNIT – VI:

Implementation of ITS: ITS programs globally- overview of ITS in developed countries and developing countries – ITS at Toll Plazas – Parking lots – Highways.

TEXT BOOKS:

1. Intelligent Transport Systems Handbook: Recommendations for World Road Association (PIARC), Kan Paul Chen, John Miles, 2000
2. Intelligent Transport Systems – Cases and Policies, Roger R. Stough, Edward Elgar, 2001
3. Intermodal Freight Transport, David Lowe, Elsevier Butterworth-Heinemann, 2005

REFERENCES:

1. Positioning Systems in Intelligent Transportation Systems, Chris Drane and Chris Rizos, Artech House Publishers, 2000
2. Perspectives on Intelligent Transport Systems, Joseph M. Sussman, Springer, 2000
3. Intelligent Transport System, Intelligent Transportation Primer, 2001

WASTE MANAGEMENT

WASTE MANAGEMENT

The courses such as solid waste management (SWM), hazardous waste management (HWM), waste to energy (WTE) and intelligent waste management and recycling system (IWM&RS) are the courses available in the waste management track stream which having a potential syllabus content to meet out the industrial and research needs.

Solid waste management is an interesting track course which actual highlights the day-to-day problems where everybody is facing due to the improper management of industrial, domestic and household waste. Further, the enthusiastic aspects involved in the track courses such as: awareness on its impact over on environment, formal or scientific way of handling and management of waste and disposal scenarios.

In hazardous waste management course, handling and management of nuclear waste at national and international level have been highlighted. Further, the content enlightens about the legal process of state, central and industrial responses toward any emergency situations arise by hazardous waste. Finally, it deals about natural resource damage assessment and restoration.

Waste to energy is a pioneering course available in the track; it is one of the interesting and mindboggling course in the track which highlights the importance of converting the waste materials into wealth. It gives enough space to understand the basic process technologies in a theoretical and industrial way such as: thermal, chemical and biological conversion process. From the above, biological conversion process is in its embryonic state and having potential to expands its technological wings in the near future and having enormous scope of industrial applications where students can be benefited. Finally, conversion devices is an innovative module have been framed to explore the young minds in the line of designing and creating a demand based conversion device products which even lays an entrepreneurial pathway to them.

First of its kind, even at both international and national level a dedicated and extensive course for intelligent waste management and recycling system have been framed with conventional and advanced modules. It is really an interesting course where a student can apply his/her innovative creations to solve the existing and futuristic problems in a smart way with the help of smart tools. Optimistic modules such as: life cycle assessment and carbon-footprint-based IWMS, principles of systems engineering and regulatory frameworks have been incorporated to meet out the international requirements.

In the pathway of exploring the fundamentals and basic knowledges about the course, the six units of all the courses have been formulated keeping in the mind that the students can be able to competitive among the international community at the end of semester. In this context, comprehensive theoretical and industrial processes have been incorporated in each and every module of courses. Further, it is highly believed that the framed syllabus modules having 100% industrial applications which can make the students to feel motivated, satisfied and confidence to compete with the international community.

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1CE05) SOLID WASTE MANAGEMENT

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

- To understand the concepts of solid waste management
- To remember the characteristics of solid waste and source reduction techniques
- To acquire the knowledge & skills in the collection, storage, transport and engineering principles of solid waste
- To remember and Understand the treatment, disposal and recycling and various laws and regulation of solid waste management

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Apply the fundamental concepts of solid waste management

CO-2: Apply the acquired knowledge to resolve the practical problems on source reduction

CO-3: Apply the knowledge on collection, storage, transport and waste processing of solid waste in real time situation

CO-4: Impart the gained knowledge and skills and various laws & regulations on treatment of SW in real time societal problems

UNIT – I:

Sources and Classification: Types and Sources of solid and hazardous wastes - Need for solid and hazardous waste management – Elements of integrated waste management and roles of stakeholders - Financing and Public Private Participation for waste management- Integrated solid waste management.

UNIT – II:

Waste Characterization and Source Reduction: Waste generation rates and variation - Composition, physical, chemical and biological properties of solid wastes – Hazardous Characteristics – TCLP tests – waste sampling and characterization plan - Source reduction of wastes –Waste exchange - Extended producer responsibility - Recycling and reuse.

UNIT – III:

Storage, Collection and Transport of Wastes: Handling and segregation of wastes at source – storage and collection of municipal solid wastes – Analysis of Collection systems - Need for transfer and transport – Transfer stations Optimizing waste allocation– compatibility, storage, labeling and handling of hazardous wastes – hazardous waste manifests and transport.

UNIT – IV:

Waste Processing Technologies: Objectives of waste processing – material separation and processing technologies – biological and chemical conversion technologies –

methods and controls of Composting - thermal conversion technologies and energy recovery – incineration – solidification and stabilization of hazardous wastes-treatment of biomedical wastes - Health considerations in the context of operation of facilities.

UNIT – V:

Waste Disposal: Waste disposal options – Disposal in landfills - Landfill Classification, types and methods – site selection - design and operation of sanitary landfills, secure landfills and landfill bioreactors – leachate and landfill gas management – landfill closure and environmental monitoring – Rehabilitation of open dumps-remediation of contaminated sites.

UNIT – VI:

Regulatory Frameworks: Salient features of Indian legislations on management and handling of municipal solid wastes, hazardous wastes, biomedical wastes, nuclear wastes - lead acid batteries, electronic wastes, plastics waste, bio-medical waste, construction and demolition waste and fly ash waste.

TEXT BOOKS:

1. Integrated Solid Waste Management, George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, McGraw-Hill International Edition, 1993
2. CPHEEO, Manual on Municipal Solid Waste Management, Central Public Health and Environmental Engineering Organization, Government of India, 2014

REFERENCES:

1. Handbook of Solid Waste Management, Frank Kreith, George Tchobanoglous, McGraw-Hill, 2002
2. Waste Management Practices, John Pitchtel, CRC Press, Taylor and Francis Group, 2014
3. Municipal Solid Waste Management, Processing, Energy Recovery, Global Examples, P. Jayarama Reddy, BS Publications, CRC Press, Taylor and Francis Group, 2011
4. GoI, Ministry of Environment and Forest and Climate Change, Various Recent Laws and Rules of Solid Waste Management

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B.Tech. VI Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1CE06) HAZARDOUS WASTE MANAGEMENT

COURSE PRE-REQUISITES: Solid Waste Management

COURSE OBJECTIVES:

- To understand the concepts of hazardous waste management
- To understand the principle of waste characterization, storage, transport and processing
- To understand the principles of nuclear waste and Hazardous Management (HM) and emergency Response
- To understand the principle and process of landfills and natural resource Damage Assessment & Restoration

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Apply the fundamental concepts of hazardous waste management

CO-2: Apply the knowledge to resolve the problems on storage, transport and processing

CO-3: Apply the knowledge to resolve the practical problems on nuclear waste and HM & emergency response

CO-4: Impart the gained knowledge and skills to resolve the practical problems on landfills and natural resource damage assessment & restoration on field

UNIT – I:

Introduction: Need for hazardous waste management – Sources of hazardous wastes – Effects on community – terminology and classification – Storage and collection of hazardous wastes – Problems in developing countries – Protection of public health and the environment.

UNIT – II:

Waste Characterization, Storage, Transport and Processing: Hazardous Waste Characterization and Definable Properties - Analytical– Analytical methods – Hazardous waste inventory- Source reduction of hazardous wastes - Handling and storage of Hazardous wastes –Waste Compatibility Chart – Hazardous Waste Transport- Manifest system – Transboundary movement of wastes – Basal Convention – Hazardous waste treatment technologies – Physical, chemical and thermal treatment of hazardous waste – Solidification – Chemical fixation – Encapsulation – Incineration.

UNIT – III:

Nuclear Waste: Characteristics – Types – Nuclear waste – Uranium mining and processing – Power reactors – Refinery and fuel fabrication wastes – spent fuel – Management of nuclear wastes – Decommissioning of Nuclear power reactors – Health and environmental effects.

UNIT – IV:

Management of Hazardous Wastes: Identifying a hazardous waste – methods – Quantities of hazardous waste generated – Components of a hazardous waste management plan – Hazardous waste minimization – Disposal practices in Indian Industries – Future challenges - Emergency Response - National Response Team and Regional Response Teams; National Contingency Plan and Regional Contingency Plans; National Response Center; State, Local and Industry Response Systems.

UNIT – V:

Secure Landfills: Hazardous waste landfills – Site selections – landfill design and operation – Regulatory aspects – Liner System- Liners: clay, geomembrane, HDPE, geonet, geotextile – Cover system- Leachate Collection and Management – Environmental Monitoring System- Landfill Closure and post closure care - Underground Injection Wells.

UNIT – VI:

Natural Resource Damage Assessment and Restoration: Natural Resource Damage Assessment Laws and Regulations - Central and State government agencies - Damage Assessment and Restoration Procedures - Groundwater Hydrology and Contamination Processes - Groundwater Contamination Detection, Analysis and Monitoring - Overview of CERCLA - Remedial Action Process and RCRA Correction Action Program - Preliminary Assessments and Site Inspections - Hazard Ranking System - National Priorities List - State Priorities List - Remedial Investigations and Feasibility Studies - Records of Decision and the Administrative Process - Remedial Design - Remedial Action - NPL Deletion Process.

TEXT BOOKS:

1. Hazardous Waste Management, Charles A. Wentz., 2nd Edition, McGraw-Hill International, 1995
2. Standard Handbook of Hazardous Waste Treatment and Disposal, Harry M. Freeman, McGraw-Hill, 1997

REFERENCES:

1. Hazardous Waste (Management and Transboundary Movement) Rules, Ministry of Environment and Forests, Government of India
2. Guidelines and Criteria for Hazardous Waste Landfills and Hazardous Waste Treatment Disposal Facilities, Central Pollution Control Board, 2010
3. Hazardous Waste Management, Prof. Anjaneyulu
4. Hazardous Waste Management, M. LaGrega and others, McGraw-Hill Publication

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B.Tech. VII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1CE07) WASTE TO ENERGY

COURSE PRE-REQUISITES: Solid Waste Management, Hazardous Waste Management

COURSE OBJECTIVES:

- To understand the concepts of energy from waste
- To understand the principle and process of thermal conversion technology (TCT)
- To understand the principle and process of chemical and biological conversion technology (CCT & BCT)
- To understand the principles and processes of biomass energy technology (BET) and conversion process and devices (P&D) for solid wastes

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply the fundamental concepts of energy from waste
CO-2: Apply the acquired knowledge to resolve the practical problems on TCT
CO-3: Apply the knowledge to resolve the practical problems on CCT and BCT
CO-4: Impart the gained knowledge and skills to resolve the practical problems on BET and P&D

UNIT – I:
Introduction to Energy from Waste: Classification of waste as fuel – agro based, forest residue, industrial waste, MSW – conversion devices – incinerators, gasifiers, digesters, Environmental monitoring system for land fill gases, Environmental impacts; Measures to mitigate environmental effects due to incineration.

UNIT – II:
Thermal Conversion Technologies: Fundamentals of thermal processing – combustion system – pyrolysis system – gasification system – environmental control system – energy recovery system – incineration.

UNIT – III:
Chemical Conversion Technologies: Acid & Alkaline hydrolysis – hydrogenation; solvent extraction of hydrocarbons; solvolysis of wood; biocrude; biodiesel production via chemical process; catalytic distillation; transesterification methods; Fischer-Tropsch diesel: chemicals from biomass - various chemical conversion processes for oil, gas, cellulose acetate.

UNIT – IV:
Biological Conversion Technologies: Nutritional requirement for microbial growth – types of microbial metabolism – types of microorganisms – environmental requirements – aerobic biological transformation – anaerobic biological transformation – aerobic composting – low solid anaerobic digestion – high solid anaerobic digestion – development of anaerobic digestion processes and technologies for treatment of the organic fraction of MSW – Biodegradation and

biodegradability of substrate; biochemistry and process parameters of biomethanation - other biological transformation processes.

UNIT – V:

Biomass Energy Technologies: Biomass energy resources – types and potential; Energy crops - Biomass characterization (proximate and ultimate analysis); Biomass pyrolysis and gasification; Biofuels – biodiesel, bioethanol, Biobutanol; Algae and biofuels; Pellets and bricks of biomass; Biomass as boiler fuel; Social, economic and ecological implications of biomass energy.

UNIT – VI:

Conversion Devices: Combustors (Spreader Stokes, Moving grate type, fluidized bed), gasifier, digesters. Briqueting technology: Production of RDF and briquetted fuel. Properties of fuels derived from waste to energy technology: Producer gas, Biogas, Ethanol and Briquettes – conversion process with basic device formulation for agricultural residues and wastes including animal wastes; industrial wastes; municipal solid wastes; E-waste; Bio-medical waste; C&D waste; plastic waste and batteries waste.

TEXT BOOKS:

1. Integrated Solid Waste Management, George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, McGraw-Hill International Edition, 1993
2. Energy from Waste - An Evaluation of Conversion Technologies, C. Parker and T. Roberts, Elsevier Applied Science, London, 1985

REFERENCES:

1. Introduction to Biomass Energy Conversion, Capareda S., CRC Press, 2013
2. Thermo-chemical Processing of Biomass: Conversion into Fuels, Chemicals and Power, Brown RC and Stevens C, Wiley and Sons, 2011
3. Biomass Conversion Processes for Energy and Fuels, Sofer, Samir S. (Ed.), Zaborsky, R. (Ed.), Plenum Press, 1981
4. Energy Recovery from Municipal Solid Waste Thermal Conversion Technologies, P. Jayarama Reddy, CRC Press, Taylor & Francis Group, 2016

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1CE08) INTELLIGENT WASTE MANAGEMENT SYSTEM AND RECYCLING SYSTEM

COURSE PRE-REQUISITES: Solid Waste Management, Hazardous Waste Management, Waste to Energy

COURSE OBJECTIVES:

- To understand the concepts of Solid waste
- To understand the principle and process of IWMS Tools
- To understand the applications of IoT, ML, DL, BC and LCA & Carbon Foot Print (CFP) based SWM
- To understand the principles of Process Systems Engineering (PSE) and various laws and regulation of SWM

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Apply the fundamental concepts of Solid waste

CO-2: Apply the knowledge to resolve the practical problems with the help of IWMS Tools

CO-3: Apply the knowledge of IoT, ML, DL, BC and LCA & CFP to resolve the practical problems in SWM

CO-4: Impart the PSE knowledge and various laws and regulation to resolve the practical problems in SWM

UNIT – I:

Introduction to Solid Waste: Sources, Generation, Classification and Types of Solid Waste – Biomedical Waste – E-Waste – Construction and Demolition Waste – Plastic Waste – Batteries Waste – Hazardous Waste - Waste Management Through Waste Hierarchy: Reduce, Reuse, Recycle, Recover, and Disposal - Waste Operational Units: Equipment and Facilities: Collection and Transportation - Mechanical Treatment - Biological Treatment - Thermal Treatment – Disposal.

UNIT – II:

Introduction to IWMS Tools: Introduction – Need of the IWMS – functional elements of IWMS – Ultrasonic Sensor, Arduino Board, GSM Module, Bread Board, Power Supply (Battery) – Jump Wires - Navigation system – Cloud Services - Zero Waste Principle.

UNIT – III:

Applications in Intelligent Waste Management System: Introductory Applications of IoT, Machine Learning, Deep Learning and Block Chain Technology in Waste Characterization and Source Reduction, Storage, Collection and Transport of Wastes, Waste Processing Technologies and Waste Disposal.

UNIT – IV:

Life Cycle Assessment and Carbon-Footprint-Based IWMS: Phases of Life Cycle Assessment: Goal and Scope Definition - Life Cycle Inventory - Life Cycle Impact

Assessment – Interpretation - LCA Waste Management Software - Umberto Software - SimaPro Software - LCA Assessment Methodology: Life Cycle Inventory Analysis - Life Cycle Impact Assessment – Interpretation - Sensitivity Analysis - Carbon-Footprint-Based SWM - The Global-Warming Potential Impact - GHG Accounting - GWP Assessment for Solid Waste Management.

UNIT – V:

Principles of Systems Engineering: Systems Engineering Principles and Tools for SWM - Planning Regional Material Recovery Facilities - Optimal Planning for Solid Waste Collection, Recycling, and Vehicle Routing - Multiattribute Decision Making with Sustainability Considerations - Decision Analysis for Optimal Balance between Solid Waste Incineration and Recycling Programs - Environmental Informatics for Integrated Solid Waste Management - Future Perspectives.

UNIT – VI:

Regulatory Frameworks: Salient features of Indian legislations on management and handling of municipal solid wastes, hazardous wastes, biomedical wastes, nuclear wastes - lead acid batteries, electronic wastes, plastics waste, bio-medical waste, construction and demolition waste and fly ash waste.

TEXT BOOKS:

1. Sustainable Solid Waste Management - A Systems Engineering Approach, Ni-Bin Chang and Ana Pires, IEEE & John Wiley, Hoboken, 2015
2. Integrated Solid Waste Management, George Tchobanoglous, Hilary Theisen and Samuel A. Vigil, McGraw-Hill International Edition, 1993

REFERENCES:

1. Manual on Municipal Solid Waste Management, CPHEEO, Central Public Health and Environmental Engineering Organization, Government of India, 2014
2. Smart Waste Management- Nutshell, Vishal Gupta, Amazon.com Services LLC, 2017
3. Recyclable Household Waste Management System for Smart Home in IOT, Manpreet Kaur & Dr. Kamaljit Singh Saini, Independently, 2018
4. GoI, Ministry of Environment and Forest and Climate Change, Various Recent Laws and Rules of Solid Waste Management

GREEN ENERGY

1. RENEWABLE ENERGY SOURCES

What we are studying?

The climate landscape is changing rapidly, and new technologies and solutions keep arising to respond to global and local challenges.

Renewable energy sources course makes you discover how Solar Thermal Energy conversion system works. It makes you understand how a Solar Photo voltaic generation system generates electricity. Scope of the course also includes wind energy generation. It also navigates you through Biomass and geo thermal energy generation systems.

Job opportunities:

When it comes to the hottest and most buzzing careers in the 21st century, the majority of people think of hardcore technical domains such as data science, machine learning & artificial intelligence. Few people might also come up with biotechnology (or biosciences). But, quite often people forget about one of the dark horses – the Renewable Energy sector. Even Bill Gates lobbied for the Energy sector as one of the top three career choices for making an impactful career.

Reference:

https://www.stoodnt.com/blog/careers-in-renewable-energy-job-opportunities-fields-of-study-and-top-universities/

2. RENEWABLE ENERGY TECHNOLOGIES

Within Crisis, there are seeds of opportunity..! We are at the wedge of fossil fuel end. After few years you can witness fuel crisis all over the world, as an engineer one must aware of the solution. To design sustainable systems those last for decades, one must use renewable energy as main or auxiliary source of energy. The application may be electrical or mechanical or chemical, one must convert energy from renewable source into electricity for ease of use.

Renewable Energy Technologies course will introduce you to Different types of Solar PV systems and their characteristics. Students will know the functionality of Power Converters such as Inverters etc., through block diagram approach. Fuel cell technology, which is one of the solutions for energy crisis will be discussed in detail. Course will conclude by discussing impact of PV panel production on environment and disposal of it.

Job Opportunities:

Green jobs in the renewable energy sector are expected to touch new figures with 6 digit monthly income. Following link may describe the interesting interdisciplinary careers for budding engineers.

Reference:

https://www.businessinsider.in/slideshows/miscellaneous/21-high-paying-careers-for-people-who-want-to-save-the-planet-and-also-have-job-security/slidelist/70677782.cms#slideid=70677804

3. ENERGY STORAGE TECHNOLOGIES

Battery technology is an essential skill for every engineer in present scenario. Course on energy storage technologies will enable student to, Design storage

system Residential loads integrated to Renewable and storage systems for Electric Vehicles. It will make student to understand various electrochemical storages such as Lead acid, Li Ion cell etc. and their characteristics. The course enables student to compare non-electric, electric storage systems and analyze application of them to various domains.

Job opportunities:

Upon successful completion of course student will enhance the chances of getting into EV industry, which almost open fact. Job Profiles include

i. Battery algorithms engineer
ii. Battery management engineer
iii. Battery modeling expert
iv. Design engineer – EV

4. ENERGY MANAGEMENT AND CONSERVATION

Energy Management And Conservation course is mainly intended to monitor Energy consumption of industries and to manage energy systems. This course also deals with methods of improving efficiency of electric machinery and to design a good illumination system. It also teaches student calculate pay back periods for energy saving equipment.

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1EE01) RENEWABLE ENERGY SOURCES

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:
- To understand the role of solar power
- To know components of PV system conversion
- To learn operation of windmills
- To understand the principle operation of biomass and geo thermal energy systems

COURSE OUT COMES: After completion of the course, the student should be able to
CO-1: Understand Solar Thermal Energy conversion systems
CO-2: Understand Solar Photo voltaic systems
CO-3: Analyze wind energy conversion system
CO-4: Understand the principle operation of Biomass and geo thermal energy systems

UNIT – I:
Principles of Solar Radiation: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, The apparent motion of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sunshine, solar radiation data.

UNIT – II:
Solar Thermal Energy Conversion:
Solar Heating: Some basic calculations, The performance of solar heating devices, Evaluation of sunlight received by a collector, Flat solar panels - Different technologies of thermal solar collectors-Evaluation of the performance of solar collectors- Selective coatings for collectors and glazing, Solar heating systems -Individual and collective solar water heaters- Combined solar systems for the heating of buildings
Power Stations: Concentric Solar Power Plants- Concentrating systems- Components for production of heat and conversion into electricity

UNIT – III:
Solar PV Conversion: The PV Cell-Crystalline Solar cells-Thin film solar cell, Module, Array, Equivalent Electrical circuit, Open circuit voltage and Short circuit current, I-V, P-V Corves, Array design- Sun angle- effect of Temperature-Sun tracking, PV system components

UNIT – IV:
Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria, Maximum power Tracking of wind mills, and peak power operation Site selection of Wind mills, working Induction generator (Principle only)

UNIT – V:

Bio-Mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation and economic aspects.

UNIT – VI:

Geothermal & Ocean Energy: Resources, types of wells, methods of harnessing the energy (brief discussion) potential in India. OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

TEXT BOOKS:

1. Non-Conventional Energy Sources, G. D. Rai, Khanna Publishers
2. Renewable Energies, John Claude Sabbonedere, ISTE & John Wiley, 2007
3. Renewable Energy Resources, Twidell & Wier, CRC Press (Taylor & Francis), 2016

REFERENCE:

1. Wind & Solar Power Systems, Mukund R. Patel, CRC Press, 2003

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1EE02) RENEWABLE ENERGY TECHNOLOGIES

COURSE PRE-REQUISITES: Renewable Energy Sources

COURSE OBJECTIVES:

- To provide necessary knowledge about the modeling, design and analysis of various PV systems
- To show that PV is an economically viable, environmentally sustainable alternative to the world's energy supplies
- To understand the power conditioning of PV and WEC system's power output

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Model, analyze and design various photovoltaic systems
CO-2: Know the feasibility of PV systems as an alternative to the fossil fuels
CO-3: Design efficient stand alone and grid connected PV and WEC power systems

UNIT – I:

Behavior of Solar Cells-Basic Structure and Characteristics: Types - equivalent circuit-modeling of solar cells including the effects of temperature, irradiation and series/shunt resistances on the open-circuit voltage and short-circuit current-Solar cell arrays- PV modules-PV generators- shadow effects and bypass diodes- hot spot problem in a PV module and safe operating area.

UNIT – II:

Types of PV Systems: Grid connected PV systems- Net-metering- Estimation of actual a.c. output power from PV systems
Stand-alone system- Approach to designing an off-grid PV system with battery- with battery and diesel generator- Stand-alone solar water pumping system- Sizing/designing PV water pumping system- Problems

UNIT – III:

Power Converters for PV and Wind: Basic switching devices, AC-DC Rectifier, DC-AC inverter (Basic operation), DC DC converter - Buck, Boost converters Basic operation, Battery charger (Basic operation), grid interface requirements in Renewable energy integration

UNIT – IV:

Maximum Power Point Tracking: Various Sources of Losses is PV system, Charge Control in Battery Backed PV Systems, Maximum Power Point Tracking (MPPT)- Role of DC-DC converter in MPP tracking- Perturb and Observe Method-pseudo program for P&O method, Advanced Issues & Algorithms- search steps-variable step size algorithm.

UNIT – V:

Fuel Cell Technology: History of Fuel cells, Fuel Cell Vehicle Emissions, Hydrogen safety factors, Principle of Operation- Fuel cell Model- cell voltage, Power and efficiency of fuel cell, Various types of fuel cells, Various storage systems for Hydrogen, Applications

UNIT – VI:

Solar Thermal Electricity Generation: Sterling Engine, Solar Pond, Solar Chimney

Solar PV System Environment Impact: Potential Hazards in production of PV cell, Energy payback and CO2 emission of PV systems, Procedure for decommissioning of PV plant, Future Trends of Wind Energy system

TEXT BOOKS:

1. Handbook of Renewable Energy Technology, Ahmed F. Zobaa, World Scientific Publishing Company, 2011
2. Wind and Solar Power Systems Design, Analysis, and Operation, Patel M. R., 2nd Edition, CRC Press, New York, 2005
3. Practical Handbook of Photovoltaics - Fundamentals and Applications, Augustin McEvoy, Tom Markvart, T. Markvart, L. Castaner, Elsevier Science, 2003

REFERENCE:

1. Electric Powertrain - Energy Systems, Power Electronics & Drives for Hybrid, Electric & Fuel Cell Vehicles, Goodarzi, Gordon A., Hayes, John G., John Wiley & Sons, 2018

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B.Tech. VII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1EE03) ENERGY STORAGE TECHNOLOGIES

COURSE PRE-REQUISITES: Renewable Energy Sources, Renewable Energy Technologies

COURSE OBJECTIVES:
- To understand Techno economic analysis of various storage systems
- To know Feasibility of different storage technologies
- To learn Operation of several electrochemical storage systems
- To understand Functionality of non-electric storage systems

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Design storage system Residential loads integrated to Renewable and storage systems for Electric Vehicles
CO-2: Understand various electrochemical storage system
CO-3: Understand terminology and characteristics of Electro chemical systems
CO-4: Compare non-electric and electric storage system
CO-5: Analyze application of storage systems to various domains

UNIT – I:
Techno-economic Analysis of Various Energy Storage Technologies: Electrical Energy Storage (EES)-Definition-Role, Energy storage components, Applications and Technical support, Financial Benefits of EES, Techno economic analysis, Classification of Energy Storage systems, Comparison

UNIT – II:
Estimation of Energy Storage and Feasibility Analysis: Background-Solar Power-Wind Power (Brief discussion), Estimation-daily residential load-daily available solar energy-daily available wind energy-Importance, Estimation of Storage sizing- Steps for Storage sizing- Grid connected residential PV-grid connected residential Wind-hybrid system, Feasibility analysis of Storage systems- Various Terms involved- Case study of comparison between Off grid and grid connected systems

UNIT – III:
Electro Chemical Storage: Standard Batteries- Lead Acid- VRLA - Ni-cd, Modern Batteries- Ni MH- Li Ion, Flow Batteries – Br2 Zn-Vanadium Redox, Battery composition, construction, Principle of operation, Types, Advantages and disadvantages to above batteries.

UNIT – IV:
Terminology & Characteristics: Battery Terminology, Capacities, Definitions of various characteristics, Different States of charge-DOD-SOC-SOE-SOH-SOF, Resistance, Battery Design, Battery Charging, Charge Regulators, Battery Management, General Equivalent Electrical Circuit, Performance Characteristics

UNIT – V:

Non-Electric Storage Technologies: Flywheel, Energy Relations, Flywheel System Components, Benefits of Flywheel over Battery, Superconducting Magnet Energy Storage, Compressed Air Energy storage, Overview Thermal Energy Storage. Capacitor bank storage, Comparison of storage Technologies

UNIT –VI:

Applications: Domains of applications of Energy storage- Starter-Traction-stationary-mobile or nomadic, Review of storage requirements, Storage for Electric Vehicle application, Storage for hybrid vehicle-Regenerative Braking-Super capacitor-hybrid capacitor

TEXT BOOKS:

1. Energy Storage Technologies and Applications, Ahmed Faheem Zobaa, InTech Publishers, 2013
2. Lithium Batteries and Other Electrochemical Storage Systems, Christian Glaize, Sylvie Geniès, ISTE & John Wiley, 2013
3. Wind and Solar Power Systems, Mukund R. Patel, 2nd Edition, CRC Press, 2006

REFERENCES:

1. Rechargeable Batteries Applications Handbook, EDN Series for Design Engineers, Elsevier

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B.Tech. VIII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1EE04) ENERGY MANAGEMENT AND CONSERVATION

COURSE PRE-REQUISITES: Renewable Energy sources, Renewable Energy Technologies, Energy Storage Technologies

COURSE OBJECTIVES:

- To understand the necessity of conservation of Energy
- To Know the methods of Energy management
- To identity the factors to increase the efficiency of electrical equipment
- To know the benefits of carrying out energy Audits

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: To conduct Energy Audit of industries
CO-2: To manage energy Systems
CO-3: To specify the methods of improving efficiency of electric motor
CO-4: To improve power factor and to design a good illumination system
CO-5: To calculate pay back periods for energy saving equipment

UNIT – I:

Basic Principles of Energy Audit: Energy audit- definitions, concept, types of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes- Energy audit of industries- energy saving potential, energy audit of process industry, thermal power station, building energy audit

UNIT – II:

Energy Management: Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting- Energy manager, Qualities and functions, language, Questionnaire - check list for top management

UNIT – III:

Energy Efficient Motors: Energy efficient motors, factors affecting efficiency, loss distribution, constructional details, characteristics - variable speed, variable duty cycle systems, RMS hp- voltage variation-voltage unbalance- over motoring- motor energy audit

UNIT – IV:

Power Factor Improvement, Lighting and Energy Instruments: Power factor – methods of improvement, location of capacitors, p.f with non-linear loads, effect of harmonics on p.f., p.f motor controllers – simple problems

UNIT – V:

Lighting Energy Audit and Energy Instruments: Good lighting system design and practice, lighting control, lighting energy audit - Energy Instruments- watt meter, data loggers, thermocouples, pyrometers, flux meters, tongue testers, application of PLC's

UNIT – IV:

Economic Aspects and Analysis: Economics Analysis-Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis.

UNIT – VI:

Analysis of Energy Efficient Motor: Energy efficient motors- calculation of simple payback method, net present worth method- Power factor correction, lighting - Applications of life cycle costing analysis, return on investment.

TEXT BOOKS:

1. Energy Management, W. R. Murphy & G. Mckay, Butterworth-Heinemann
2. Energy Management, Paul o' Callaghan, 1st Edition, McGraw-Hill, 1998

REFERENCES:

1. Energy Efficient Electric Motors, John C. Andreas, 2nd Edition, Marcel Dekker Inc., 1995
2. Energy Management Handbook, W. C. Turner, John Wiley and Sons
3. Energy Management and Good Lighting Practice: Fuel Efficiency Booklet12, EEO

3D PRINTING AND DESIGN

3D PRINTING AND DESIGN

3D Printing is a process for making a physical object from a three-dimensional digital model by laying down many successive thin layers of a material. It brings a digital CAD model into its physical form by adding layer by layer of materials. Thus called 'Additive Manufacturing'. It is the opposite of subtractive manufacturing i.e., removing material from an object using a mechanical machine. It enables to produce complex shapes using less material than traditional manufacturing methods. There are several different techniques to 3D print an object. It saves time through prototyping and is also responsible for manufacturing impossible shapes. Due to these, it has many applications in different fields like consumer products (eyewear, footwear, design, furniture, industrial products (manufacturing tools, prototypes, functional end-use parts, dental products, prosthetics, architectural scale models, reconstructing fossils, replicating ancient artefacts, reconstructing evidence in forensic pathology etc.

3D printing has good prospects from career perspective. Various positions that could be available are CAD designers, engineers, technical developers, software developers, electronics engineers, etc.

This OE track consists of 04 courses and is designed with an objective to provide an overview of all the constituents of 3D Printing starting from elements of CAD that are needed to create CAD models, followed by basics of 3D Printing required for setting the parameters, then the machines and tools used in 3D Printing for thorough understanding of systems and processes and finally the reverse engineering of 3D printing models from actual objects.

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1ME01) ELEMENTS OF CAD

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

- To understand the basics of CAD and devices used
- To know the various types of modeling used in CAD
- To appreciate the concept of feature-based modeling and geometric transformations
- To comprehend the assembly modeling procedure and data exchange formats

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Know the fundamentals of CAD and devices used

CO-2: Identify the types of CAD modeling techniques and utilize them

CO-3: Evaluate the objects or models using geometric transformations and manipulations

CO-4: Perform the assembly modeling and asses the various data exchange formats

UNIT – I:

Fundamentals of CAD: Introduction to Computer Aided Design (CAD), Design process, Application of computers for Design and Manufacturing, Benefits of CAD, Brief overview of computer peripherals for CAD.

UNIT – II:

Geometric Modeling: Introduction to Geometric Model, Types of modeling, Curve representation

Wireframe Modeling: Introduction, advantages, limitations and applications, Wire frame entities-analytic and synthetic, Basic definitions of Cubic, Bezier and B-spline curves

UNIT – III:

Surface Modeling: Introduction, advantages, limitations and applications, surface entities, Basic definitions of analytic surfaces - planar surface, ruled surface, tabulated cylinder, surface of revolution; Basic definitions of synthetic surfaces - Bezier surface, B-spline surface

UNIT – IV:

Solid Modeling: Introduction, advantages, limitations and applications, Solid Entities, Solid Representation schemes – Boundary Representation (B-Rep) scheme, Constructive Solid Geometry (CSG) scheme.

Feature-based Modeling: Introduction, Feature entities, Feature representation, 3D Sketching, Parameter, Relations and Constraints

UNIT – V:

Geometric Transformations: Introduction to 2D & 3D transformations, Brief treatment on Translation, Scaling, Reflection and Rotation using Homogeneous and concatenated transformations

Manipulations: Displaying, Segmentation, Trimming, Intersection, Projection

UNIT – VI:

Assembly Modeling: Introduction, Assembly modeling, Assembly Tree, Mating Conditions, Bottom-up and Top-down approach

Product Data Exchange: Introduction, Graphics Standards, Types of translators, Importance of formats in 3D Printing, Data exchange formats - IGES, STEP and STL

TEXT BOOKS:

1. CAD/CAM Theory and Practice, Ibrahim Zeid, Tata McGraw-Hill
2. Mastering CAD/CAM, Ibrahim Zeid, Tata McGraw-Hill
3. CAD/CAM-Computer Aided Design and Manufacturing, Mikell P. Groover, E. W. Zimmers, Pearson Education/Prentice Hall

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B.Tech. VI Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1ME02) INTRODUCTION TO 3D PRINTING

COURSE PRE-REQUISITES: Elements of CAD

COURSE OBJECTIVES:

- To understand the need of 3D Printing
- To understand about the process chain involved in 3D Printing
- To know about the two-dimensional layer by layer techniques, solid based systems & 3D Printing data exchange formats
- To know the post processing methods involved in 3D Printing

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Summarize the importance of 3D Printing
CO-2: Explain the process chain involved in 3D Printing
CO-3: Explain about two-dimensional layer-by-layer techniques, solid based systems and 3D printing data exchange formats
CO-4: Apply the knowledge gained in the post-processing methods

UNIT – I:
Introduction to 3D Printing: Introduction to 3D Printing, 3D Printing evolution, Classification of 3D Printing, Distinction between 3D Printing & CNC Machining, Advantages of 3D Printing

UNIT – II:
Generalized 3D Printing Process Chain: Process chain, Materials for 3D Printing, Design for 3D Printing and Overview of Medical Modeling & Reverse Engineering.

UNIT – III:
Two-Dimensional Layer-By-Layer Techniques: Stereolithography (SL), Selective Laser Sintering (SLS), Selective Powder Building (SPB), Advantages and Applications.

UNIT – IV:
Solid Based Systems: Introduction, basic principles, Fused Deposition Modeling, Multi-Jet Modeling, Laminated Object Manufacturing (LOM), Advantages and Applications.

UNIT – V:
3D Printing Data Exchange Formats: STL Format, STL File Problems, Brief Overview of other translations like IGES File, HP/GL File and CT data only.

UNIT – VI:
Post-Processing: Introduction, Support Material Removal, Surface Texture Improvements, Accuracy Improvements, Aesthetic Improvements.

TEXT BOOKS:

1. Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Ian Gibson, David W Rosen, Brent Stucker, Springer, 2010
2. Rapid Prototyping: Principles & Applications, Chuaa Chee Kai, Leong Kah Fai, World Scientific, 2010

REFERENCES:

1. Rapid Prototyping: Theory and Practice, Ali K. Karmani, Emand Abouel Nasr, Springer, 2006
2. Understanding Additive Manufacture: Rapid Prototyping, Rapid Tooling and Rapid Manufacture, Andreas Gebhardt, Hanser Publishers, 2013
3. Rapid Manufacturing: Advanced Research in Virtual and Rapid Prototyping, Hopkinson, N. Haque, and Dickens, Taylor and Francis, 2007

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1ME03) 3D PRINTING-MACHINES, TOOLING AND SYSTEMS

COURSE PRE-REQUISITES: Elements of CAD, Introduction to 3D Printing

COURSE OBJECTIVES:
- To understand the need of prototyping
- To understand about the liquid and solid based 3D printing systems
- To know about the liquid-based 3D printing systems & rapid tooling
- To know the applications of 3D Printing

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Summarize the importance of 3D Printing
CO-2: Explain the process involved in liquid and solid based 3D printing systems
CO-3: Explain about the liquid-based 3D printing systems and rapid tooling
CO-4: Adapt the knowledge gained in applications of 3D Printing

UNIT – I:
Introduction: Prototype Fundamentals, Types of Prototypes, Roles of Prototypes, Phases of Development Leading to Rapid Prototyping, Fundamentals of Rapid Prototyping.

UNIT – II:
Liquid Based 3D Printing Systems: Introduction, Principles, Processes and Applications of Solid Ground Curing, Material Jetting & Binder Jetting

UNIT – III:
Solid Based 3D Printing Systems: Introduction, Principles, Processes and Applications of Fused Deposition Modelling (FDM), Paper Lamination Technology (PLT) and Laminated Object Manufacturing (LOM)

UNIT – IV:
Laser Based 3D Printing Systems: Selective Laser Sintering (SLS)-Principle, Process and Applications, Three-Dimensional Printing- Principle, Process and Applications, Laser Engineered Net Shaping (LENS)- Principle, Process and Applications

UNIT – V:
Rapid Tooling: Introduction and need for Rapid Tooling, Overview of Indirect and Direct Processes, Applications

UNIT – VI:
3D Printing Applications: Brief overview of Applications in Design, Engineering, Aerospace Industry, Automotive Industry and Biomedical Industry

TEXT BOOKS:

1. Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Ian Gibson, David W Rosen, Brent Stucker, Springer, 2010
2. Rapid Prototyping: Principles & Applications, Chuaa Chee Kai, Leong Kah Fai, World Scientific, 2010

REFERENCES:

1. Rapid Prototyping: Theory and Practice, Ali K. Karmani, Emand Abouel Nasr, Springer, 2006
2. Understanding Additive Manufacture: Rapid Prototyping, Rapid Tooling and Rapid Manufacture, Andreas Gebhardt, Hanser Publishers, 2013
3. Rapid Manufacturing: Advanced Research in Virtual and Rapid Prototyping, Hopkinson, N. Haque, and Dickens, Taylor and Francis, 2007

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1ME04) REVERSE ENGINEERING

COURSE PRE-REQUISITES: Elements of CAD, Introduction to 3D Printing, 3D Printing Machines, Tooling & Systems

COURSE OBJECTIVES:

- To understand the Reverse Engineering (RE) and its methodologies
- To comprehend data acquisition techniques for reverse engineering
- To understand Integration Between Reverse Engineering and Additive manufacturing
- To know the applications of reverse engineering

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Basic understanding of Reverse Engineering and its methodologies

CO-2: Understanding the data acquisition techniques for reverse engineering

CO-3: Understanding of amalgamation Between Reverse Engineering and Additive manufacturing

CO-4: Adapt the knowledge gained in reverse engineering for various applications

UNIT – I:

Introduction to Reverse Engineering: Need, Definition, The Generic Process, History of Reverse Engineering, Overview of Applications

UNIT – II:

Methodologies and Techniques: Potential for Automation with 3-D Laser Scanners, Computer-aided (Forward) Engineering, Computer-aided Reverse Engineering, Computer Vision and Reverse Engineering

UNIT – III:

Data Acquisition Techniques: Contact Methods: Coordinate Measurement Machine and Robotic Arms

UNIT – IV:

Data Acquisition Techniques: Noncontact Methods: Triangulation, Structured Light and Destructive Method

UNIT – V:

Integration Between Reverse Engineering and Additive manufacturing: Modeling Cloud Data, Integration of RE and AM for Layer-based Model Generation, Adaptive Slicing Approach for Cloud Data Modeling.

UNIT – VI:

Applications:

Automotive: Workflow for Automotive Body Design, Reverse Engineering for Better Quality

Aerospace: RE in Aerospace–A Work in Progress, Reducing Costs of Hard Tooling

Medical: Orthodontics, Hearing Instruments, Knee Replacement

TEXT BOOKS:

1. Reverse Engineering: An Industrial Perspective, V. Raja and K. Fernandes, Springer-Verlag
2. Reverse Engineering, K. A. Ingle, McGraw-Hill
3. Rapid Prototyping, Ali Kamrani, Emad Nasr, Springer, 2006

REFERENCES:

1. Smart Product Engineering, Michael Abramovici, Rainer Stark, Springer-Berlin Heidelberg
2. Product Design: Techniques in Reverse Engineering and New Product Development, K. Otto and K. Wood, Prentice Hall, 2001

INTERNET OF THINGS

INTERNET OF THINGS

Internet of Things: The IoT creates opportunities for more direct integration of the physical world into computer-based systems, resulting in efficiency improvements, economic benefits, and reduced human exertions. *IoT* **is changing how we live, work, travel, and do business. It is even the basis of a new industrial transformation, known as** Industry 4.0**, and key in the** digital transformation **of organizations, cities, and society overall.** The IoT track helps students to learn about how to

- Learn different protocols and connectivity technologies used in IOT.
- Expose the various sensors and transducers for measuring mechanical quantities.
- Develop simple applications using 8051 microcontrollers.
- Understand the key routing protocols for sensor networks and their design issues.

Some of the more common career paths in the Internet of Things path are

- IoT Developer. ...
- IoT Architect…
- IoT Embedded Systems Designer…
- IoT Solutions Engineer…
- Professional in Sensors and Actuators…
- Embedded Programs Engineer…
- Safety Engineer…

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1EC01) SENSORS TRANSDUCERS AND ACTUATORS

COURSE PRE-REQUISITES: Engineering Physics, Electronic Measuring Instruments

COURSE OBJECTIVES:

- To expose the students to various sensors and transducers for measuring mechanical quantities
- To make the students familiar with the specifications of sensors and transducers
- To make the students identify for various sensors and transducers for various applications
- To expose the students to various actuators

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Familiar with classification and characteristics of various sensors and transducers

CO-2: Familiar with the principle and working of various sensors and transducers

CO-3: Familiar with the principle and working of various actuators

CO-4: Able to select proper Transducer / Sensor for a specific measurement application

CO-5: Able to select proper Actuator for a specific measurement application

UNIT – I:

Primary Sensing Elements and Transducers: Mechanical devices as primary detectors, mechanical spring devices, pressure sensitive primary devices, flow rate sensing elements, Transducers-electrical Transducers, classification of Transducers, characteristics and choice of Transducers, factors influencing the choice of Transducers.

UNIT – II:

Electric Transducers: Resistive transducers, Potentiometers, Strain gauges, Types of Strain gauges, Resistance thermometers, Thermistors, Thermocouples, variable Inductance Transducers, Linear Variable Differential Transformer, Synchros, Resolvers, Capacitive Transducers, Piezo electric Transducers.

UNIT – III:

Magnetic & Optical Transducers: Hall Effect Transducers, Magneto resistors, Magneto-Elastic and Magneto-Strictive Transducers, Opto electronic Transducers, Digital Encoding Transducers, Photo Optic Transducers.

UNIT – IV:

Smart Sensors & Applications: Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters, Compensation, Information Coding/Processing, Data Communication, Standards for Smart Sensor Interface, the Automation. Sensors Applications: Introduction, On-board Automobile Sensors (Automotive Sensors), Home

Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing, Sensors for environmental Monitoring.

UNIT – V:

Mechanical and Electrical Actuators: Mechanical Actuation Systems-Types of motion, Kinematic chains, Cams, Gears, Ratchet and pawl, Belt and chain drives, Bearings, Mechanical aspects of motor selection, Electrical Actuation Systems, Electrical systems, Mechanical switches, Solid-state switches, Solenoids, D.C. Motors, A.C. Motors, Stepper motors.

UNIT – VI:

Pneumatic and Hydraulic Actuators: Pneumatic and Hydraulic Actuation Systems-Actuation systems, Pneumatic and hydraulic systems, Directional Control valves, Pressure control valves, Cylinders, Servo and proportional control valves, Process control valves, Rotary actuators.

TEXT BOOKS:

1. A Course in Electrical and Electronic Measurements and Instrumentation, A. K. Sawhney, Puneet Sawhney,19th Edition, 2011
2. Sensors and Transducers, D. Patranabis, 2nd Edition, PHI, 2013
3. Mechatronics, W. Bolton, Pearson Education Limited, 7th Edition, 2018

REFERENCES:

1. Sensors and Actuators, Patranabis, 2nd Edition, PHI, 2013

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B.Tech. VI Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1EC02) INTRODUCTION TO MICROCONTROLLER AND INTERFACING

COURSE PRE-REQUISITES: Sensors Transducers and Actuators

COURSE OBJECTIVES:
- To differentiate various number systems
- To understanding programming concepts
- To develop simple applications using 8051 microcontrollers

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand basic computing concepts
CO-2: Know architecture of 8051 microcontrollers
CO-3: Program internal resources of 8051 microcontroller
CO-4: Interface peripherals to 8051 microcontroller

UNIT – I:
Introduction to Computing: Numbering and Coding Systems: Binary, Decimal, Hexadecimal and conversions, Binary and Hexadecimal Arithmetic, Complements, Alphanumeric codes. Digital Premier, Inside the Computer

UNIT – II:
Embedded System Design: Embedded system - Definition, Characteristics of embedded computing applications, Design challenges, Requirements, Specification, Architecture design, Designing hardware and software components, system integration, Design example: Model train controller.

UNIT – III:
8051 Microcontroller: Microcontrollers and Embedded Processors, Architecture and Programming Model of 8051, Special Function Register formats, Memory Organization, Timers and Counters- Operating modes, Serial port, Interrupts

UNIT – IV:
8051 Programming in C: Data types, software delay generation, Logical operations, Accessing code and data space in 8051, I/O port programming, Timer/counter programming.

UNIT – V:
8051 Programming: Serial IO modes and their programming in C, interrupts programming in C: serial, timer and external interrupts.

UNIT – VI:
Introduction to Arduino: Features of Arduino, Arduino components and IDE, Interfacing: Seven Segment Display, Pulse Width Modulation, Analog Digital

Converter, Wireless connectivity to Arduino. Case study: From BT To WiFi: Creating WiFi Controlled Arduino Robot Car.

TEXT BOOKS:

1. The 8051 Microcontroller: Programming, Architecture, Ayala & Gadre, Cengage Publications 3rd Edition, 2008
2. The 8051 Microcontroller and Embedded Systems: Using Assembly and C, Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, 2nd Edition, 2005

REFERENCES:

1. Digital Design, Morris Mano, PHI, 3rd Edition, 2006
2. Embedded Systems: Architecture, Programming and Design, 2nd Edition, TATA MCGRAW-HILL

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1EC03) FUNDAMENTALS OF INTERNET OF THINGS

COURSE PRE-REQUISITES: Sensors Transducers and Actuators, Introduction to Microcontrollers and Interfacing

COURSE OBJECTIVES:

- To understand the basics of Internet of Things
- To learn about IOT and M2M
- To understand Cloud of Things
- To learn different applications with IoT

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the concepts of Internet of Things
CO-2: Understand the IOT, M2M
CO-3: Understand the concepts Cloud of Things
CO-4: Apply IOT to different applications in the real world

UNIT – I:
Introduction to Internet of Things: Definition and Characteristics of IoT, Physical Design of IoT, Logical Design of IoT-IoT Functional Blocks, IoT Communication Models, IoT Communication API's

UNIT – II:
IoT Enabling Technologies: Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Deployment Templates

UNIT – III:
IoT Platforms Design Methodology: Introduction, IoT Design Methodology- Purpose & Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specification, IoT Level Specifications, Functional view Specification, Operational View Specification, Device & component Integration, Application Development

UNIT – IV:
IoT and M2M: Introduction, M2M, Difference between IoT and M2M – Communication Protocols, Machines in M2M Vs things in IoT, Hardware Vs Software emphasis, Data collection and analysis, applications, SDN and NFV for IoT

UNIT – V:
Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards – Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture.

UNIT – VI:

Domain Specific Applications of IoT: Applications of IoT– Home, Health, Environment, Energy, Agriculture, Industry and Smart City.

TEXT BOOKS:

1. Internet of Things: A Hands-On Approach, Vijay Madisetti, Arshdeep Bahga, Universities Press, 2015
2. The Internet of Things – Key Applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi, Wiley, 2012
3. The Internet of Things in the Cloud: A Middleware Perspective, Honbo Zhou, CRC Press, 2012

REFERENCES:

1. Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, Ovidiu Vermesan, Peter Friess, River Publishers, 2013
2. Building the Internet of Things, Sara Cordoba, Wimer Hazenberg, Menno Huisman, BIS Publishers, 2011
3. Designing the Internet of Things, Adrian Mcewen, Hakin Cassimally, John Wiley and Sons, 2015

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B.Tech. VIII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1EC08) WIRELESS SENSOR NETWORKS

COURSE PRE-REQUISITES: Sensors Transducers and Actuators, Introduction to Microcontrollers and Interfacing, IoT Protocols and its applications

COURSE OBJECTIVES:

- To expose basic concepts of wireless sensor network technology
- To study medium access control protocols and various issues in a physical layer
- To understand the key routing protocols for sensor networks and their design issues
- To understand sensor management in networks and design requirements

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Appreciate various design issues of wireless sensor networks

CO-2: Understand the hardware details of different types of sensors and select the application specific sensor

CO-3: Understand radio standards and communication protocols to be used for wireless sensor networks

UNIT – I:

Introduction: Overview of sensor network architecture and its applications, sensor network comparison with Ad Hoc Networks, Sensor node architecture with hardware and software details.

UNIT – II:

Hardware: Examples like mica2, micaZ, telosB, cricket, Imote2, tmote, btnode, and Sun SPOT, Software (Operating Systems): TinyOS, MANTIS, Contiki, and RetOS.

UNIT – III:

Programming Tools: C, nesC. Performance comparison of wireless sensor networks simulation and experimental platforms like open source (ns-2) and commercial (QualNet, Opnet, NetSim)

UNIT – IV:

Overview of Sensor Network Protocols (Details of at least 2 important protocol per layer): Physical, MAC and routing/ Network layer protocols, node discovery protocols, multi- hop and cluster-based protocols, Fundamentals of 802.15.4, Bluetooth, BLE (Bluetooth low energy), UWB.

UNIT – V:

Data Dissemination and Processing: Differences compared with other database management systems, Query models, In-network data aggregation, data storage; query processing.

UNIT – VI:

Specialized Features: Energy preservation and efficiency; security challenges; Fault tolerance, Issues related to Localization, connectivity and topology, Sensor deployment mechanisms; coverage issues; sensor Web; sensor Grid, Open issues for future research, and Enabling technologies in wireless sensor network.

TEXT BOOKS:

1. Wireless Sensor Networks Technology, Protocols, and Applications, Kazem Sohraby, Daniel Minoli, Taieb Znati, John Wiley & Sons, 2007
2. Protocols and Architectures for Wireless Sensor Networks, H. Karl and A. Willig, John Wiley & Sons, India, 2012
3. Wireless Sensor Networks, C. S. Raghavendra, K. M. Sivalingam, and T. Znati, Editors, 1st Indian Reprint, Springer Verlag, 2010

REFERENCES:

1. Wireless Sensor Networks: An Information Processing Approach, F. Zhao and L. Guibas, 1st Indian Reprint, Morgan Kaufmann, 2013
2. Wireless Sensor Network and Applications, Yingshu Li, My T. Thai, Weili Wu, Springer Series on Signals and Communication Technology, 2008
3. Principles of Mobile Communications, Gordon L. Stuber, Springer International, 2nd Edition, 2001

AUGMENTED REALITY (AR) / VIRTUAL REALITY (VR)

AUGMENTED REALITY (AR) / VIRTUAL REALITY (VR)

Augmented Reality and virtual Reality (AR & VR): Augmented reality (AR) and Virtual Reality (VR) bridge the digital and physical worlds. They allow you to take in information and content visually, in the same way you take in the world. AR dramatically expands the ways our devices can help with everyday activities like searching for information, shopping, and expressing yourself. VR lets you experience what it's like to go anywhere from the front row of a concert to distant planets in outer space.

Job Roles in Augmented Reality and Virtual Reality (AR & VR) Track

- Design Architect. ...
- Software Designer. ...
- System Validation Engineers. ...
- Software Developer. ...
- 3D Artist…

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1EC04) INTRODUCTION TO C-SHARP

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:
- To understand the foundations of CLR execution
- To learn the technologies of the .NET framework and object-oriented aspects of C#
- To be aware of application development in .NET
- To learn web-based applications on .NET (ASP.NET)

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Explain how C# fits into the .NET platform
CO-2: Analyze the basic structure of a C# application
CO-3: Develop programs using C# on .NET
CO-4: Design and develop Web based applications on .NET

UNIT – I:
Introduction to C#: Introducing C#, Understanding .NET, overview of C#, Literals, Variables, Data Types, Operators, checked and unchecked operators, Expressions, Branching, Looping, Methods, implicit and explicit casting, Constant, Arrays, Array Class, Array List, String, String Builder, Structure, Enumerations, boxing and unboxing.

UNIT – II:
Object Oriented Aspects of C#: Class, Objects, Constructors and its types, inheritance, properties, indexers, index overloading, polymorphism, sealed class and methods, interface, abstract class, abstract and interface, operator overloading, delegates, events, errors and exception, Threading.

UNIT – III:
Application Development on .NET: Building windows application, Creating our own window forms with events and controls, menu creation, inheriting window forms, SDI and MDI application, Dialog Box (Modal and Modeless), accessing data with ADO.NET, DataSet, typed dataset, Data Adapter, updating database using stored procedures

UNIT – IV:
SQL Server with ADO.NET, handling exceptions, validating controls, windows application configuration.

UNIT – V:
Web Based Application Development on .NET: Programming web application with web forms, ASP.NET introduction, working with XML and .NET, Creating Virtual Directory and Web Application, session management techniques, web.config, web services,

passing datasets, returning datasets from web services, handling transaction, handling exceptions, returning exceptions from SQL Server.

UNIT – VI:

CLR and .NET Framework: Assemblies, Versoning, Attributes, reflection, viewing meta data, type discovery, reflection on type, marshalling, remoting, security in .NET

TEXT BOOKS:

1. The Complete Reference: C# 4.0, Herbert Schildt, Tata McGraw-Hill, 2012
2. Professional C# 2012 with .NET 4.5, Christian Nagel et al., Wiley, 2012

REFERENCES:

1. Pro C# 2010 and the .NET 4 Platform, Andrew Troelsen, 5th Edition, A Press, 2010
2. Programming C# 4.0, Ian Griffiths, Matthew Adams, Jesse Liberty, 6th Edition, O"Reilly, 2010

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B.Tech. VI Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1EC05) INTRODUCTION TO SIGNAL PROCESSING

COURSE PRE-REQUISITES: Introduction to C Sharp

COURSE OBJECTIVES:

- To understand various fundamental characteristics of signals and systems
- To analyze signals in frequency domain
- To know principles of signal transmission through systems
- To understand fundamentals of digital signal

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Classify signals and implement various operations on signals
CO-2: Analyze the characteristics of signals and systems
CO-3: Understand the basics of filter design
CO-4: Appreciate the processes of Multirate systems

UNIT – I:

Representation of Signals: Continuous time and Discrete Time signals, Classification of Signals – Periodic and aperiodic, even and odd, energy and power signals, deterministic and random signals, causal and non-causal signals, complex exponential and sinusoidal signals. Concepts of standard signals. Various operations on Signals.

UNIT – II:

Representation of Systems: Classification of discrete time Systems, impulse response, Concept of convolution in time domain and frequency domain, response of a linear system, System function, Signal bandwidth, system bandwidth. Ideal filter characteristics.

UNIT – III:

Sampling Theorem: Representation of continuous time signals by its samples - Sampling theorem – Reconstruction of a Signal from its samples, aliasing
Z –Transform: Basic principles of z-transform, region of convergence, properties of ROC, Inverse z-transform using Partial fraction.

UNIT – IV:

Introduction to Digital Signal Processing: Applications of Z-Transforms- Solution of Linear Constant Coefficient Difference equations (LCCD), System function, Frequency Response of the system.

UNIT – V:

Discrete Fourier Transforms: Circular convolution, Comparison between linear and circular convolution, Computation of DFT.

IIR Digital Filters: Design of IIR Digital filters (H(s) to be given) - Impulse invariance transformation techniques, Bilinear transformation method.

UNIT – VI:

FIR Digital Filters: Characteristics of linear phase FIR filters and its frequency response, Comparison of IIR and FIR filters. Design of FIR filters using Fourier Method and Windowing Technique (only Hanning).

Realization of IIR and FIR Filters: Direct and Cascade forms.

TEXT BOOKS:

1. Signals, Systems and Communications, B. P. Lathi, BS Publications, 2009
2. Signals and Systems, Alan V. Oppenheim, Alan S. Willsky and S. Hamid Nawab, 2nd Edition, PHI
3. Digital Signal Processing: Principles, Algorithms and Applications, John G. Proakis, D. G. Manolakis, 4th Edition, Perason/PHI, 2009

REFERENCES:

1. Signals and Systems, Simon Haykin and Barry Van Veen, 2nd Edition, John Wiley
2. Signals, Systems and Transforms, C. L. Philips, J. M. Parr and Eve A. Riskin, 3rd Edition, Pearson, 2004
3. Signals and Systems, Schaum's Outlines, Hwei P. Hsu, Tata McGraw-Hill, 2004
4. Digital Signal Processing – A Practical Approach, Emmanuel C. Ifeacher, Barrie W. Jervis, 2nd Edition, Pearson Education

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B.Tech. VII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1EC06) INTRODUCTION TO IMAGE AND VIDEO PROCESSING

COURSE PRE-REQUISITES: Introduction to C Sharp, Introduction to Signal Processing

COURSE OBJECTIVES:

- To introduce fundamentals of digital image and video processing
- To demonstrate digital signal processing techniques in spatial and frequency domains
- To study and compare various image and video compression algorithms
- To study applications of motion estimation in video processing

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Acquire, represent the digital image and transforms

CO-2: Apply various pixel position and intensity-based image processing techniques

CO-3: Understand and analyze the performance of block matching algorithms in MPEG video coding standards

UNIT – I:

Fundamentals of Image Processing and Image Transforms: Basic steps of Image processing system sampling and quantization of an Image – Basic relationship between pixels, 2 – D Discrete Fourier Transform, Discrete Cosine Transform, Introduction to Wavelet transforms.

UNIT – II:

Image Enhancement-Spatial Domain Methods: Point Processing, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial filters, Sharpening Spatial filters.

UNIT – III:

Image Enhancement-Frequency Domain Methods: Basics of filtering in frequency domain, Image Smoothing, Image Sharpening, Selective Filtering.

Image Segmentation: Segmentation Concepts, Point, Line and Edge Detection, Thresholding, Region Based Segmentation.

UNIT – IV:

Image Compression: Image compression fundamentals – coding Redundancy, spatial and temporal redundancy.

Compression Models: Lossy and Lossless, Huffmann coding, Arithmetic coding, LZW coding, run length coding, Bit Plane coding, transform coding.

UNIT – V:

Basic Steps of Video Processing: Analog video, Digital Video, Time varying Image Formation models: 3D motion models, Geometric Image formation, Photometric Image formation, sampling of video signals.

UNIT – VI:

2-D Motion Estimation: Optical flow, pixel-based motion estimation, Block matching algorithm, Mesh based motion Estimation, global Motion Estimation, Region based motion estimation, multi resolution motion estimation. Application of motion estimation in video coding.

TEXT BOOKS:

1. Digital Image Processing, Gonzaleze and Woods, 3rd Edition, Pearson
2. Video Processing and Communication, Yao Wang, Joem Ostarmann and Ya – Quin Zhang, 1st Edition, PHI

REFERENCES:

1. Digital Video Processing, M. Tekalp, Prentice Hall International
2. Image Acquisition and Processing with LabVIEW, Relf, Christopher G., CRC Press
3. Inverse Synthetic Aperture Radar Imaging with MATLAB Algorithms, Aner Ozdemi R, John Wiley & Sons
4. Fundamentals of Digital Image Processing, A Practical Approach with Examples in Matlab, Chris Solomon, Toby Breckon, John Wiley & Sons

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B.Tech. VIII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1EC07) FUNDAMENTALS OF AUGMENTED REALITY AND VIRTUAL REALITY

COURSE PRE-REQUISITES: Introduction to C Sharp, Introduction to Signal Processing, Introduction to Image & Video Processing

COURSE OBJECTIVES: Throughout the course, Students will be expected to develop AR VR applications by being able to do each of the following:

- To a review of current Virtual Reality (VR) and Augmented Reality (AR) technologies
- To the fundamentals of VR/AR modeling and programming
- To provides a detailed analysis of engineering scientific and functional aspects of VR/AR

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Acquire knowledge in main applications VR / AR technologies
CO-2: Analyze different tools for VR/AR applications
CO-3: Developing VR/AR applications

UNIT – I:
Augmented Reality and Virtual Reality:
Augmented Reality: Introduction to Augmented Reality (AR), Fundamentals, Chronicle order of AR, features
Virtual Reality: Introduction to Virtual Reality (VR), Features of VR and Chronicle order of VR; Difference between AR and VR.

UNIT – II:
Types of Augmented Reality: Marker based AR, Marker less AR, Projection based AR, Super Imposition based AR, Applications of AR.

UNIT – III:
Types of Virtual Reality: Non- immersive simulation, Semi-immersive simulations, Fully immersive simulations; Applications VR.

UNIT – IV:
Making an AR App with Simple CUBE: Introduction to Unity, Installation steps, Fundamentals while implementing Project, importing a cube, Create an account in Vuforia, license manager, target manager, downloading database and uploading target database in unity.

UNIT – V:
AR App with Interaction: Introduction to C#, Scripting interactive objects, implementation C# Script using unity, uploading target object, deploying application into ANDROID Device.

UNIT – VI:

Creating an Virtual Reality: Creating an Virtual Reality Scene in unity, adding colliders, Settings of Unity to make the application compatible with Google cardboard.

TEXT BOOKS:

1. Augmented Reality for Developers, Build Practical Augmented Reality Applications with Unity, ARCore, ARKit, and Vuforia. Linowes J., Babilinski K., United Kingdom, Packt Publishing, 2017
2. Building Virtual Reality with Unity and Steam VR, Murray, J. W., United Kingdom, CRC Press, 2020

REFERENCES:

1. Virtual Reality & Augmented Reality in Industry, Ma D., Gausemeier J., Fan X., Grafe M. (Eds.) Springer, 2011
2. Unity 2020 Virtual Reality Projects: Learn VR Development by Building Immersive Applications and Games with Unity 2019.4 and Later Versions, Linowes J., 3rd Edition, United Kingdom, Packt Publishing, 2020

ARTIFICIAL INTELLIGENCE

ARTIFICIAL INTELLIGENCE

Artificial Intelligence (AI) is a cognitive science with highly research activities in the major areas like Machine Learning, Robotics, Natural Language Processing and image processing. This track will cover basic foundations of artificial intelligence it will make the students industry-ready for artificial intelligence and data science job roles. Artificial intelligence is used in wide range of industrial applications such as healthcare, transportation, entertainment, insurance, transport and logistics, and customer service.

Future applications of AI would be utilized in automated transportation, cyborg technology, solving problems associated with climate change, deep-sea and space exploration.

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1MT01) MATHEMATICS FOR ARTIFICIAL INTELLIGENCE

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

- To introduce the basic concepts of probability and matrices in the field of Artificial Intelligence
- To identify, explore the complex problem-solving strategies
- To develop problem solving skills related to algorithmic analysis required for AI
- To apply and build mathematical model to solve real-world problems

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Explore and demonstrate practical approaches related to implementation of the AI algorithms using probability concepts

CO-2: Formulate and solve the Artificial intelligence related problems by using the knowledge of matrices and vectors

CO-3: Demonstrate the understanding of mathematical ideas from artificial intelligence perspective and machine learning

CO-4: Analyze and solve the complexity of a given problem with suitable optimization techniques

UNIT – I:

Probability: Basic rules and axioms, events, sample space, frequentist approach, dependent and independent events, conditional probability, Random variables, continuous and discrete, expectation, variance, distributions - joint and conditional, Bayes' theorem, Popular distributions - Bernoulli, Binomial, Poisson, Normal.

UNIT – II:

Descriptive Statistics & Linear Regression: Classification and tabulation of univariate data, graphical representation, Frequency curves. Descriptive measures - Central tendency and Dispersion. Simple Linear Regression Models.

UNIT – III:

Vector Space: Vectors, definition, scalars, addition, scalar multiplication, inner product (dot product), vector projection, cosine similarity, orthogonal vectors, normal and orthonormal vectors, vector norm, vector space, linear combination, linear span, linear independence, basis vectors.

UNIT – IV:

Matrices: Matrices definition, rank, System of equations: Direct methods - LU decomposition method, Tri-diagonal system; Applications of linear systems - Network flows and Mechanical systems.

UNIT – V:

Eigen Values & Eigen Vectors: Eigen values & eigen vectors, concept, intuition, significance, how to find principle component analysis, concept, properties, applications, Singular value decomposition, concept, properties, applications.

UNIT – VI:

Multivariate Calculus: Functions, Scalar derivative, partial derivatives, Gradient, chain rule, properties, method for derivative of vector-valued function with respect to scalar, vector four combinations - Jacobian, Hessian, Gradient of vector valued function, Gradient of matrices. Local/global maxima and minima, saddle point, convex functions, gradient descent algorithms - Learning rate, momentum, stochastic, Constrained optimization (Lagrange Multiplier method), convex optimization.

TEXT BOOKS:

1. Mathematics for Machine Learning, Peter Deisenroth, A. Aldo Faisal, and Cheng Soon Ong, Cambridge University Press, 2020
2. Linear Algebra and it's Applications, David C. Lay, 3rd Edition, Pearson Publications
3. Probability and Statistics for Engineers, Richard A. Johanson, 5th Edition, Prentice-Hall, 1995

REFERENCES:

1. Math for Machine Learning: Open Doors to Data Science and Artificial Intelligence, Richard Han, 2018
2. Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning, James V. Stone
3. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006

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B.Tech. VI Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1CS01) FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE

COURSE PRE-REQUISITES: Mathematics for Artificial Intelligence

COURSE OBJECTIVES:

- To understand and analyze the importance and basic concepts of artificial intelligence and the use of agents
- To identify, explore the complex problem-solving strategies and approaches
- To analyze the concepts of basic concepts of neural networks and learning process
- To explore and analyze the methodology used in machine learning

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Apply the basic concepts of artificial intelligence and the use of agents into the real-world scenario

CO-2: Design and formulate complex problem solutions with the use of various searching techniques

CO-3: Correlate the algorithmic approach of machine learning algorithms for a given case study

CO-4: Analyse the phenomenon of neural networks and apply basic learning laws

UNIT – I:

Introduction to AI: Foundations of AI – History of AI - Applications of AI, Intelligent Agents – Agents and Environments – Nature of Environments – Structure of Agents – Problem solving Agents – Problem formulation – Example Problems.

UNIT – II:

Searching Techniques: Uninformed Search Strategies – Breadth first search – Depth first search – Depth limited search - Bidirectional search – comparison – Search with partial information - Heuristic search – Greedy best first search – A* search – Memory bounded heuristic search - Heuristic functions - Local search- Hill climbing – Simulated annealing search - Local beam search, Genetic algorithms.

UNIT – III:

Constraint Satisfaction Problems: Backtracking search for CSP's - local search for constraint satisfaction problem. *Adversarial search* – Games - Minimax algorithm, Alpha beta pruning, cutting-off search.

UNIT – IV:

Knowledge Representation and Reasoning: Propositional Logic, Rules of Inference, First Order Logic (FOL) Syntax, Semantics, Entailment.

UNIT – V:

Classical Planning: Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

UNIT – VI:

Planning and Acting in the Real World: Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning.

TEXT BOOKS:

1. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, 3rd Edition, Prentice Hall, 2010
2. Machine Learning, Tom M. Mitchell, McGraw-Hill Publications
3. Neural Networks A Comprehensive Foundation, Simon Haykin, 2nd Edition, Pearson Education, 2004

REFERENCES:

1. Artificial Intelligence, Elaine Rich & Kevin Knight, 2nd Edition, TATA MCGRAW-HILL
2. Artificial Intelligence-A New Synthesis, Nils J. Nilsson, Elsevier
3. Artificial Neural Networks, Yegnanarayana B., PHI

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B.Tech. VII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1CS02) MACHINE LEARNING TECHNIQUES

COURSE PRE-REQUISITES: Mathematics for Artificial Intelligence, Fundamentals of Artificial Intelligence

COURSE OBJECTIVES:

- To understand applications in computational learning theory
- To analyse the pattern comparison techniques

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Familiarize the basic concepts, notations, mathematical understanding required for machine learning applications

CO-2: Understand various kinds of models and algorithms used for machine learning

CO-3: Apply the suitable machine learning techniques to solve real world applications

CO-4: Demonstrate given technique for various data analysis applications

UNIT – I:

Introduction to Machine Learning: Perspectives and issues in machine learning, Goals and applications of machine learning. Aspects of developing a learning system: training data, concept representation, function approximation.

UNIT – II:

Supervised Learning: Classification, decision boundaries; nearest neighbor methods, Decision Tree Learning – Introduction, decision tree representation, appropriate problems for decision tree learning, Linear classifiers Bayes' Rule and Naive Baye's classification

Regression: Regression types, gradient descent; features of Over fitting and complexity; training, validation, test data, Logistic regression and applications.

UNIT -III:

Unsupervised Learning: Clustering, k-means, hierarchical, partition-based clustering, overlapping clustering, Support vector machines, Support vector regression.

UNIT -IV:

Reinforcement Learning: Introduction to Reinforcement learning, the learning task, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

UNIT- V:

Instance-Based Learning: Introduction, k-nearest neighbour algorithm, locally weighted regression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.

UNIT – VI:

Neural Networks: Introduction to neural networks, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and Convolution neural networks.

TEXT BOOKS:

1. Machine Learning, Tom M. Mitchell, McGraw-Hill
2. Neural Networks and Learning Machines, S. Haykin, Pearson, 2008

REFERENCES:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis
2. Machine Learning: The Art and Science of Algorithms that make Sense of Data, Peter Flash, Cambridge, University Press
3. Machine Learning: A Probabilistic Perspective, Kevin P. Murphy, MIT Press, 2012

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B.Tech. VIII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1CS03) DEEP LEARNING

COURSE PRE-REQUISITES: Mathematics for Artificial Intelligence, Fundamentals of Artificial Intelligence, Machine Learning Techniques

COURSE OBJECTIVES:
- To introduce the foundations of deep learning
- To acquire the knowledge on Deep Learning Concepts

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Identify and select appropriate learning network models required for real world problems
CO-2: Design an efficient model with various deep learning techniques
CO-3: Implement deep learning algorithms and solve real-world problems
CO-4: Apply optimization strategies necessary for problem solving required for large scale applications

UNIT – I:
Introduction to Deep Learning: History of Deep Learning, Deep Learning Success Stories, Biological Neuron, Idea of computational units, McCulloch Pitts Neuron, Thresholding Logic, Perceptrons, Perceptron Learning Algorithm and Convergence.

UNIT – II:
Feedforward Networks: Multilayer Perceptron, Gradient Descent, Back-propagation, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks.

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 Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier.

UNIT – IV:
Optimization for Training Deep Models: Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithm.

UNIT – V:
Convolutional Neural Networks: LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Markov Networks, Object Detection, RCNN, Fast RCNN, Faster RCNN, YOLO

UNIT – VI:

Auto-Encoders: Regularization in auto-encoders, De-noising auto-encoders, Sparse auto-encoders, Contractive auto-encoders, Structured probabilistic models of deep learning.

TEXT BOOKS:

1. Deep Learning: An MIT Press Book, Ian Goodfellow and Yoshua Bengio and Aaron Courville
2. Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall

REFERENCES:

1. Neural Networks: A Systematic Introduction, Raúl Rojas, 1996
2. Pattern Recognition and Machine Learning, Christopher Bishop, 2007

BLOCKCHAIN TECHNOLOGIES

BLOCKCHAIN TECHNOLOGIES

The blockchain is one of the fastest growing skills in the IT sector today. This track will help the students to gain knowledge in blockchain technology, it has taken quite a turn in the industry given its popularity in providing safe and secured online transactions. Most individuals and organizations have started adopting blockchain because of the many benefits it offers to the industry today. It is used in many industry applications such as banking sector, voting, health care, real estate, the legal industry and government.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1CS04) FUNDAMENTALS OF COMPUTER NETWORKS

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

- To introduce the fundamental various types of computer networks
- To demonstrate the TCP/IP and OSI models with merits and demerits
- To explore the various layers of OSI model
- To introduce UDP and TCP models
- To have the concept of different routing techniques for data communications

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand and explore the basics of Computer Networks and Various Protocols and in a position to understand the World Wide Web concepts

CO-2: Position to administrate a network and flow of information

CO-3: Understand easily the concepts of network security, Mobile and ad-hoc networks

UNIT – I:

Introduction to Networks: Internet, Protocols and Standards, The OSI Model, Layers in OSI Model, TCP/IP Suite, Addressing.

Physical Layer: Multiplexing, Transmission Media, Circuit Switched Networks, Datagram Networks, and Virtual Circuit Networks.

UNIT – II:

Data Link Layer: Introduction, Checksum, Framing, Flow and Error Control, Noiseless Channels, Noisy Channels, Random Access Controlled Access, Channelization, IEEE Standards, Ethernet, Giga-Bit Ethernet, Wireless LANs, SONET-SDH, Frame Relay and ATM.

UNIT – III:

Network Layer: Logical Addressing, Internetworking, Tunneling, Address Mapping, ICMP, IGMP, Forwarding, Routing-Flooding, Bellman& Ford, Disjkstra's routing protocols, RIP, OSPF, BGP and Multicast Routing Protocols. Connecting Devices-Passive Hubs, Repeaters, Active Hubs, Bridges, Routers.

UNIT – IV:

Transport Layer: Process to Process Delivery, UDP, TCP and SCTP Protocols, Congestion, Congestion Control, Quality of Service.

UNIT – V:

Application Layer: Domain Name Space, DNS in Internet, Electronic Mail, File Transfer Protocol, WWW, HTTP, SNMP, Multi-Media.

UNIT – VI:

Network Security: Security services, mechanisms and attacks, IPSec, SSL, VPN, Firewall. Bluetooth, Zigbee, IPv4, IPv6.

TEXT BOOKS:

1. Data Communications and Networking, Behrouz A. Forouzan, 4th Edition, McGraw-Hill Education, 2006
2. Computer Networks, Andrew S. Tanenbaum, 4th Edition, Pearson Education
3. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, K. W. Ross, 3rd Edition, Pearson Education

REFERENCES:

1. Data Communications and Networks, William Stallings
2. Data Communication and Networks, Bhusan Trivedi, Oxford University Press, 2016
3. An Engineering Approach to Computer Networks, S. Keshav, 2nd Edition, Pearson Education
4. Understanding Communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1CS08) RELATIONAL DATABASE MANAGEMENT SYSTEMS

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:
- To understand the basic concepts and the applications of database systems
- To master the basics of SQL and construct queries using SQL
- To understand the relational database design principles
- To become familiar with the basic issues of transaction processing and concurrency control
- To become familiar with database storage structures and access techniques

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Demonstrate the basic elements of a relational database management system
CO-2: Identify the data models for relevant problems
CO-3: Design entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data
CO-4: Apply normalization for the development of application software

UNIT – I:
Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages – DDL, DML, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database Users and Administrators, History of Database Systems.
Introduction to Database Design: Database Design and ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises.
Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design: ER to Relational, Introduction to Views, Destroying /Altering Tables and Views.

UNIT – II:
Relational Algebra and Calculus: Preliminaries, Relational Algebra, Relational calculus – Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus.
SQL: Queries, Constraints, Triggers: Form of Basic SQL Query, UNION, INTERSECT, and EXCEPT, Nested Queries, Aggregate Operators, NULL values Complex Integrity Constraints in SQL, Triggers and Active Data bases, Designing Active Databases.

UNIT – III:
Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Dependencies - Reasoning about FDs, Normal Forms, Properties of

Decompositions, Normalization, Schema Refinement in Database Design, Other Kinds of Dependencies.

UNIT – IV:

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

UNIT – V:

Concurrency Control: Lock–Based Protocols, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols, Multiversion Schemes.

Recovery System-Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with loss of nonvolatile storage, Early Lock Release and Logical Undo Operations, Remote Backup systems.

UNIT – VI:

Storage and Indexing: Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing, Index Data Structures, Comparison of File Organizations.

Tree-Structured Indexing: Intuition for tree Indexes, Indexed Sequential Access Method (ISAM), B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

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

TEXT BOOKS:

1. Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, 3rd Edition, McGraw-Hill
2. Database System Concepts, A. Silberschatz, Henry. F. Korth, S. Sudarshan, 6th Edition, McGraw-Hill
3. Database Systems, R. Elmasri, Shamkant B. Navathe, 6th Edition, Pearson Education

REFERENCES:

1. Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning
2. Introduction to Database Management, M. L. Gillenson and others, Wiley
3. Database Development and Management, Lee Chao, Auerbach Publications, Taylor & Francis Group
4. Introduction to Database Systems, C. J. Date, Pearson Education

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1CS05) DISTRIBUTED DATA BASES

COURSE PRE-REQUISITES: Fundamentals of Computer Networks

COURSE OBJECTIVES:

- To introducing distributed databases and exploring several algorithms for processing queries and be able to use them
- To describe the methods to translate complex conceptual data models into logical and Physical database designs
- To demonstrating query optimization and its algorithms
- To enumerating the concepts behind distributed transaction processing

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Analyze issues related to distributed database design
CO-2: Apply Partitioning techniques to databases
CO-3: Design and develop query processing strategies
CO-4: Describe transaction processing and concurrency control in distributed databases

UNIT – I:
Introduction: Features of Distributed versus Centralized Databases,
Levels of Distribution Transparency: Reference Architecture for Distributed Databases, Types of Data Fragmentation, Distribution transparency for Read – only Applications, Distribution transparency for update Applications, Distributed database Access primitives, Integrity Constraints in Distributed Databases.

UNIT – II:
Distributed Database Design: A framework, the design of database fragmentation, the allocation of fragments.
Translation of Global Queries to Fragment Queries: Equivalence Transformations for Queries, Transforming Global Queries into Fragment Queries, Distributed Grouping and Aggregate Function Evaluation, Parametric Queries.

UNIT – III:
Optimization of Access Strategies: A Framework for Query Optimization, Join Queries, General Queries.

UNIT – IV:
The Management of Distributed Transactions: A Framework for Transaction Management, Supporting Atomicity of Distributed Transactions, Concurrency Control for Distributed Transactions, Architectural aspects of Distributed Transactions.

UNIT – V:

Concurrency Control: Foundation of Distributed Concurrency Control, Distributed Deadlocks, Concurrency Control based on Timestamps, Optimistic Methods for Distributed Concurrency Control.

UNIT – VI:

Reliability: Basic Concepts, Nonblocking Commitment Protocols, Reliability and concurrency Control, Determining a Consistent View of the Network, Detection and Resolution of Inconsistency, Checkpoints and Cold Restart.

TEXT BOOKS:

1. Principles of Distributed Database Systems, M. Tamer OZSU and Patuck Valduriez, Pearson Education Asia, 2001
2. Distributed Databases, Stefano Ceri and Willipse Pelagatti, McGraw-Hill

REFERENCES:

1. Database System Concepts, Henry F. Korth, A. Silberchatz and Sudershan, MGH
2. Database Management Systems, Raghuramakrishnan and Johhanes Gehrke, MGH

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1CS06) CRYPTOGRAPHY AND NETWORK SECURITY

COURSE PRE-REQUISITES: Fundamentals of Computer Networks, Distributed Data Bases

COURSE OBJECTIVES:

- To outline security concepts, threats, attacks, services and mechanisms
- To describe various cryptosystems- symmetric key cryptography, public key cryptography
- To apply authentication services and Secure hash functions
- To discuss the concepts of IP Security, web security, viruses and firewalls

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Analyze the security attacks, services, goals and mechanism of security
CO-2: Develop a security model using conventional approach to prevent the attacks
CO-3: Apply public key cryptography principles, examine authenticity and integrity of the messages in the communication
CO-4: Build a model for IP security, firewall and test the security issues

UNIT – I:
Security Attacks: Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and RFCs, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.

UNIT – II:
Conventional Encryption: Classical Encryption techniques, Fiestel Cipher Structure, Data Encryption Standard, Block Cipher Design Principles and Modes of Operation, Triple DES, RC-4, Evaluation criteria for AES, AES Cipher, Placement of Encryption Function, Traffic Confidentiality.

UNIT – III:
Public Key Cryptography and Authentication: Confidentiality using Symmetric Encryption – Principles of Public key Cryptosystems, RSA algorithm, Key Management, Diffie-Hellman key Exchange, Elliptic Curve Cryptography.
Authentication requirements, Authentication functions, Message Authentication Codes

UNIT – IV:
Hash Functions: Hash Functions, Security of Hash Functions and MACs, MD5 message Digest algorithm, Secure Hash Algorithm, HMAC, Digital Signatures, Authentication Protocols, Digital Signature Standard, Authentication Applications: Kerberos, X.509 Authentication Service

UNIT – V:

Network Security: Email Security and Web Security

Electronic Mail Security – PGP/ SMIME, IP security- Architecture, Authentication Header, Encapsulating Security Payload, Key Management, Web Security- Secure Socket Layer, Transport Layer Security and Secure Electronic Transaction

UNIT – VI:

System Level Security: Intrusion detection – password management – Viruses and related Threats – Virus Counter measures – Firewall Design Principles – Trusted Systems.

TEXT BOOKS:

1. Cryptography and Network Security – Principles and Practices, William Stallings, 4th Edition, Prentice Hall of India, 2005
2. Hack Proofing Your Network, Ryan Russell, Dan Kaminsky, Rain Forest, Puppy, Joe Grand, David Ahmad, Hal Flynn Ido Dubrawsky, Steve W. Manzuik and Ryan Permeh, Wiley Dreamtech

REFERENCES:

1. Network Security Essentials: Applications and Standards, William Stallings, Prentice Hall,1999
2. Security in Computing, Charles B. Pfleeger, Shari Lawrence Pfleeger, 3rd Edition, Pearson Education, 2003

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B.Tech. VIII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1CS07) BLOCKCHAIN TECHNOLOGY

COURSE PRE-REQUISITES: Fundamentals of Computer Networks, Distributed Data Bases, Cryptography and Network Security

COURSE OBJECTIVES:

- To get the terminologies and overview of blockchain technologies
- To study the concepts and foundation of blockchain technology
- To understand security mechanism and consensus in blockchain
- To design use cases and architecture blockchain technology

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Gain a clear understanding of the concepts that underlie digital distributed ledger

CO-2: Understand key mechanisms like Decentralization, Transparency and trust, Immutability, High availability, Highly secure and different types of Blockchain

CO-3: Apply the concept of Hash Function and Related Hash Algorithm

CO-4: Design and implement applications using Blockchain Technology

UNIT – I:

Introduction to Blockchain Part I: Introduction to Centralized, Decentralized and Distributed system, History of Blockchain, Various technical definitions of Blockchain.

Introduction to Blockchain Technology Part II: Generic elements of a blockchain: Block, Transaction, Peer-to-peer network, Node, Smart contract, Why It's Called "Blockchain", Characteristics of Blockchain Technology, Advantages of blockchain technology.

UNIT – II:

Concept of Blockchain Technology Part I: Cryptography, Hashing, Nonce, Distributed database, Consensus, Smart Contract, Component of block, Structure of Block chain, Technical Characteristics of the Blockchain.

Concept of Blockchain Technology Part II: Applications of blockchain technology, Tiers of blockchain technology Bolckchain 0, Bolckchain 1, Blockchain 2, Blockchain 3, Generation of Blockchain X.

UNIT – III:

Technical Foundations Part I: Cryptography, Confidentiality, Integrity, Authentication, Cryptographic primitives, Public and private keys, RSA, Discrete logarithm problem, Hash Function: Message Digest (MD), Secure Hash Algorithms (SHAs), Design of Secure Hash Algorithms (SHA), SHA-256, Design of SHA3, Elliptic Curve Digital signature algorithm.

Technical Foundations Part II: Consensus algorithm: Proof of work (PoW), Proof-of-Stake (PoS), Byzantine Fault Tolerance (BFT)

UNIT – IV:

Types of Blockchain: Public blockchains, Private blockchains, Semi-private blockchains, Side chains, Permissioned ledger, Distributed ledger, Shared ledger, Fully private and proprietary blockchains, Tokenized blockchains, Tokenless blockchains, CAP theorem and blockchain

UNIT – V:

Financial markets and trading, Trading, Exchanges, Trade life cycle, Order anticipators, Market manipulation.

Crypto Currency: Bitcoin, Bitcoin definition, Keys and addresses, Public keys in Bitcoin, Private keys in Bitcoin, Bitcoin currency units

UNIT – VI:

Implementation Platforms: Hyperledger as a protocol, Reference architecture, Hyperledger Fabric, Transaction Flow, Hyperledger Fabric Details, Fabric Membership, Fabric Membership

TEXT BOOKS:

1. Mastering Blockchain, Imaran Bashir, Second Edition, Packt
2. Blockchain Basic, Daniel Drescher, A Press

REFERENCES:

1. Blockchain For Dummies®, IBM Limited Edition, John Wiley & Sons

ROBOTICS

ROBOTICS

Robotics is a field of study that involves the design, construction and operation of robots. This field overlaps with electronics, computer science, mechatronics and artificial intelligence. Robotic companies are booming all over the world and are seeking engineers with skills for implementing **Next -Level Automation**. This Open Elective Track for Robotics consists of four courses and is intended for making students industry ready in the field of robotics.

The First course in this track" Fundamentals **of Robotics"** introduces various physical aspects of building a robot, exploring topics like how a robot perceives its environment using Sensors and how it interacts with its environment through various Actuators & Grippers. This course also inspects a variety of robot applications in different domains.

Second Course in this track" Kinematics **& Dynamics of robots"** delves a level deeper discussing analysis and control of robots. It establishes strong mathematical foundation for describing and controlling robot movement. In this course students will learn in detail about Forward Kinematics, Inverse Kinematics, Workspace Analysis and Trajectory planning for robots.

Third Course in the Robotics track **"Drives and Control System for Robots"** explores in detail various Drive Mechanisms used in robotics such as Hydraulic, Pneumatic & Electric drives. After completing this course students will be able to analyze operational aspects of a drive system for a given robotic application. Fourth Course in the track **"Robot Programming and Intelligent Control System"** expands on Robot Programming, discussing various aspects of Robot Programming Languages and their functions. This course also dives deep into advanced topics like Artificial Intelligence, Neural Networks and Fuzzy control for robots.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1EI01) FUNDAMENTALS OF ROBOTICS

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:
- To understand the basic components of a Robot
- To learn different types of Robot sensors and actuators used in Robotics
- To identify different types of Robot grippers and their applications
- To acquire basic Knowledge on Robot kinematics
- To expose to various application fields of Robotics

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Gain knowledge about basic concepts of robots
CO-2: Appreciate the usage of different sensors and actuators in Robotics
CO-3: Select appropriate Gripping mechanism for a particular application
CO-4: Analyze the direct and the inverse kinematic problems
CO-5: Appreciate robot design deference's for various applications

UNIT – I:
Basic Concepts: An overview of Robotics, classification of Robots, Robot Components, Robot degrees of freedom, Robot Joints, Robot Coordinates, Robot reference frames, Programming modes, Robot Characteristics.

UNIT – II:
Sensors: Sensor characteristics, Position sensors, Velocity sensors, Acceleration sensors, Force and Pressure sensors, Torque sensors, Microswitches, Light and infrared sensors, Touch and tactile sensors, Proximity sensors, Range finders.

UNIT – III:
Actuators: Characteristics of actuating system, Comparison of actuating systems, Hydraulic actuators, Pneumatic devices, Electric motors, Magneto-strictive actuators, Shape-Memory Metals, Electro-active Polymer Actuators.

UNIT – IV:
Grippers: Classification of Grippers, Drive system for Grippers, Mechanical Grippers, Magnetic Grippers, Vacuum Grippers, Adhesive Grippers, Hooks and Scoops, Gripper Force analysis and design, Active and Passive Grippers.

UNIT – V:
Kinematics: Robots as Mechanisms, Matrix Representation, Homogeneous Transformation Matrices, Representation of Transformations, Inverse of Transformation Matrices, Forward and Inverse Kinematics with Equations.

UNIT – VI:

Applications: Industrial applications, material handling, processing, assembly application, inspection application, application planning, justification of robots, non-industrial applications, Robot safety.

TEXT BOOKS:

1. Introduction to Robotics: Analysis, Control, Applications, Saeed B. Niku, 2nd Edition, Wiley
2. Robotics Technology and Flexible Automation, Deb S. R., John Wiley
3. Robotics and Control, R. K. Mittal, I. J. Nagrath, McGraw-Hill Education

REFERENCES:

1. Industrial Robotics, Technology programming and Applications, Mikell P. Groover, Nicholas G. Odrey, Mitchel Weiss, Roger N. Nagel, Ashish Dutta, McGraw-Hill, 2012
2. Robotics-Control, Sensing, Vision and Intelligence, K. S. Fu, R. C. Gonzalez, C. S. G. Lee, McGraw-Hill International Edition
3. Robotic Engineering–An Integrated Approach, Klafter R. D., Chimielewski T. A., Negin M., Prentice Hall of India, 2009

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B.Tech. VI Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1EI02) KINEMATICS AND DYNAMICS OF ROBOTS

COURSE PRE-REQUISITES: Fundamentals of Robotics

COURSE OBJECTIVES:

- To understand the basics of robot coordinate frames and their representation
- To obtain knowledge about direct kinematics and inverse kinematics for a robot manipulator
- To examine techniques for planning robot motion in a workspace
- To understand various methods for developing dynamic models for manipulator
- To learn control techniques applied to robot manipulators

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Mathematically represent a Robot system
CO-2: Calculate robot hand position and orientation for specific joint angles
CO-3: Calculate joint angles to achieve a particular hand position
CO-4: Plan trajectories for robot tool to do meaningful tasks
CO-5: Analyze different controlling techniques used for robot manipulators

UNIT – I:

Introduction: Introduction, position and orientation of objects, objects coordinate frame Rotation matrix, Euler angles Roll, pitch and yaw angles coordinate Transformations, Joint variables and position of end effector, Dot and cross products.

UNIT – II:

Direct Kinematics: Coordinate frames, Rotations, Homogeneous coordinates, Link coordinates D-H Representation, The ARM equation. Direct kinematic analysis for Four axis SCARA Robot and three, five and six axis Articulated Robots.

UNIT – III:

Inverse Kinematics: The inverse kinematics problem, General properties of solutions. Tool configuration, Inverse kinematics of four axis SCARA robot and three and five axis Articulated robot.

UNIT – IV:

Workspace Analysis and Trajectory Planning: Workspace Analysis, work envelope of a Four axis SCARA robot and five axis articulated robot workspace fixtures, the pick and place operations, Joint space technique - continuous path motion, Interpolated motion, straight line motion and Cartesian space technique in trajectory planning.

UNIT – V:

Manipulator Dynamics: Introduction, Lagrange's equation kinetic and potential energy. Link inertia Tensor, link Jacobian Manipulator inertia tensor. Gravity,

Generalized forces, Lagrange-Euler Dynamic model, Dynamic model of a Two-axis planar robot, Newton Euler formulation, Lagrange - Euler formulation, problems.

UNIT – VI:

Robot Control: The Control Problem, State Equations: one axis robot; three axis SCARA robot, Constant solutions, Linear Feedback Systems, Single Axis PID Control, PD-Gravity Control.

TEXT BOOKS:

1. Fundamentals of Robotics: Analysis & Control, Robert J. Schilling, Prentice Hall of India
2. Robotics and Control, R. K. Mittal, I. J. Nagrath, McGraw-Hill Education

REFERENCES:

1. Robotic Engineering–An Integrated Approach, Klafter R. D., Chimielewski T. A., Negin M., Prentice Hall of India, 2009
2. Industrial Robotics, Technology Programming and Applications, Mikell P. Groover & Nicholas G. Odrey, Mitchel Weiss, Roger N. Nagel, Ashish Dutta, Tata McGraw-Hill Education, 2012
3. Robotics-Control, Sensing, Vision and Intelligence, K. S. Fu, R. C. Gonzalez, C. S. G. Lee, McGraw-Hill International

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1EI03) DRIVES AND CONTROL SYSTEM FOR ROBOTICS

COURSE PRE-REQUISITES: Fundamentals of Robotics, Kinematics and Dynamics of Robotics

COURSE OBJECTIVES:

- To get acquainted with different robot drive mechanisms
- To understand in detail, working of hydraulic and pneumatic drives used in robotics
- To learn working principles of various electric drive systems for robotics
- To acquire basic Knowledge on servo systems for robot control

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Categorize various drive systems for robot movement
CO-2: Select appropriate drive system for a particular application
CO-3: Inspect different electric drives and their applications in robotics
CO-4: Analyze accurate positioning of robot end effector by servo control

UNIT – I:
Introduction: Objectives, motivation, open loop control, closed loop control with velocity and position feedback, Types of drive systems. Functions of drive system.

UNIT – II:
Robot Drive Mechanism: Lead Screws, Ball Screws, Chain & linkage drives, Belt drives, Gear drives, Precision gear boxes, Harmonic drives, Cyclo speed reducers.

UNIT – III:
Hydraulic Drives: Introduction, Requirements, Hydraulic piston and transfer valve, hydraulic circuit incorporating control amplifier, hydraulic fluid considerations, hydraulic actuators Rotary and linear actuators. Hydraulic components in robots.

UNIT – IV:
Pneumatic Drives: Introduction, Advantages, pistons-Linear Pistons, Rotary pistons, Motors-Flapper motor, Geared motor, Components used in pneumatic control. Pneumatic proportional controller, pneumatically controlled prismatic joint.

UNIT – V:
Electric Drives: Introduction, Types, DC electric motor, AC electric motor, stepper motors, half step mode operation, micro step mode. Types of stepper motors, Direct drive actuator.

UNIT – VI:
Servo Mechanism for Robot: Mathematical modeling of robot servos, error responses and steady state errors in robot servos, feedback and feed forward compensations,

hydraulic position servo, computer-controlled servo system for robot applications, selection of robot drive systems.

TEXT BOOKS:

1. Engineering Foundation of Robotics, Francis N-Nagy Andras Siegler, Prentice Hall
2. Robotics Engineering - An Integrated Approach, Richard D. Klafter, Thomas A., Chri Elewski, Michael Negin, PHI Learning, 2009

REFERENCES:

1. Industrial Robotics, Technology Programming and Applications, Mikell P. Groover & Nicholas G. Odrey, Mitchel Weiss, Roger N. Nagel, Ashish Dutta, Tata McGraw-Hill Education, 2012
2. Industrial Robotics, Bernard Hodges, 2nd Edition, Jaico Publishing House, 1993
3. Fundamentals of Robotics Analysis and Control, Robert J. Schilling, PHI Learning, 2009
4. Foundations of Robotics Analysis and Control, Tsuneo Yohikwa, MIT Press, 2003
5. Introduction to Robotics Mechanics and Control, John J. Craig, 3rd Edition, Pearson, 2008

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1EI04) ROBOT PROGRAMMING AND INTELLIGENT CONTROL SYSTEM

COURSE PRE-REQUISITES: Fundamentals of Robotics, Kinematics and Dynamics of Robotics, Drives and Control Systems for Robotics

COURSE OBJECTIVES:

- To understand the fundamentals of robot programming
- To learn robot textual languages that are in common use
- To expose to artificial intelligence in robotics
- To acquire basic Knowledge on neural networks in robotics
- To acquire basic Knowledge on fuzzy logic in robotics

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Gain knowledge about different methods of robot programming
CO-2: Examine various robot language elements and their functions
CO-3: Analyze different AI techniques employed in robotics
CO-4: Design basic neuro-controller for robot motion control
CO-5: Apply fuzzy logic to robot control systems

UNIT – I:
Robot Programming: Methods of robot programming, leadthrough programming methods, robot program as a path in space - defining position in space, speed control, motion interpolation, WAIT, SIGNAL, DELAY commands, Branching.

UNIT – II:
Robot Languages: Textual robot language, generations of robot languages, robot language structure, operating systems, Robot language Elements and functions, constraints and variables, aggregates and location variables.

UNIT – III:
Basic Commands and Operations: Motion commands- move and related statements, speed control, points in workspace, paths and frames. End effector and sensor commands- end effector operation, sensor operation, REACT statement. Computations and operation. Program control and subroutines. Communications and data processing. Monitor mode commands.

UNIT – IV:
AI for Robotics: Introduction to Artificial Intelligence, goals of AI research, AI techniques- knowledge representation, problem representation, search techniques. LISP programming. AI and Robotics. LISP in the factory. Robotic Paradigms.

UNIT – V:
Neural Network Approach in Robotics: Introduction, Connectionist Models, Learning Principles and Learning Rules: Supervised, unsupervised, reinforcement learning.

Sensor based robot learning, Neural Network in Robotics: Control of robot hands by neural network, neural set approach to robot motion coordination, robotic motor control using reinforcement learning optimization.

UNIT – VI:

Fuzzy Logic Approach in Robotics: Introduction, Fuzzy sets, Operation of Fuzzy sets, Fuzzy relations, Fuzzy rule formation, Control rules, Fuzzy algorithm in robotics, Robot obstacle avoidance using fuzzy logic, Fuzzy logic for robot path tracking and behavior coordination, fuzzy control system in mobile robots, fuzzy controller design for robot systems, Case study of fuzzy logic in robotics.

TEXT BOOKS:

1. Industrial Robotics Technology, Programming and Applications, Mikell P. Groover, McGraw-Hill, 2012
2. Robotics Technology and Flexible Automation, Deb S. R., Tata McGraw-Hill

REFERENCES:

1. Design and Control of Intelligent Robotic Systems, (Studies in Computational Intelligence 177) M. Begum, F. Karray (auth.), Dikai Liu, Lingfeng Wang, Kay Chen Tan (eds.), Springer
2. Neural Networks in Robotics, Edited by George Bekey, Kenneth Y. Goldberg, Springer, 2012
3. Neural Networks, Fuzzy Logic, Genetic Algorithm - Synthesis and Applications, Rajasekharan and Rai, PHI Publications
4. Introduction to Neural Networks using MATLAB 6.0, S. N. Sivanandam, S. Sumathi, S. N. Deepa, TATA MCGRAW-HILL, 2006

CYBER SECURITY

CYBER SECURITY

Cybersecurity is **important** because it incorporates everything that relates to protecting our sensitive data, personally identifiable information (PII), protected health information (PHI), personal information, intellectual property, data, and governmental and **industry** information systems from stealing and destruction endeavoured. The cyber security track helps students to learn about how to
Defend networks and data from unapproved access.
Enhanced information security and business endurance supervision.
Upgraded stakeholder confidence in your information security preparations.
Developed company authorizations with the correct security controls in place.

Some of the more common career paths in the cyber security path are

- Chief Information Security Officer. ...
- Forensic Computer Analyst. ...
- Information Security Analyst. ...
- Penetration Tester. ...
- Security Architect. ...
- IT Security Engineer. ...
- Security Systems Administrator. ...
- IT Security Consultant.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1CS04) FUNDAMENTALS OF COMPUTER NETWORKS

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

- To introduce the fundamental various types of computer networks
- To demonstrate the TCP/IP and OSI models with merits and demerits
- To explore the various layers of OSI model
- To introduce UDP and TCP models
- To have the concept of different routing techniques for data communications

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand and explore the basics of Computer Networks and Various Protocols and in a position to understand the World Wide Web concepts

CO-2: Administrate a network and flow of information

CO-3: Understand easily the concepts of network security, Mobile and ad-hoc networks

UNIT – I:

Introduction to Networks: Internet, Protocols and Standards, The OSI Model, Layers in OSI Model, TCP/IP Suite, Addressing.

Physical Layer: Multiplexing, Transmission Media, Circuit Switched Networks, Datagram Networks, and Virtual Circuit Networks.

UNIT – II:

Data Link Layer: Introduction, Checksum, Framing, Flow and Error Control, Noiseless Channels, Noisy Channels, Random Access Controlled Access, Channelization, IEEE Standards, Ethernet, Giga-Bit Ethernet, Wireless LANs, SONET-SDH, Frame Relay and ATM.

UNIT – III:

Network Layer: Logical Addressing, Internetworking, Tunneling, Address Mapping, ICMP, IGMP, Forwarding, Routing-Flooding, Bellman& Ford, Disjkstra's routing protocols, RIP, OSPF, BGP,- and Multicast Routing Protocols. Connecting Devices-Passive Hubs, Repeaters, Active Hubs, Bridges, Routers.

UNIT – IV:

Transport Layer: Process to Process Delivery, UDP, TCP and SCTP Protocols, Congestion, Congestion Control, Quality of Service.

UNIT – V:

Application Layer: Domain Name Space, DNS in Internet, Electronic Mail, File Transfer Protocol, WWW, HTTP, SNMP, Multi-Media.

UNIT – VI:

Network Security: Security services, mechanisms and attacks, IPSec, SSL, VPN, Firewall, Bluetooth, Zigbee, IPv4, IPv6.

TEXT BOOKS:

1. Data Communications and Networking, Behrouz A. Forouzan, 4th Edition, McGraw-Hill Education, 2006
2. Computer Networks, Andrew S. Tanenbaum, 4th Edition, Pearson Education
3. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, K. W. Ross, 3rd Edition, Pearson Education

REFERENCES:

1. Data Communications and Networks, William Stallings
2. Data Communication and Networks, Bhusan Trivedi, Oxford University Press, 2016
3. An Engineering Approach to Computer Networks, S. Keshav, 2nd Edition, Pearson Education
4. Understanding Communications and Networks, W. A. Shay, 3rd Edition, Cengage Learning

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1CS08) RELATIONAL DATABASE MANAGEMENT SYSTEMS

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:
- To understand the basic concepts and the applications of database systems
- To master the basics of SQL and construct queries using SQL
- To understand the relational database design principles
- To become familiar with the basic issues of transaction processing and concurrency control
- To become familiar with database storage structures and access techniques

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Demonstrate the basic elements of a relational database management system
CO-2: Ability to identify the data models for relevant problems
CO-3: Ability to design entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data
CO-4: Apply normalization for the development of application software

UNIT – I:
Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages – DDL, DML, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database Users and Administrators, History of Database Systems.
Introduction to Database Design: Database Design and ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises.
Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design: ER to Relational, Introduction to Views, Destroying /Altering Tables and Views.

UNIT – II:
Relational Algebra and Calculus: Preliminaries, Relational Algebra, Relational calculus – Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus.
SQL: Queries, Constraints, Triggers: Form of Basic SQL Query, UNION, INTERSECT, and EXCEPT, Nested Queries, Aggregate Operators, NULL values Complex Integrity Constraints in SQL, Triggers and Active Data bases, Designing Active Databases.

UNIT – III:
Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Dependencies - Reasoning about FDs, Normal Forms, Properties of

Decompositions, Normalization, Schema Refinement in Database Design, Other Kinds of Dependencies.

UNIT – IV:

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

UNIT – V:

Concurrency Control: Lock–Based Protocols, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols, Multiversion Schemes.

Recovery System-Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with loss of nonvolatile storage, Early Lock Release and Logical Undo Operations, Remote Backup systems.

UNIT – VI:

Storage and Indexing: Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing, Index Data Structures, Comparison of File Organizations.

Tree-Structured Indexing: Intuition for tree Indexes, Indexed Sequential Access Method (ISAM), B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

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

TEXT BOOKS:

1. Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, 3rd Edition, McGraw-Hill
2. Database System Concepts, A. Silberschatz, Henry F. Korth, S. Sudarshan, 6th Edition, McGraw-Hill
3. Database Systems, R. Elmasri, Shamkant B. Navathe, 6th Edition, Pearson Education

REFERENCES:

1. Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning
2. Introduction to Database Management, M. L. Gillenson and others, Wiley Student Edition
3. Database Development and Management, Lee Chao, Auerbach Publications, Taylor & Francis Group
4. Introduction to Database Systems, C. J. Date, Pearson Education

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1CS06) CRYPTOGRAPHY AND NETWORK SECURITY

COURSE PRE-REQUISITES: Fundamentals of Computer Networks, Distributed Data Bases

COURSE OBJECTIVES:

- To outline security concepts, threats, attacks, services and mechanisms
- To describe various cryptosystems- symmetric key cryptography, public key cryptography
- To apply authentication services and Secure hash functions
- To discuss the concepts of IP Security, web security, viruses and firewalls

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Analyze the security attacks, services, goals and mechanism of security
CO-2: Develop a security model using conventional approach to prevent the attacks
CO-3: Apply public key cryptography principles, examine authenticity and integrity of the messages in the communication
CO-4: Build a model for IP security, firewall and test the security issues

UNIT – I:

Security Attacks: Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and RFCs, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.

UNIT – II:

Conventional Encryption: Classical Encryption techniques, Fiestel Cipher Structure, Data Encryption Standard, Block Cipher Design Principles and Modes of Operation, Triple DES, RC-4, Evaluation criteria for AES, AES Cipher, Placement of Encryption Function, Traffic Confidentiality.

UNIT – III:

Public Key Cryptography and Authentication: Confidentiality using Symmetric Encryption – Principles of Public key Cryptosystems, RSA algorithm, Key Management, Diffie-Hellman key Exchange, Elliptic Curve Cryptography.
Authentication requirements, Authentication functions, Message Authentication Codes

UNIT – IV:

Hash Functions: Hash Functions, Security of Hash Functions and MACs, MD5 message Digest algorithm, Secure Hash Algorithm, HMAC, Digital Signatures, Authentication Protocols, Digital Signature Standard, Authentication Applications: Kerberos, X.509 Authentication Service

UNIT – V:

Network Security: Email Security and Web Security

Electronic Mail Security – PGP/ SMIME, IP security- Architecture, Authentication Header, Encapsulating Security Payload, Key Management, Web Security- Secure Socket Layer, Transport Layer Security and Secure Electronic Transaction

UNIT – VI:

System Level Security: Intrusion detection – password management – Viruses and related Threats – Virus Counter measures – Firewall Design Principles – Trusted Systems.

TEXT BOOKS:

1. Cryptography and Network Security – Principles and Practices, William Stallings, 4th Edition, Prentice Hall of India, 2005
2. Hack Proofing your Network, Ryan Russell, Dan Kaminsky, Rain Forest, Puppy, Joe Grand, David Ahmad, Hal Flynn Ido Dubrawsky, Steve W. Manzuik and Ryan Permeh, Wiley Dreamtech

REFERENCES:

1. Network Security Essentials: Applications and Standards, William Stallings Prentice Hall,1999
2. Security in Computing, Charles B. Pfleeger, Shari Lawrence Pfleeger, 3rd Edition, Pearson Education, 2003

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B.Tech. VII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1IT01) ESSENTIALS OF CYBER SECURITY

COURSE PRE-REQUISITES: Fundamentals of Computer Networks, Cryptography and Network Security

COURSE OBJECTIVES:

- To identify the key components of cyber security in network
- To describe various security levels and categories, operating system security
- To define authentication issues and network security
- To describe memory management and protection measures

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Categorize cyber-crime and an understand social, political, ethical and psychological dimensions cyber security

CO-2: Demonstrate security levels and models with objects and access control

CO-3: Analyse tools and methods used in cybercrime

CO-4: Understand Organizational Implications and security risks

UNIT – I:

Introduction to Cybercrime: Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, And Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

UNIT – II:

Cyber Offenses: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

UNIT – III:

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

UNIT – IV:

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT – V:

Cyber Security: Organizational Implications

Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications.

UNIT – VI:

Social Media Marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

TEXT BOOKS:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley India

REFERENCES:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press
2. Introduction to Cyber Security, Chwan-Hwa (John) Wu, J. David Irwin, CRC Press T&F Group

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1IT02) COMPUTER FORENSICS

COURSE PRE-REQUISITES: Fundamentals of Computer Networks, Cryptography and Network Security, Essentials of Cyber Security

COURSE OBJECTIVES:

- To provide an understanding of computer forensics fundamentals
- To analyze various computer forensics technologies and to provide computer forensics systems
- To identify methods for data recovery
- To apply the methods for preservation of digital evidence

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Define and discuss the concepts of computer forensics
CO-2: Explain and apply the concepts of computer investigations
CO-3: Select and apply current computer forensics tools
CO-4: Identify and apply current practices for processing crime and incident scenes

UNIT – I:

Computer Forensics Fundamentals: What is Computer Forensics? Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps taken by Computer Forensics Specialists.

UNIT – II:

Types of Computer Forensics Technology: Types of Military Computer Forensic Technology, Types of Law Enforcement — Computer Forensic Technology — Types of Business Computer Forensic Technology Computer Forensics Evidence and Capture: Data Recovery Defined — Data Back-up and Recovery — The Role of Back-up in Data Recovery — The Data-Recovery Solution.

UNIT – III:

Evidence Collection and Data Seizure: Why Collect Evidence? Collection Options — Obstacles — Types of Evidence — The Rules of Evidence — Volatile Evidence — General Procedure — Collection and Archiving — Methods of Collection — Artifacts — Collection Steps — Controlling Contamination: The Chain of Custody Duplication and Preservation of Digital Evidence: Preserving the Digital Crime Scene — Computer Evidence Processing Steps — Legal Aspects of Collecting and Preserving Computer Forensic Evidence Computer Image Verification and Authentication: Special Needs of Evidential Authentication — Practical Consideration —Practical Implementation.

UNIT – IV:

Computer Forensics Analysis and Validation: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing

remote acquisitions Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honeynet project. Processing Crime and Incident Scenes: Identifying digital evidence, collecting evidence in private-sector incident scenes, processing law enforcement crime scenes, preparing for a search, securing a computer incident or crime scene, seizing digital evidence at the scene, storing digital evidence, obtaining a digital hash, reviewing a case.

UNIT – V:

Current Computer Forensic Tools: Evaluating computer forensic tool needs, computer forensics software tools, computer forensics hardware tools, validating and testing forensics software E-Mail Investigations: Exploring the role of e-mail in investigation, exploring the roles of the client and server in e-mail, investigating e-mail crimes and violations, understanding e-mail servers, using specialized e-mail forensic tools.

Cell Phone and Mobile Device Forensics: Understanding mobile device forensics, understanding acquisition procedures for cell phones and mobile devices.

UNIT – VI:

Working with Windows and DOS Systems: understanding file systems, exploring Microsoft File Structures, Examining NTFS disks, Understanding whole disk encryption, windows registry, Microsoft startup tasks, MS-DOS startup tasks, virtual machines.

TEXT BOOKS:

1. Computer Forensics, Computer Crime Investigation, John R. Vacca, Firewall Media, New Delhi
2. Computer Forensics and Investigations, Nelson, Phillips Enfinger, Steuart, CENGAGE Learning
3. Real Digital Forensics, Keith J. Jones, Richard Bejtiich, Curtis W. Rose, Addison Wesley, Pearson Education

REFERENCES:

1. Forensic Compiling, A Practitioners Guide, Tony Sammes and Brian Jenkinson, Springer International Edition
2. Computer Evidence Collection & Presentation, Christopher L. T. Brown, Firewall Media
3. Homeland Security, Techniques & Technologies, Jesus Mena, Firewall Media
4. Software Forensics Collecting Evidence from the Scene of a Digital Crime, Robert M. Slade, TATA MCGRAW-HILL 2005
5. Windows Forensics, Chad Steel, Wiley India Edition

DATA SCIENCES / BIG DATA AND ANALYTICS

DATA SCIENCES / BIG DATA AND ANALYTICS

Data science helps in risk evaluation and observing, possible deceitful comportment, payments, customer analysis, and experience, among much other exploitation. The capability to make **data**-driven choices generates a steadier financial situation and **data scientists** make the strength of the **industry.**

As such, **data science** track helps students to apply business concepts in banking, finance, manufacturing, transport, e-commerce, education, etc. that use **data science**. As a consequence, there are numerous **Data Science** Applications associated to it

Job Roles in Data Science Track

- Data Analyst
- Data Engineers
- Database Administrator
- Machine Learning Engineer
- Data Scientist
- Data Architect
- Statistician
- Business Analyst
- Data and Analytics Manager

Big Data analytics track helps the students to learn the process of gathering, establishing and examining large sets of **data** (called **Big Data**) to determine patterns and other beneficial information. Analysts occupied with **Big Data** characteristically want the acquaintance that comes from investigating the **data**.

Big data analytics is the practice of mining useful information by examining different **types** of big data sets. Big data analytics is utilized to determine concealed patterns, market developments and consumer favorites, for the advantage of organizational decision making.

Job responsibilities in a Big Data Analytics Track are

- To gather and accumulate data from disparate sources, clean it, organize it, process it, and analyse it to extract valuable insights and information.
- To identify new sources of data and develop methods to improve data mining, analysis, and reporting.
- To create data definitions for new database files or alterations made to the already existing ones for analysis purposes.
- To present the findings in reports (in table, chart, or graph format) to help the management team in the decision-making process.
- To apply statistical analysis methods for consumer data research and analysis purposes.
- To keep track of the trends and correlational patterns among complex data sets.
- To perform routine analysis tasks to support day-to-day business functioning and decision making.
- To collaborate with Data Scientists to develop innovative analytical tools.
- To work in close collaboration with both the IT team and the business management team to accomplish company goals.

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1MT02) STATISTICAL METHODS FOR DATA SCIENCE

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

- To provide insights about the basic roles of various statistical methods in building computer applications
- To develop a greater understanding of the importance of Data Visualization techniques
- To develop problem-solving skills
- To make inferences about the population parameters using sample data
- To provide an understanding on the importance and techniques of predicting a relationship between the two sets of data and determine the goodness of fitted model

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Analyze an extremely large data set and perform exploratory data analysis to extract meaningful insights

CO-2: Develop various visualizations of the data in hand and communicate results of analysis effectively (visually and verbally)

CO-3: Examine a real-world problem and solve the same with the knowledge gained from various distributions study

CO-4: Use and fit a linear regression model to data and use it for prediction

CO-5: Fit a polynomial regression model to data and use it for prediction

UNIT – I:

Introduction to Statistics: Definition of statistics, basic objectives, applications in various branches of science with examples, collection of data: internal and external data, primary and secondary data, population and sample, representative sample.

UNIT – II:

Descriptive Statistics: Classification and tabulation of univariate data, graphical representation, frequency curves, descriptive measures - central tendency and dispersion, bivariate data, summarization, marginal and conditional frequency distribution.

UNIT – III:

Introduction to R: Introduction, Installing R and data types in R, programming using R: operators, conditional statements, looping, scripts, function creation, creating list, list operations, recursive list, creating a data frame, operations on data frames.

UNIT – IV:

Data Visualization using R: Import - export of data, measures of central tendency and measures of dispersion, data visualization – scatter plot, pie chart, histogram, bar chart, box plot, absolute and relative frequencies, frequency distribution.

UNIT – V:

Correlation & Linear Regression:

Correlation: Correlation, types of correlation, coefficient of correlation, rank correlation coefficient.

Linear Regression: Introduction, regression model, interval estimation, estimation of parameters of β_0 and β_1, Estimation of $\sigma^{2.}$

UNIT – VI:

Non-Linear Regression: Regression of second-degree polynomial (non-linear least square method for polynomial function), power function, exponential, estimation of coefficients, linear and polynomial regressions in R.

TEXT BOOKS:

1. Introductory Statistics, Thomas H. Wonnacott & Ronald J. Wonnacot, John Wiley & Sons, 1969
2. Applied Statistics and Probability for Engineers, Douglas C. Montgomery, George C. Runger, 3rd Edition, John Wiley & Sons, 2003
3. R for Beginners, Sandip Rakshit, 1st Edition, McGraw-Hill Education, 2017

REFERENCES:

1. R-The Statistical Programming Language, Dr. Mark Gardner, Wiley India, 2013
2. Introduction to the Theory of Statistics, A. M. Mood, F. A. Graybill and D. C. Boes, 3rd Edition, McGraw-Hill Education, 2017
3. Introduction of Probability Models, S. M. Ross, 11th Edition, Academic Press, N.Y., 2014
4. Statistical Methods, S. P. Gupta, 42nd Revised Edition, Sultan Chand & Sons, 2012

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B.Tech. VI Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1IT03) COMPUTATIONAL THINKING USING PYTHON

COURSE PRE-REQUISITES: Statistical Methods for Data Science

COURSE OBJECTIVES:

- To understand why Python is a useful scripting language for developers
- To create and execute Python programs and to Learn how to use lists, tuples, and dictionaries in Python programs
- To learn how to build and package Python modules for reusability
- To learn how to design object-oriented programs with Python classes
- To learn how to use exception handling in Python applications for error handling

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Adapt and combine standard algorithms to solve a given problem (includes numerical as well as non-numerical algorithms)

CO-2: Adequately use standard programming constructs: repetition, selection, functions, composition, modules, aggregated data (arrays, lists, etc.)

CO-3: Explain what a given program (in Python) does identify and repair coding errors in a program

CO-4: Understand and use object-based software concepts (constructing OO software will be dealt with in the course Software Engineering)

CO-5: Use library software for (e.g.) building a graphical user interface, web application, or mathematical software

UNIT – I:

Introduction: History, Features, Setting up path, Working with Python, Basic Syntax, Variable and Data Types, Operator, Conditional Statements-If

If- else Nested if-else Looping for While Nested loops Control Statements Break Continue Pass String Manipulation Accessing Strings Basic Operations String slices Function.

UNIT – II:

Methods, Lists: Introduction, Accessing list, Operations, Working with lists, Function and Methods,

Tuple: Introduction, Accessing tuples, Operations, Working, Functions and Methods

Dictionaries: Introduction, Accessing values in dictionaries, Working with dictionaries, Properties.

UNIT – III:

Functions: Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables.

Modules: Creation, Importing module, Math module, Random module, Packages.

UNIT – IV:

Composition: Input-Output-Printing on screen, Reading data from keyboard, Opening and closing file Reading and writing files, Functions.

Exception Handling: Exception, Exception Handling, Except clause, Try? Finally clause, User Defined Exceptions

UNIT – V:

OOPs Concept: Class and object, Attributes, Inheritance, Overloading, Overriding, Data hiding, Regular expressions- Match function, Search function, Matching VS Searching, Modifiers, Patterns.

Multithreading: Thread, Starting a thread, Threading module, Synchronizing threads.

CGI: Introduction, Architecture, CGI environment variable, GET and POST methods, Cookies, File upload.

UNIT – VI:

Database: Introduction, Connections, Executing queries, Transactions Handling error,

Networking: Socket, Socket Module, Methods, Client and server, Internet modules, Sending email.

TEXT BOOKS:

1. Learning Python, David Ascher and Mark Lutz, O'Relly

REFERENCES:

1. Python Programming: An Introduction to Computer Science, John M. Zelle, 2nd Edition, Kindle Edition
2. Python Essential Reference, David M. Beazley, 4th Edition, Developer's Library

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B.Tech. VII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1IT04) FUNDAMENTALS OF DATA MINING

COURSE PRE-REQUISITES: Statistical Methods for Data Science, Computational Thinking using Python

COURSE OBJECTIVES:

- To introduce the basic concepts and techniques in building a Data Warehouse
- To apply preprocessing methods for any given raw data
- To develop skills of using recent data mining software for solving practical problems
- To implement and apply basic algorithms for supervised and unsupervised learning

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Assess raw input data and process it to provide suitable input for a range of data mining algorithms.

CO-2: Discover and measure interesting patterns from different kinds of databases

CO-3: Evaluate and select appropriate data-mining algorithms and apply, interpret and report the output appropriately

CO-4: Design and implement data-mining applications using sample, realistic data sets and modern tools

UNIT – I:

Data Warehousing & Modeling: Basic Concepts: Data Warehousing: A multitier Architecture, Data warehouse models: Enterprise warehouse, Data mart and virtual warehouse, Extraction, Transformation and loading.

UNIT – II:

Data Cube: A multidimensional data model, Stars, Snowflakes and Fact constellations: Schemas for multidimensional Data models, Dimensions: The role of concept Hierarchies, Measures: Their Categorization and computation, Typical OLAP Operations.

UNIT – III:

Data Warehouse Implementation & Data Mining: Data Warehouse Architecture, What is data mining, Challenges, From Data Warehousing and Data Mining, Data Mining Tasks, Data Mining Functionalities, Major Issues in Data Mining. Data: Types of Data, Data Quality, Data Pre-processing, Measures of Similarity and Dissimilarity.

UNIT – IV:

Association Analysis: Association Analysis: Problem Definition, Frequent Item set Generation, Rule generation. Alternative Methods for Generating Frequent Item sets, FP-Growth Algorithm, Evaluation of Association Patterns.

UNIT – V:

Classification: Decision Trees Induction, Method for Comparing Classifiers, Rule Based Classifiers, Nearest Neighbor Classifiers, Bayesian Classifiers.

UNIT – VI:

Clustering Analysis: Overview, K-Means, Agglomerative Hierarchical Clustering, DBSCAN, Cluster Evaluation, Density-Based Clustering, Graph- Based Clustering, Scalable Clustering Algorithms.

TEXT BOOKS:

1. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, Vipin Kumar, First Impression, Pearson, 2014
2. Data Mining-Concepts and Techniques, Jiawei Han, Micheline Kamber, Jian Pei, 3rd Edition, Morgan Kaufmann, 2012

REFERENCES:

1. Data Warehousing in the Real World, Sam Anahory, Dennis Murray, Tenth Impression, Pearson, 2012
2. Mastering Data Mining, Michael J. Berry, Gordon S. Linoff, 2nd Edtion, Wiley, 2012

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B.Tech. VIII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1IT05) DATA ANALYSIS AND VISUALIZATION

COURSE PRE-REQUISITES: Statistical Methods for Data Science, Computational Thinking using Python, Fundamentals of Data Mining

COURSE OBJECTIVES:

- To introduce concept and characteristics of probability distribution
- To introduce underlying design principles, properties and assumptions of linear and non-linear regression modelling
- To introduce design principles involved in identifying interesting classification and prediction of data patterns
- To introduce properties of time series data and perform time series analysis

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply probability distribution concepts to identify univariate data patterns
CO-2: Apply regression modelling to build efficient mathematical models for prediction and classification
CO-3: Apply decision and regression trees for supervised learning
CO-4: Visualize time series data by applying time series techniques

UNIT – I:
Data Definitions and Analysis Techniques: Elements, Variables, and Data categorization, Introduction to statistical learning, Descriptive Statistics: Measures of central tendency, Measures of location of dispersions.

UNIT – II:
Basic Analysis Techniques: Basic analysis techniques, Statistical hypothesis generation and testing, Chi-Square test, t-Test Analysis of variance, Correlation analysis, Maximum likelihood test.

UNIT – III:
Data Analysis Techniques: Regression analysis and visualization, Classification techniques and visualization, Clustering and visualization, Association rules analysis and visualization

UNIT – IV:
Time-series Analysis and Forecasting: Time-series components, Variation in Time Series, Cyclic Variation, Seasonal Variation, Irregular Variation.

UNIT – V:
Smoothing Techniques: A problem involving all four components of time series, Introduction to forecasting, forecasting models, Trend and Seasonal effects, Trend Analysis

UNIT – VI:

Case-studies and Projects: Understanding business scenarios, Feature engineering and visualization, Sensitivity Analysis.

TEXT BOOKS:

1. Data Mining and Analysis, Mohammed J. Zaki, Wagner Meira, Cambridge, 2012
2. Data Mining: Theories, Algorithms, and Examples, Nong Ye, CRC Press Taylor & Francis Group, 2014
3. Statistics for Management, David S. Rubin, Sanjay Rastogi, Masood Husain Siddiqui Richard I. Levin, 7th Edition, Pearson Learning

REFERENCES:

1. Probability & Statistics for Engineers & Scientists, Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, 9th Edition, Prentice Hall
2. The Elements of Statistical Learning, Data Mining, Inference and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, 2nd Edition, Springer, 2014
3. An Introduction to Statistical Learning Mining Massive Data Sets, A. Rajaraman and J. Ullman, Cambridge University Press, 2012
4. Software for Data Analysis: Programming with R (Statistics and Computing), John M. Chambers, Springer

AUTONOMOUS VEHICLES

AUTONOMOUS VEHICLES

The invention of the wheel marked a large step in the evolution of mankind. With mobility, man experienced a newfound freedom that opened the doors for several other inventions. Automobile engineering or automotive engineering is one of the most challenging careers in the field of engineering with a wide scope. This branch deals with the designing, developing, manufacturing, testing and servicing automobiles such as cars, trucks, motorcycles, scooters, etc. and the related engineering sub systems. For the perfect blend of designing and manufacturing automobiles, automobile engineering uses the features of different elements of engineering such as mechanical, electrical, electronic, instrumentation, civil, software and safety engineering. Exploring the topic from an interdisciplinary perspective is indispensable. Globalization and incredible growth of automobile industry have resulted in numerous opportunities for engineers both in India and abroad.

The 17th and 18th centuries were mostly about steam-powered vehicles transporting people and goods. While electric cars enjoyed popularity in the A19th and early 20th centuries, the later period saw the accelerated adoption of the petrol car, due to its advantages of power, mass production, cost and advances in the internal combustion engine. It is only in the 21st century that interest in electric cars has come back, given the need for cleaner, greener modes of transport. The modern period is associated with several path breaking technologies. Over the last couple of decades, there has been an explosion of electronics in vehicles. Connected cars that include technology features are ever more popular. These smart cars come with internet access, GPS, wi-fi, superior infotainment, advanced telematics and navigation capabilities. More innovations in in-vehicle infotainment and electronics promise to give car users even more enhanced capabilities in the near future.

Today, safety has become a larger concern than ever before. While entertainment and infotainment have made car driving a pleasure, this has also given rise to a growing tribe of distracted drivers. Add to this, underdeveloped roads, which take a toll on drivers today. Increased distractions and fatigue can also contribute to human fatalities. The future certainly points in the direction of driverless cars, which promise to alleviate concerns of traffic congestion and road safety. Driverless cars, also known as autonomous cars, will usher in a paradigm shift in the evolution of the modern automobile. Self-driving cars can sense the environment and traffic with the help of RADAR, LIDAR, GPS and computer vision and navigate without human intervention. Autonomous cars are claimed to have greater accuracy, reliability and faster reaction time compared to human drivers. This would lead to fewer traffic collisions and less road congestion.

Autonomous driving is a popular subject of today's discussion and automakers are developing complex systems that allow cars to drive themselves. If technology continues on its current course, car will do the concentrating for you. Self-parking, automatic emergency braking, adaptive cruise control and lane keeping are just some of the technologies that have leapt into the market in the past few years. Put them all together, get a picture of driving to assisted driving to fully autonomous cars. The open elective track "Autonomous Vehicles" offered by the department of automobile engineering trains the students to meet the technological challenges and diverse needs of the industry and society in various areas of automobile engineering and equips them to excel in a truly competitive industry. With through knowledge in

this filed, engineering graduates get opportunity to serve many top-notch automobile companies and IT companies as well.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1AE01) PRINCIPLES OF AUTOMOBILE ENGINEERING

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

- To understand the layout of an automobile and functionalities subsystems
- To provide overview on concepts of engine, cooling, lubrication and fuel systems
- To present constructional features and working of automotive driveline and running systems
- To study the fundamentals and principles of automotive electrical systems

COURSE OUTCOMES After completion of the course, the student should be able to
CO-1: Explain the functionalities of automotive systems and subsystems
CO-2: Give an overview on engine and engine subsystems.
CO-3: Describe working of automotive driveline and running systems
CO-4: Discuss the concepts of automotive starting, ignition and charging systems

UNIT – I:
Introduction: Classification of automobiles, layout of an automobile, automobile sub systems and their role. Types of chassis, role and requirement of a chassis frame, types of frames, materials, loading points and types of bodies.

UNIT – II:
Engine: Classification and components of an engine, principle and working of four stoke and two stroke SI and CI engines, petrol fuel system - carburetor, diesel fuel system - diesel fuel pump, injectors, introduction to electronic fuel injection system – MPFI and CRDI.

UNIT – III:
Cooling and Lubrication: Necessity of cooling, air-cooling, water cooling - thermosyphon and pump cooling, radiator, pump, thermostat, antifreeze solution and radiator fan. Mist, splash and forced lubrication, oil filters and oil pumps.

UNIT – IV:
Drive Line: Clutches, principle, single plate clutch, multi plate clutch and centrifugal clutch. Gear box - Need, sliding mesh, constant mesh and synchromesh gear box. Propeller shaft, universal joint, differential, wheels and tyres.

UNIT – V:
Running Systems: Suspension systems – Objective, rigid axle and independent suspension system and torsion bar. Steering system – Layout, steering mechanism, steering geometry and steering gear boxes. Brake system –Principle, stopping distance, types of brakes and actuation.

UNIT – VI:

Electrical Systems: Starting system - Principle, working of different starter drive units and solenoid switches. Ignition system **-** Conventional ignition system types, ignition advance and retarding mechanisms. Charging system – Alternator principle, construction and working, cut-outs and regulators.

TEXT BOOKS:

1. Advanced Vehicle Technology, Heinz Heisler, Butterworth Heinemann, 2002
2. Automobile Electrical Equipment, Crouse W. H., 3rd Edition, McGraw-Hill, 1986

REFERENCES:

1. Motor Vehicle, Garrett T. K., Newton K., Steeds W. ButterWorths & Co., 2001
2. Automotive Electrical Equipment, Kohli P. L., Tata McGraw-Hill, 1975
3. Automotive Chassis and Body, Crouse W. H., 5th Edition, McGraw-Hill,1976
4. Automotive Mechanics, Giri N. K., Khanna Publications, 2006

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1AE02) MODERN AUTOMOTIVE TECHNOLOGIES

COURSE PRE-REQUISITES: Principles of Automobile Engineering

COURSE OBJECTIVES:
- To provide an overview on advanced engine control system concepts
- To know the interdisciplinary concepts and intelligent automotive systems
- To understand the interdisciplinary concepts and GPS-enabled applications in automobile
- To present intelligent vehicle technologies like comfort, safety and security systems

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply advanced engine control system concepts in engineering
CO-2: Discuss the need for implementation intelligent vehicle technologies
CO-3: Address the key technologies in automotive navigation
CO-4: Appreciate the technological advancements driver assistance systems

UNIT – I:
Advanced Engine Controls: Concept of an electronic engine control system, engine control module, powertrain control module, electronic fuel injection - throttle body fuel injection, multi-point fuel injection, gasoline direct injection, common rail direct injection, electronic ignition control, engine mapping, on-board diagnostics.

UNIT – II:
Introduction to Intelligent Vehicles: Driver information, driver perception, driver convenience, driver monitoring, general vehicle control, longitudinal and lateral control, collision avoidance, vehicle monitoring.

UNIT – III:
Telematics: Global positioning system, geographical information systems, navigation system, architecture, automotive vision system, road recognition.

UNIT – IV:
Comfort Systems: Adaptive cruise control system, active suspension system, power steering, collapsible and tiltable steering column, power windows.

UNIT – V:
Safety Systems: Active and passive safety, airbags, seat belt tightening system, forward collision warning systems, child lock, anti-lock braking systems, traction control system, lane departure warning system.

UNIT – VI:

Security Systems: Anti-theft technologies – mechanical, electromechanical and electronic immobilizers, alarm system, stolen vehicle tracking system, remote keyless entry, smart card system, number plate coding.

TEXT BOOKS:

1. Understanding Automotive Electronics, William B. Ribbens, 5th Edition, Butterworth Heinemann,1998
2. Intelligent Vehicle Technologies: Theory and Applications, Ljubo Vlacic, Michel Parent and Fumio Harashima, Butterworth-Heinemann, Oxford, 2001

REFERENCES:

1. Automotive Handbook, Robert Bosch, 5th Edition, SAE, 2000
2. Navigation and Intelligent Transportation Systems – Progress in Technology, Ronald K. Jurgen, Automotive Electronics Series, SAE, USA, 1998
3. Understanding Automotive Electronics, Bechhold, SAE, 1998

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.TECH. VII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1AE03) ELECTRIC, HYBRID AND FUEL CELL VEHICLES

COURSE PRE-REQUISITES: Principles of Automobile Engineering, Modern Automotive Technologies

COURSE OBJECTIVES:

- To study the concepts and drivetrain configurations of electric and hybrid vehicles
- To understand about electric propulsion system
- To provide various energy storage devices
- To present principle, working and automotive applications of fuel cell and solar technology

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Explain the concepts and drivetrain configurations of electric and hybrid vehicles

CO-2: Discuss various electric motors and controls

CO-3: Present various energy storage devices

CO-4: Describe automotive applications of fuel cell and solar technology

UNIT – I:

Electric Vehicles: Layout of an electric vehicle, system components, traction motor characteristics, transmission, electronic control system, advantage and limitations, performance and energy consumption of electric vehicles.

UNIT – II:

Hybrid Vehicles: Concepts of hybrid electric drivetrain based on hybridization and powertrain configuration, architecture of series, parallel and series-parallel hybrid electric drivetrains, modes of operation, merits and demerits, plug-in hybrid architecture, speed and torque coupling of hybrid electric drivetrains.

UNIT – III:

Electric Motors: Review of technology suited to automotive propulsion, requirements, DC motors, Induction motors, permanent magnet brushless DC motors and switched reluctance motors.

UNIT – IV:

Motor Drives: Speed and torque control, DC motor - Chopper based four quadrant operations, induction motor, permanent magnet motor and switched reluctance motor.

UNIT – V:

Energy Storages: Electromechanical batteries - Types, parameters, lead acid batteries, nickel-based batteries, lithium-based batteries, battery management system and ultracapacitors.

UNIT – VI:

Fuel Cell and Solar Vehicles: Fuel cell vehicle – Operating principle, types of fuel cells, fuel cell options for fuel cell vehicle and fuel cell hybrid vehicle. Solar vehicle - Solar photovoltaic cell, solar array, solar car electrical system and drive train.

TEXT BOOKS:

1. Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, Mehrdad Ehsani, Yimin Gao, Sebastien E. Gay and Ali Emadi, CRC Press, 2004
2. Electric Vehicle Technology-Explained, James Larminie and John Loury, John Wiley, 2003

REFERENCES:

1. Electric and Hybrid Vehicles – Design Fundamentals, Iqbal Husain, CRC Press, 2010
2. Electric Vehicle Battery Systems, Sandeep Dhameja, Butterworth–Heinemann, 2002
3. Electric and Hybrid – Electric Vehicles, Ronald K. Jurgen, SAE, 2002
4. Light Weight Electric/Hybrid Vehicle Design, Ron Hodkinson and John Fenton, Butterworth–Heinemann

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1AE04) CONNECTED AND AUTONOMOUS VEHICLES

COURSE PRE-REQUISITES: Principles of Automobile Engineering, Modern Automotive Technologies, Electric, Hybrid and Fuel Cell Vehicles

COURSE OBJECTIVES:

- To understand the fundamentals of vehicle communication and networking
- To provide state-of-the-art in wireless communication technology within and between vehicles
- To know various levels of vehicle autonomy and intelligent automotive systems
- To provide an overview on driver-assist and self-driving processes

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Present the fundamentals of vehicle communication and networking
CO-2: Appreciate intra-vehicle and inter-vehicle communication technologies
CO-3: Describe various levels of vehicle autonomy
CO-4: Discuss the driver-assist and self-driving processes

UNIT – I:

Introduction to Vehicle Communications: Intra-vehicle communications - communications protocols, systems and sensors (Braking, steering, power train, chassis systems, body electronics, instrument clusters, infotainment systems), inter-vehicle communications - cooperative driving (accident warning, frontal/rear collision prevention, lane change, assistance). Consumer assistance – traffic information, multimedia support and smart parking

UNIT – II:

Communication Fundamentals and Controller Area Network: Communication fundamentals – Frequency, bandwidth, power measurement, signal to noise ratio, transmission rate constraints, radio frequency spectrum allocation, RADAR operation and types of RADAR. CAN evolution, versions, types of controllers, layered architecture. CAN bus, message frames and error handling.

UNIT – III:

Intra-Vehicle Communications: Wired communication – Network comparison, two tier approach, LIN applications - Localized vehicle area support, general support areas, CAN applications - In vehicle operation, infotainment, wireless communication – Bluetooth vehicle applications, satellite services – satellite radio, vehicle care and traffic status.

UNIT – IV:

Inter-Vehicle Communication: Adhoc Communications –Applications in Vehicle traffic Monitoring, Collision and congestion avoidance, Highway lane reservation, Emission Control, Vehicle Frequency Utilization – AM Radio, Bluetooth, FM Radio, GPS,

Short range RADAR, Wireless LAN, Intelligent Roadway-Infrastructure to vehicle and vehicle to vehicle communications. Evolving smart vehicle – ECU, wireless networking, forward RADAR, side RADAR, GPS, cellular transmission and event Recorder.

UNIT – V:

Autonomous Vehicles: Importance, levels of automation, policy making, social costs, safety and crashes, congestion, land use, energy and emissions, costs and disadvantages

UNIT – VI:

Current State of Autonomous Vehicles: Research, challenges, commercial development, sensor systems, sensor suits, environmental challenges, graceful degradation, V2V and V2I communication, sharing the drive, integrity, security, verification and policy implications.

TEXT BOOKS:

1. Inter and Intra Vehicle Communications, Gilbert Held Auerbach, 2008
2. Autonomous Vehicle Technology-A Guide for Policymakers, James M. Anderson, Nidhi Kalra, Karlyn D. Stanley, Paul Sorensen, Constantine Samaras, Oluwatobi A. Oluwatola, RAND Corporation, Santa Monica, 2016
3. Autonomous Driving - Technical, Legal and Social Aspects, Markus Maurer, J. Christian Gerdes, Barbara Lenz, Hermann Winner, Editors, Springer, 2016

REFERENCES:

1. Intelligent Vehicle Technologies: Theory and Applications, Ljubo Vlacic, Michel Parent and Fumio Harashima, Butterworth-Heinemann, Oxford, 2001
2. Navigation and Intelligent Transportation Systems – Progress in Technology, Ronald K. Jurgen, Automotive Electronics Series, SAE, USA, 1998
3. Automotive In–vehicle Networks, J. Gabrielleen, Wiley-Blackwell, 2008
4. In-Vehicle Network Architecture for the Next-Generation Vehicles, Syed Masud Mahmud, IGI
5. Communication Technologies for Vehicles, Mohamed Kassab Springer, 2015

GENERAL - COMPUTING

1. PROGRAMMING THROUGH JAVA

Java is an extensively **used** programming language specifically intended for use in the distributed environment of the internet. **Java** help students to create wide-ranging applications that possibly will run on a single workstation or be distributed among servers and clients in a network.

Java is an extremely fruitful language and an upper option for many developers for many years. The motive that it has remained so prevalent is since it still happens the needs of functioning across networks.

Students will have different roles and responsibilities by learning Java Programming

- Designing, implementing, and maintaining Java applications that are often high-volume and low-latency, required for mission-critical systems.
- Delivering high availability and performance.
- Contributing in all phases of the development lifecycle.
- Writing well-designed, efficient, and testable code.

2. RELATIONAL DATABASE MANAGEMENT SYSTEMS

A relational database permits you to effortlessly find precise information. It also consents you to sort based on any field and produce reports that comprise only definite fields from each record. With features like, Data Accuracy, Easy Access to Data, Data Integrity, Flexibility, Normalization, High Security, Feasible for Future Modifications

By learning RDBMS Students will have different roles in Database environment

- Data Administrator,
- Database Administrator
- Database Designer
- Application Programmer

3. COMPUTATIONAL THINKING USING PYTHON

The **python** language is one of the utmost accessible programming languages available because it has streamlined syntax and not complex, which gives more importance on natural language. Due to its comfort of learning and practice, **python** codes can be readily written and executed much quicker than former programming languages.

Data Science: The libraries and frameworks Python offers, e.g. PyBrain, PyMySQL, and NumPy are one of the big reasons. Another reason is diversity. Python experience allows you to do a lot more than any other language, e.g. you can create scripts to automate stuff, go into web development, and so much more.

Students will have various Job Profiles by learning Python

- Software Engineer.
- Python Developer.
- Research Analyst.
- Data Analyst.
- Data Scientist.
- Software Developer.

4. INTRODUCTION TO DATA ANALYTICS

Data Scientists and Analysts **use data analytics** techniques in their research, and businesses also **use** it to inform their conclusions. **Data analysis** can assistance corporations healthier comprehend their customers, assess their ad-campaigns, personalize gratified, create content approaches and progress products.

By learning Data Analytics students will get Jobs with different designations

- IT Systems Analyst. Systems analysts use and design systems to solve problems in information technology. ...
- Healthcare Data Analyst. ...
- Operations Analyst. ...
- Data Scientist. ...
- Data Engineer. ...
- Quantitative Analyst. ...
- Data Analytics Consultant. ...
- Digital Marketing Manager.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech.	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1IT06) PROGRAMMING THROUGH JAVA

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

- To introduces object-oriented programming concepts using the Java language
- To introduces the principles of inheritance and polymorphism; and demonstrates how they relate to the design of abstract classes
- To introduces the implementation of packages and interfaces
- To introduces exception handling, event handling and multithreading

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Develop applications for range of problems using object-oriented programming techniques

CO-2: Design simple graphical user interface applications

CO-3: Explore the design of graphical user interface using applets and swings

UNIT – I:

Object Oriented Thinking and Java Basics: Need for OOP Paradigm, Summary of OOP Concepts, Coping with Complexity, Abstraction Mechanisms, A Way of Viewing World – Agents, Responsibility, Messages, Methods, History of Java, Java Buzzwords, Data Types, Variables, Scope and Life Time of Variables, Arrays, Operators, Expressions, Control Statements, Type Conversion and Casting, Simple Java Program, Concepts of Classes, Objects, Constructors, Methods, Access Control, This Keyword, Garbage Collection, Overloading Methods and Constructors, Method Binding, Inheritance, Overriding and Exceptions, Parameter Passing, Recursion, Nested and Inner Classes, Exploring String Class.

UNIT – II:

Inheritance, Packages and Interfaces: Hierarchical Abstractions, Base Class Object, Subclass, Subtype, Substitutability, Forms of Inheritance- Specialization, Specification, Construction, Extension, Limitation, Combination, Benefits of Inheritance, Costs of Inheritance. Member Access Rules, Super Uses, Using Final with Inheritance, Polymorphism- Method Overriding, Abstract Classes, The Object Class.

Defining, Creating and Accessing a Package, Understanding Classpath, Importing Packages, Differences between Classes and Interfaces, Defining an Interface, Implementing Interface, Applying Interfaces, Variables in Interface and Extending Interfaces, Exploring Java.IO.

UNIT – III:

Exception Handling and Multi-threading: Concepts of Exception Handling, Benefits of Exception Handling, Termination or Resumptive Models, Exception Hierarchy, Usage of Try, Catch, Throw, Throws and Finally, Built in Exceptions, Creating Own Exception Sub Classes.

String Handling, Exploring Java. Util, Differences between Multi-Threading and Multitasking, Thread Life Cycle, Creating Threads, Thread Priorities, Synchronizing Threads, Interthread Communication, Thread Groups, Daemon Threads. Enumerations, Autoboxing, Annotations, Generics.

UNIT – IV:

Event Handling: Events, Event Sources, Event Classes, Event Listeners, Delegation Event Model, Handling Mouse and Keyboard Events, Adapter Classes.

The AWT Class Hierarchy, User Interface Components- Labels, Button, Canvas, Scrollbars, Text Components, Check Box, Check Box Groups, Choices, Lists Panels – Scrollpane, Dialogs, Menubar, Graphics, Layout Manager – Layout Manager Types – Border, Grid, Flow, Card and Grid Bag.

UNIT – V:

Applets: Concepts f Applets, Differences between Applets and Applications, Life Cycle of an Applet, Types of Applets, Creating Applets, Passing Parameters to Applets.

UNIT – VI:

Swing: Introduction, Limitations of AWT, MVC Architecture, Components, Containers, Exploring Swing- Japplet, Jframe and Jcomponent, Icons and Labels, Text Fields, Buttons – The Jbutton Class, Check Boxes, Radio Buttons, Combo Boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

TEXT BOOKS:

1. Java The Complete Reference, Herbert Schildt, 7th Edition, TATA MCGRAW-HILL
2. Understanding OOP with Java Updated Edition, T. Budd, Pearson Education
3. An Introduction to Programming and OO Design using Java, J. Nino and F. A. Hosch, John Wiley & Sons

REFERENCES:

1. Introduction to Java Programming, Y. Daniel Liang, Pearson Education
2. An Introduction to Java Programming and Object-Oriented Application Development, R. A. Johnson, Thomson
3. Core Java 2, Vol. 1 - Fundamentals, Cay S. Horstmann and Gary Cornell, 8th Edition, Pearson Education
4. Core Java 2, Vol. 2 - Advanced Features, Cay S. Horstmann and Gary Cornell, 8th Edition, Pearson Education

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B.Tech.	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1CS08) RELATIONAL DATABASE MANAGEMENT SYSTEMS

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:
- To understand the basic concepts and the applications of database systems
- To master the basics of SQL and construct queries using SQL
- To understand the relational database design principles
- To become familiar with the basic issues of transaction processing and concurrency control
- To become familiar with database storage structures and access techniques

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Demonstrate the basic elements of a relational database management system
CO-2: Identify the data models for relevant problems
CO-3: Design entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data
CO-4: Apply normalization for the development of application software

UNIT – I:
Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages – DDL, DML, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database Users and Administrators, History of Database Systems.
Introduction to Database Design: Database Design and ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises.
Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design: ER to Relational, Introduction to Views, Destroying /Altering Tables and Views.

UNIT – II:
Relational Algebra and Calculus: Preliminaries, Relational Algebra, Relational calculus – Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus.
SQL: Queries, Constraints, Triggers: Form of Basic SQL Query, UNION, INTERSECT, and EXCEPT, Nested Queries, Aggregate Operators, NULL values Complex Integrity Constraints in SQL, Triggers and Active Data bases, Designing Active Databases.

UNIT – III:
Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Dependencies - Reasoning about FDs, Normal Forms, Properties of

Decompositions, Normalization, Schema Refinement in Database Design, Other Kinds of Dependencies.

UNIT – IV:

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

UNIT – V:

Concurrency Control: Lock–Based Protocols, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols, Multiversion Schemes.

Recovery System-Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with loss of nonvolatile storage, Early Lock Release and Logical Undo Operations, Remote Backup systems.

UNIT – VI:

Storage and Indexing: Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing, Index Data Structures, Comparison of File Organizations.

Tree-Structured Indexing: Intuition for tree Indexes, Indexed Sequential Access Method (ISAM), B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

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

TEXT BOOKS:

1. Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, 3rd Edition, McGraw-Hill
2. Database System Concepts, A. Silberschatz, Henry F. Korth, S. Sudarshan, 6th Edition, McGraw-Hill
3. Database Systems, R. Elmasri, Shamkant B. Navathe, 6th Edition, Pearson Education

REFERENCES:

1. Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning
2. Introduction to Database Management, M. L. Gillenson and others, Wiley Student Edition
3. Database Development and Management, Lee Chao, Auerbach Publications, Taylor & Francis Group
4. Introduction to Database Systems, C. J. Date, Pearson Education

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech.	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1IT03) COMPUTATIONAL THINKING USING PYTHON

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

- To understand why Python is a useful scripting language for developers
- To create and execute Python programs and to Learn how to use lists, tuples, and dictionaries in Python programs
- To learn how to build and package Python modules for reusability
- To learn how to design object-oriented programs with Python classes
- To learn how to use exception handling in Python applications for error handling

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Adapt and combine standard algorithms to solve a given problem (includes numerical as well as non-numerical algorithms)

CO-2: Adequately use standard programming constructs: repetition, selection, functions, composition, modules, aggregated data (arrays, lists, etc.)

CO-3: Explain what a given program (in Python) does identify and repair coding errors in a program

CO-4: Understand and use object-based software concepts (constructing OO software will be dealt with in the course Software Engineering)

CO-5: Use library software for (e.g.) building a graphical user interface, web application, or mathematical software

UNIT – I:

Introduction: History, Features, Setting up path, Working with Python, Basic Syntax, Variable and Data Types, Operator, Conditional Statements-If
If- else Nested if-else Looping for While Nested loops Control Statements Break Continue Pass String Manipulation Accessing Strings Basic Operations String slices Function.

UNIT – II:

Methods, Lists: Introduction, Accessing list, Operations, Working with lists, Function and Methods,

Tuple: Introduction, Accessing tuples, Operations, Working, Functions and Methods

Dictionaries: Introduction, Accessing values in dictionaries, Working with dictionaries, Properties.

UNIT – III:

Functions: Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables.

Modules: Creation, Importing module, Math module, Random module, Packages.

UNIT – IV:

Composition: Input-Output-Printing on screen, Reading data from keyboard, Opening and closing file Reading and writing files, Functions.

Exception Handling: Exception, Exception Handling, Except clause, Try? Finally clause, User Defined Exceptions

UNIT – V:

OOPs Concept: Class and object, Attributes, Inheritance, Overloading, Overriding, Data hiding, Regular expressions- Match function, Search function, Matching VS Searching, Modifiers, Patterns.

Multithreading: Thread, Starting a thread, Threading module, Synchronizing threads.

CGI: Introduction, Architecture, CGI environment variable, GET and POST methods, Cookies, File upload.

UNIT – VI:

Database: Introduction, Connections, Executing queries, Transactions Handling error, Networking: Socket, Socket Module, Methods, Client and server, Internet modules, Sending email.

TEXT BOOKS:

1. Learning Python, David Ascher and Mark Lutz, 2nd Edition, O'Relly, 2003

REFERENCES:

1. Python Programming: An Introduction to Computer Science, John M. Zelle, 2nd Edition, Kindle Edition
2. Python Essential Reference, David M. Beazley, 4th Edition, Developer's Library

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech.	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1IT07) INTRODUCTION TO DATA ANALYTICS

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:
- To be exposed to conceptual framework of big data
- To understand different techniques of data analysis
- To be familiar with concepts of data streams
- To be exposed to item sets, clustering, frame works and Visualization

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand big data fundamentals
CO-2: Learn various data analysis techniques
CO-3: Implement various data streams
CO-4: Understand item sets, clustering, frame works & Visualizations

UNIT – I:
Introduction to Big Data: Introduction to Big Data Platform – Challenges of Conventional systems – Web data – Evolution of Analytic scalability, analytic process and tools, Analysis vs Reporting – Modern data analytic tools,
Statistical Concepts: Sampling distributions, resampling, statistical inference, prediction error.

UNIT – II:
Data Analysis: Regression modeling, Multivariate analysis, Bayesian modeling, inference and Bayesian networks, Support vector and Kernel methods
Analysis of Time Series: Linear systems analysis, nonlinear dynamics – Rule induction –
Neural Networks: Learning and and Generalisation, competitive learning, Principal component analysis and neural networks
Fuzzy Logic: extracting fuzzy models from data, fuzzy decision trees, Stochastic search methods.

UNIT – III:
Mining Data Streams: Introduction to Streams Concepts – Stream data model and architecture – Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimating moments – Counting oneness in a Window – Decaying window – Real time Analytics Platform (RTAP) applications – case studies – real time sentiment analysis, stock market predictions.

UNIT – IV:
Frequent Itemsets and Clustering: Mining Frequent itemsets – Market based Modeling – Apriori Algorithm – Handling large data sets in Main Memory – Limited Pass Algorithm – Counting frequent itemsets in a Stream – Clustering Techniques – Hierarchical – K-Means.

UNIT – V:

Clustering high dimensional data – CLIQUE and ProCLUS – Frequent pattern-based clustering methods – Clustering in non-Euclidean space – Clustering for streams and Parallelism.

UNIT – VI:

Frameworks and Visualization: MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases – S3 – Hadoop Distributed file systems – Visualizations – Visual data analysis techniques,

Interaction Techniques: Systems and Applications

TEXT BOOKS:

1. Intelligent Data Analysis, Michael Berthold, David J. Hand, Springer, 2007
2. Mining of Massive Datasets, Anand Rajaraman and Jeffrey David Ullman, Cambridge University Press, 2012

REFERENCES:

1. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Bill Franks, John Wiley & Sons, 2012
2. Big Data Glossary, Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, Pete Warden, O'Reilly, 2011
3. Data Mining Concepts and Techniques, Jiawei Han, Micheline Kamber, 2nd Edition, Elsevier, 2008

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech.	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1CS11) FUNDAMENTALS OF COMPUTER ALGORITHMS

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:
- To reinforce algorithms analysis methods
- To analyse running time of an algorithm
- To understand different algorithm design strategies
- To familiarize with an assortment of important algorithms

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply algorithm design techniques and concepts to solve given engineering problem
CO-2: Analyze running times of algorithms using asymptotic analysis
CO-3: Develop efficient algorithms for computational tasks
CO-4: Computing complexity measures of algorithms

UNIT – I:
Introduction: Characteristics of algorithm. Analysis of algorithms: Asymptotic analysis of complexity bounds – best, average and worst-case behaviour; Performance measurements of Algorithm, Time and space trade-offs.

UNIT – II:
Divide and Conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication. Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.

UNIT – III:
Greedy Method: General method, applications-Job sequencing with deadlines, 0/1 knapsack problem, Minimum cost spanning trees, Single source shortest path problem, Huffman Codes.

UNIT – IV:
Dynamic Programming-I: General method, Principle of optimality, applications-Multistage graphs, Matrix chain multiplication, Optimal binary search trees.

UNIT – V:
Dynamic Programming-II: 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliability design.

UNIT – VI:
Backtracking: General method, applications- N-Queen problem, Sum of subsets problem, Graph coloring, Hamiltonian cycles.

TEXT BOOKS:

1. Fundamentals of Computer Algorithms, E. Horowitz et al., Galgotia Publications
2. Introduction to Algorithms, Thomas H. Cormen, Charles E. Lieserson, Ronald L. Rivest and Clifford Stein, 4th Edition, MIT Press/McGraw-Hill

REFERENCES:

1. Algorithm Design, Jon Kleinberg and Eva Tardos, 1st Edition, Pearson
2. Algorithm Design: Foundations, Analysis and Internet Examples, Michael T. Goodrich and Roberto Tamassia, 2nd Edition, Wiley
3. Algorithms – A Creative Approach, Udi Manber, 3rd Edition, Addison-Wesley
4. Introduction to the Design and Analysis of Algorithms, Anany Levitin, 3rd Edition, Pearson

GENERAL

PROFESSIONAL ETHICS AND HUMAN VALUES

Ethics is a necessary and listed Graduate Attribute for all engineers according to the Washington Accord. As engineers deal with the society and provide for the society, it is important that the ethical concerns pertaining to technology are well-understood and addressed. Human Values form the basis for all Ethics and ethical theories help resolve professional dilemmas too. This course aims to create an appreciation for normative and applied ethics with special focus on professionalism and technology education and practice. Given the diverse set of roles an engineer or computer scientist may play in the society, there is an inherent societal need for engineers, technologists, and computer scientists to be ethical. The formative years of students of engineering are the best time to impress upon them the practical importance and application aspects of ethics. The curriculum is designed to include an inherent appreciation for the Indian Ethos and cover a wide variety of topics with suitable case studies and examples all through, so as to enable the learners to find practical contexts in global and contemporary careers of their future. The course also leads to attaining two other Graduate Attributes majorly, along with Ethics, *viz.* Engineer and Society, and Lifelong Learning.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1HS01) PROFESSIONAL ETHICS AND HUMAN VALUES

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

- To emphasize on the importance of ethics for engineers and computer scientists
- To provide a toolkit for ethical behaviour in personal and professional settings
- To relate the profession of engineering to sociocultural as well as ethical and moral contexts in India and globally
- To develop more socially conscious engineers who create and conceive a better society and a better world without sacrificing or ignoring public good

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Distinguish morals, values, and ethics in Indian and global contexts

CO-2: Resolve moral and ethical dilemmas through ethical inquiries and appropriate ethical theories

CO-3: Realize the professional role of engineers in society and the support available in creating safe solutions for the society focusing on public welfare

CO-4: Conduct themselves ethically in various roles that present themselves in professional and business environments

UNIT – I:

Motivation and Introduction to Human Values: Motivation to study ethics in engineering with justifying case studies, historical events, and current affairs; Morals, Values, and Ethics – Definitions; Moral Judgement vs. Value Judgement; Moral Character and Moral Autonomy – Conscientiousness, Integrity, Empathy as basic building blocks; The Golden Rule; Maslow's Theory of Needs; Universal Human Values and Theories; Conventional and Constitutional Values in Indian Ethos; Anomie vs. Civic Virtue as a foundation for an ideal society; Ethics as a basis of legal framework; Privacy and Confidentiality – Increasing emphasis in personal and professional lives, technological considerations and examples; Profession, Professionalism – Definitions, Engineering as a Profession

UNIT – II:

Ethics, Ethical Theories, and Professionalism: Ethics through Spirituality, Religion, and beyond; Indian Philosophy and Ethos, ancient to modern – Family System, Ethical Pluralism, Unity in Diversity; Ethics as application of values and as moral philosophy – Kohlberg's theory vs. Gilligan's theory of moral development leading to ethics, examples; Moral and Ethical Dilemmas – Definition, Causes, Case Studies and Examples; Resolution of Ethical Dilemmas through Ethical Inquiries – Normative, Conceptual, and Factual Inquiries, Classification of Ethics by Character and Conduct – Consequentialism/ Utilitarianism, Deontological Ethics, Virtue Ethics and Theories, Rights Theories; Ethical Frameworks and examples; Practical application of ethical theories for decision-making in personal life

UNIT – III:

Professionalism, Engineering in the Societal Context: Professionalism – Professional Traits, Rights, Responsibilities, Roles, Virtues; Business Ethics; Engineering as Social Experimentation – Context with examples, Comparison with standard experiments, Application of Ethical Inquiries to gain knowledge and to gather relevant information, Responsibility of Experimenters, Accountability and Answerability, Consensus and Need for Informed Consent – how to address exceptions; Responsible Innovation – Social Context of Innovation, Responsible Research and Innovation, Data Privacy and Protection of Individual Rights, being Ethical by Design; Trust in the context of professionalism – confidentiality, non-disclosure agreements (NDA); Intellectual Property (IP) – IP Rights (IPR) as Professional Rights, Law, Moral Rights and Economic Rights, Patenting; Diverse roles of Engineers as Professionals – Manager, Leader, Consultant, and Expert Witness

UNIT – IV:

Professional Ethics, Ethics at Workplace and Roles of Engineers: Overview of Organizational Behaviour; Collegiality, Loyalty, Trust in professional context; Respect for Authority vs. Moral Autonomy, Moral Responsibility; Organizational context of Ethics – Minor, interpersonal, severe, organizational workplace deviances; Occupational Crime, Culpable mistakes, Collateral damage; Gifts and bribes; Industrial Ethics for non-professionals; Code of ethics and Code of Conduct – Role of professional societies in guiding, promoting, and protecting professionals and professions, Examples of common professional societies in Engineering and Science; Decision-making in professional context – Choosing the right guidance, choosing the right ethical theory; Conflicts in profession and at workplace - Employee Relations and Discrimination, Conflict of Interest, Conflict Management and Resolution, Framework for Conflict Resolution; Multinational Companies and Corporates – Work Culture and Respect for Diversity and Pluralism; Employee Rights vs. Professional Rights; Whistleblowing – Social, Organizational, and Legal context with examples

UNIT – V:

Public Welfare, Safety & Risk: Impact of engineering activities and technology on Public Welfare; Ethical Concerns of Public welfare in the context of Emerging Technologies – Artificial Intelligence, Machine Learning, Internet of Things, Cybersecurity and Cybercrime; Issues of Public Concern – Informed Consent, Health and environmental aspects, data security; Safety and Risk – Definitions; Risk Assessment – Known and Unintended consequences, Risk-Benefit Analysis, Reducing Risk, Optimum Level of Safety, Capability Curves, Safe Exit; Learning from the Past – Case Studies in Ethics Context: Titanic, Bhopal, Chernobyl; Environmental Ethics and Sustainable Development Goals; Computer Ethics and various Technology Ethics; Ethics in the context of War and Weapon Development; Ethics and Economics – Fair Trade, Capitalism vs. Communism, Developed vs. Developing vs. Underdeveloped economies

UNIT – VI:

Ethics for Lifelong Learning: Ethics in the context of Globalization; Moral Character and Ethical Leadership – Case Studies and Examples of success and failure; Overview and comparison of different schools of thought, comparison of the works of pioneering

philosophers and social scientists – Immanuel Kant, John Rawls, Martin Heidegger, Swami Vivekananda, Jiddu Krishnamurti, Dr. Abdul Kalam, *etc.*; Impact of Ethical and Unethical Behaviour in personal and professional lives, developing and maintaining ethical behaviour, threats to moral autonomy and how to continue to be ethical in personal and professional lives

TEXT BOOKS:

1. Ethics in Engineering, Mike W. Martin, Roland Schinzinger, McGraw-Hill, 2017
2. Business Ethics: An Indian Perspective, A. C. Fernando, K. P. Muralidheeran, E. K. Satheesh, Pearson Education, 2019
3. Professional Ethics, R. Subramanian, Oxford University Press, 2017

REFERENCES:

1. Engineering Ethics: Concepts & Cases, Charles E. Harris, Jr., Michael S. Pritchard, Michael J. Rabins, Cengage Learning, 2012
2. Classical Indian Ethical Thought: A Philosophical Study of Hindu, Jaina and Bauddha Morals, Kedar Nath Tiwari, Motilal Banarsidass Publishers, 2017
3. The Manual for Indian Start-Ups, Dalai Lama, Ethics for the Whole World 978-9351360803 Vijay Kumar Ivaturi et al., Penguin Random House India, 2017
4. To Be Human, Jiddu Krishnamurti, Shambhala, 2000
5. On Ethics and Economics, Amartya Sen, Oxford India, 1999

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1HS02) ENTREPRENEURSHIP

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

- To motivate the engineers to inculcate the skills thereof in any professional role and to consider intrapreneurship or entrepreneurship as career choices for personal and societal growth
- To impart lean management principles and practices to plan, execute, and convert one's own idea into a sustainable business model
- To gain practical knowledge to design one's own lean startup
- To identify and avoid the potential pitfalls in validation, design, production, and marketing phases of an innovative product or service

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Discover societal problems as entrepreneurial opportunities and ideate to develop solutions through systematic and creative approaches to innovation and business strategy

CO-2: Apply lean methodology to startup ideas using Business Model Canvas and Lean Canvas and be able to create Business Plan

CO-3: Validate ideas, design, production, and marketing systematically using techniques such as 5 Whys, Innovation Accounting, Value and Growth Propositions

CO-4: To strategize during ideation, production, market research, marketing and facing competition

UNIT – I:

Entrepreneurial Skills and Opportunities : Role of Entrepreneurs in Indian and World Economy; Entrepreneurship as a career for engineers, scientists, and technologists; Personality and Skill Set of an Entrepreneur; Need for Ethics and Empathy for Entrepreneurs; Stories of Successful and Failed Enterprises; Current Business Trends; Entrepreneurial Management vs. Corporate Management – Roles and Scope; Concepts of Intrapreneurship, Social Entrepreneurship, Technopreneurship, Studentpreneurship; Opportunities in Telangana State and India – incubators, schemes, accelerators

UNIT – II:

Introduction to Lean Startup Methodology: Overview, Principles of Lean Startup, Lean vs. Traditional Startup; Vision-to-Steering, Start-Define-Learn-Experiment, Leap-Test-Measure-Pivot, Build-Measure-Learn

UNIT – III:

Business Model Concepts: Components of Business Plan; Business Model Canvas (BMC); Lean Canvas (LC); Pitch Deck; Elevator Pitch; Financial Aspects – Financing, Funding Stages, Inflows, Outflows; Market Research and Marketing

UNIT – IV:

Building Your Business Model: Desirability, Feasibility, and Viability; Minimum Viable Product (MVP), Proof of Concept (PoC), Prototype; Early Adopters; Value Proposition; Overview of opportunities in India – Financing and Support Schemes, Online and Offline Resources, Entrepreneurial Networks

UNIT – V:

Evaluating Your Business Model: Three Learning Milestones of Innovation; Root Cause Analysis (RCA) through 5 Whys; Pivot or Persevere; The Engines of Growth: Sticky, Viral, and Paid; Kan-ban Diagram for Project Planning and Resource Allocation

UNIT – VI:

Strengthen Your Business Model: Why startups fail? Value and Waste; Design Thinking for Business; Analogs and Antilogs; Paralysis by Analysis and Extinct by Instinct; The three A's: Actionable, Accessible, and Auditable Metrics and Vanity Metrics

TEXT BOOKS:

1. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, Eric Ries, Penguin Portfolio, 2015 (ISBN: 978-0670921607)
2. Entrepreneurship, Robert D. Hisrich, Michael P. Peters and Dean A. Shepherd, Tata McGraw-Hill, 11th Ed., 2020 (ISBN: 978-9390113316)
3. Entrepreneurship Simplified: From Idea to IPO, Ashok Soota, S R Gopalan, Penguin Random House India, 2016 (ISBN: 978-0670088959)

REFERENCES:

1. Measure What Matters: OKRs: The Simple Idea that Drives 10x Growth, John Doerr, Penguin Portfolio, 2018 (ISBN: 978-0241348482)
2. Entrepreneurship Development and Business Ethics, Abhik Kumar Mukherjee, Shaunae Roy, Oxford University Press, 2019 (ISBN: 978-0A199494460)
3. The Manual for Indian Start-Ups, Vijay Kumar Ivaturi et al., Penguin Random House India, 2017 (ISBN: 978-0143428527)
4. Social Entrepreneurship in India: Quarter Idealism and a Pound of Pragmatism, Madhukar Shukla, SAGE Publications India Pvt Ltd, 2020 (ISBN: 978-9353882372)
5. Entrepreneurship: A South Asian perspective. Donald F Kuratko, T.V Rao. Cengage Learning, 2012

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B.Tech. VII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1HS03) PERSONALITY DEVELOPMENT AND PUBLIC SPEAKING

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

- To develop skills and techniques for Effective Communication and Public Speaking
- To develop Leadership qualities and increase Self – confidence
- To get along with people and Team-Building
- To enhance career opportunities by Goal setting
- To develop an acceptable PERSONALITY

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Communicate better and speak with confidence

CO-2: Exhibit Leadership qualities and increased Self – confidence

CO-3: Work towards Team-Building

CO-4: Use career opportunities by Goal setting

CO-5: Acquire a forceful personality to maintain a pleasant relationship between the seniors and subordinates and other stakeholders

UNIT – I:

EFECTIVE COMMUNICATION

i. Fundamentals of Effective Communication
ii. How to sell your ideas
iii. Communication within Industry (awareness of motivation, ego states, games, etc.)
iv. Guidelines on: Listening, Reading and Writing
v. Non-verbal Communication (Body Language)
vi. Barriers of Communication

UNIT – II:

PUBLIC SPEAKING (SPEECH COMMUNICATION)

i. How to develop courage and self-confidence
ii. Speech purposes, preparation patterns and outlining of speech
iii. Fundamentals and secrets of good delivery
iv. How to make your meaning clear and convince an audience / client
v. How to close effectively and get action?
vi. How to participate in conferences, group discussions and office meetings

UNIT – III:

PERSONALITY DEVELOPMENT -1

i. Leadership - qualities of a successful leader ; Leadership Styles; Leadership in Administration; Problem-solving & Decision-making
ii. Group Dynamics and Team Building
iii. Importance of groups in organization; Interactions in group, Group Decision Taking, Team Building, Interaction with the Team, Building a good team

UNIT – IV:

PERSONALITY DEVELOPMENT -2

i. Interpersonal Relations- Introduction; Transactional Analysis in communication Awareness of Ego states and their application in communication
ii. Conflict Management- Introduction & Causes of Conflict; Managing Conflict

UNIT – V:

PERSONALITY DEVELOPMENT -3

i. Positive Attitude &Ways to develop positive attitude
Self Esteem & Confidence Building
ii. Motivation- Importance of self-motivation;
iii. Stress -Causes of Stress & Impact of Stress; Managing Stress

UNIT – VI:

PERSONALITY DEVELOPMENT -4

i. Goal Setting-Meaning; Short, medium and Long Term Goals;
Importance of Goal setting & Steps for Goal Setting
ii. Creativity-Meaning; Barriers to Creativity & Steps to stimulate Creativity
Understanding and Importance of Human Values; Ideals in Life; Becoming a Role Model
iii. Time Management - Time as a Resource; Techniques for better Time Management.

TEXT BOOKS:

1. Advance Speaking Skills, Jeremy Harmar & John Arnold, Essex, Longman Group Limited, 1978
2. Developing Soft Skills, Sherfield R. M., Montgomery R. J., Moody P. G. 4th Edition, Pearson, 2010
3. Personality Development and Soft Skills, Barun K. Mitra, Oxford University Press, 2016

REFERENCES:

1. Body Language: A Guide for Professionals, Hedwig Lewis, Response Books (A Division of Sage Publications India), 1998
2. Emotional Intelligence, Daniel Goldman, Bantam Books, 1995
3. Personality Development, Rajiv Mishra, Rupa & Co., 2004

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1HS04) FOREIGN LANGUAGE – FRENCH

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

- To communicate verbally in a simple way by asking and responding to simple questions related to everyday language needs
- To read and comprehend different kinds of texts (notices, informal letters, catalogues, menus etc.)
- To write clear, concise, and correct sentences and paragraphs on familiar topics.
- To recognize and use basic syntax and structures in French including articles, prepositions and connecting words as well as master basic vocabulary

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Use vocabulary contextually and effectively

CO-2: Use reading skills to comprehend different kinds of texts

CO-3: Understand everyday expressions dealing with simple and concrete everyday needs, in clear, slow and well-articulated speech and manage very short mini dialogues /conversations

CO-4: Demonstrate basic competence in Written French including grammar, sentence and paragraph structure, coherence

UNIT – I: Introduce oneself and introduce someone:

Reading: Read and understand an introduction about someone

Grammar: Question words, Subject verb agreement, Mas/fem and prepositions with cities and countries

Vocabulary: professions, nationalities, countries numbers, days of the week and verbs

Writing: Build basic sentences and Write about oneself

Life Skills: Greetings, Formal and Informal way of asking questions

UNIT – II: Express likes and dislikes and Talk about your locality:

Reading: Read and understand description of a place

Grammar: Articles, prepositions, possessive adjectives, basic connecting words such as **"like, and, but",** and Negation

Vocabulary: Adjectives, verbs of preference, different places, and basic vocabulary on leisure and sports activities.

Writing: Write about hobbies and pastimes

Life Skills: Conversation fillers

UNIT – III: Take / Fix an appointment with someone:

Reading: Understand propositions and counters

Grammar: How to say time, Interrogative adjectives

Vocabulary: Irregular verbs, days of the week, Fixed expressions with Etre and Avoir and expressions to ask for appointment or refuse/accept a proposed time

Life Skills: Telephone etiquette and colloquial expressions in French

UNIT – IV: Talk about your routine / Invite someone and Accept or refuse an invitation
Reading: Read and understand an invitation on basic info: date and time, venue, occasion, type of invitation etc.
Grammar: Question word Why, Connecting word "because", partitive and contracted articles, reflexive verbs
Vocabulary: Expressions to propose, thank / apologize and accept or refuse an invitation,
Writing: Respond to an invitation (Accept or refuse)
Life Skills: At the table

UNIT – V: Ask for information (timings, price, etc) and Ask for/ Give Directions
Reading: Understand signboards and instructions
Grammar: Imperative mode and prepositions.
Vocabulary: Directions, Expressions to ask information or seek precision
Writing: Give instructions and fill a form

UNIT – VI: Vacation (plan vacation, choose destination, visit, and appreciate)
Reading: Read and understand travel brochures for basic info on offers, locations, touristic attractions hotels and so on
Grammar: demonstrative adjectives and near future tense
Vocabulary: Weather forecast, modes of transport, and vacation activities
Writing: Write a post card
Life Skills: Types of vacation in France

TEXT BOOKS:

1. Painless French, Carol Chitin, Lynn Gore, Barrons Educational Series, 2016 (ISBN: 978-1438007700)
2. Language Learning University, French: Learn French for Beginners Including French Grammar, French Short Stories and 1000+ French Phrases, Createspace Independent Publications, 2018 (ISBN: 978-1726415002)
3. Language School, French Language for Beginners, 2019 (ISBN: 978-1700175700)

REFERENCES:

1. Practice Makes Perfect: Complete French All-in-One, Annie Heminway, McGraw-Hill Education, 2018 (ISBN: 978-1260121032)
2. Easy French Step-by-Step, Myrna Bell Rochester, McGraw-Hill Education, 2008 (ISBN: 978-0071453875)
3. Contacts: Langue et culture françaises, Jean-Paul Valette, Rebecca Valette, Wadsworth Publishing Co. Inc., 2012 (ISBN: 978-1133309581)

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech.	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1CE09) SMART CITIES

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

- To understand smart city basic concepts, global standards, and Indian context of smart cities
- To explain smart community, smart transportation and smart buildings
- To understand Energy demand, Green approach to meet Energy demand and their capacities
- To identify Smart Transportation Technologies in cities and concepts towards smart city

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Explain and elaborate smart city concepts and their international and national standards
CO-2: Conceptualize smart community, transportation and building concepts
CO-3: Develop and calibrate energy demand and their capacity limits
CO-4: Predict the various smart urban transportation systems and the transition from existing city towards a smart city

UNIT – I:
Introduction to Smart Cities: Introduction to Smart Cities - Understanding Smart Cities - Dimensions of Smart Cities – World urbanization, Global Experience of Smart Cities, Smart City case studies-Indian scenario - India "100 Smart Cities" Policy and Mission.

UNIT – II:
City as a System of Systems: Systems thinking – Developing a smart city approach – Core elements of a smart city – Relevant open data for a smart city – Sustainability – Privacy and Ethics – Energy systems for smarter cities.

UNIT – III
Smart Cities Planning and Development: Introduction to Smart Community; Smart community concepts: Concept of Smart Community - Smart Transportation - Smart Building and Home Device - Smart Health - Smart Government - Smart Energy and Water - Cybersecurity, Safety, and Privacy; Internet of Things, Blockchain, Artificial Intelligence, Alternate Reality, Virtual Reality.

UNIT – IV:
Smart Urban Energy Systems: Conventional vs. Smart, City components, Energy demand, Green approach to meet Energy demand, Index of Indian cities towards smartness – a statistical analysis -Meeting energy demand through direct and indirect solar resources- Efficiency of indirect solar resources and its utility, Capacity limit for

the indirect solar resources- Effectiveness in responsive environment in smart city; Smart communication using green resources- **Relevant case studies**

UNIT – V:

Smart Transportation Systems: Smart Transportation Technologies - Driverless and connected vehicles - ride sharing solutions - The "improve" pathway - The "shift" pathway – Smart Roads and Pavement systems – Relevant case studies

UNIT – VI:

Future of Smart Cities: The transition of legacy cities to Smart - Right transition process - the benefit of citizens, cities have to adopt effective management and governance approaches-factors in the transition phase of legacy cities to Smart cities and their managerial implications.

TEXT BOOKS:

1. Internet of Things in Smart Technologies for Sustainable Urban Development, G. R. Kanagachidambaresan, R. Maheswar, V. Manikandan, K. Ramakrishnan., Springer, 2020
2. Society 5.0: A People-Centric Super-Smart Society, Hitachi-U Tokyo Laboratory (H-U Tokyo Lab), Springer, 2020
3. The Routledge Companion to Smart Cities, Katharine S. Willis, Alessandro Aurigi, Routledge International Handbooks, 2020

REFERENCES:

1. Smart Cities in Asia: Governing Development in the Era of Hyper-Connectivity Yu-min Joo, Yu-Min Joo, Teck-Boon Tan, Edward Elgar, 2020
2. Urban Systems Design: Creating Sustainable Smart Cities in the Internet of Things Era, Yoshiki Yamagata, Perry P. J. Yang, Elsevier, 2020
3. Smart Cities and Artificial Intelligence: Convergent Systems for Planning, Design, and Operations, Christopher Grant Kirwan, Zhiyong Fu, Elsevier, 2020

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech.	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1EE05) TRENDS IN ENERGY SOURCES FOR SUSTAINABLE DEVLOPMENT

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:
- To understand the role of sustainable energy
- To know components of solar PV and wind energy conversion systems
- To understand the principles of Biomass, geo-thermal and wave energy systems
- To learn various energy storage methods

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand various sources for sustainable energy
CO-2: Understand Solar Photo voltaic and wind energy systems
CO-3: Learnt the harnessing techniques of Biomass, geothermal and ocean energy
CO-4: Familiarize with energy storage methods

UNIT – I:
Introduction: Trends in energy consumption - Conventional and renewable sources, Energy sources and their availability, Energy Conservation status in India -need of new energies for sustainable development.

UNIT – II:
Fundamentals of Solar Radiation: Introduction-The Sun as Source of Energy, Extraterrestrial and Terrestrial Radiations, Spectral Power Distribution of Solar Radiation, instruments for measuring solar radiation and sunshine recorder.
Solar PV Conversion: The PV Cell-Crystalline Solar cells -Thin film and amorphous solar cells, Module, Array, Equivalent Electrical circuit- Open circuit voltage and Short circuit current, I-V, P-V Curves. Developments in efficient non silicon solar cells

UNIT – III:
Wind Energy: origin of winds-Global (or Planetary) Winds- Local Winds-Factors Affecting the Distribution of Wind Energy on the Surface of Earth, Wind Turbine – Types, construction of HAWT, VAWT, performance characteristics, Betz criteria.

UNIT – IV:
Bio-Mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Biogas digesters, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation and economic aspects.

UNIT – V:
Geothermal Energy: Resources, types of wells, methods of harnessing the energy
Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles.

Tidal and Wave Energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT – VI:

Energy Storage:

Electro Chemical Storage: lead-acid- nickel cadmium-nickel-metal-hydride and lithium type batteries-Principle of operation, Types, Advantages and disadvantages.

Non-Electric Storage: Methods of Energy storage –Pumped Energy Storage – Compressed air Energy Storage, Superconducting Magnet Energy Storage.

TEXT BOOKS:

1. Non-Conventional Energy Sources, G. D. Rai, 6th Edition, Khanna Publishers, 2004
2. Non-Convention Energy Resources, B. H. Khan, 3rd Edition, McGraw-Hill, 2017

REFERENCES:

1. Renewable Energy Sources, Twidell & Weir, 3rd Edition, CRC Press, 2015
2. Solar Energy, Sukhatme, 3rd Edition, McGraw-Hill, 2008
3. Non-Conventional Energy, Ashok V. Desai, Wiley Eastern, 1990

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B.Tech.	**L**	**T/P/D**	**C**
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(A19OE1ME05) 3D PRINTING AND DESIGN

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

- To understand the need and know about the applications of 3D Printing
- To understand the need of liquid and solid based 3D Printing systems
- To know about the laser-based 3D Printing systems and importance of CAD for 3D Printing
- To understand post-processing, inspection and testing involved in 3D Printing

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Summarize the importance of 3D Printing
CO-2: Explain the process involved in liquid and solid based 3D Printing Systems
CO-3: Explain about the laser-based 3D Printing systems and CAD for 3D Printing
CO-4: Plan post-processing techniques and perform inspection and testing in 3D Printing

UNIT – I:
Introduction: Introduction to 3D Printing, Classification, 3D Printing Process Chain, Materials for 3D Printing, Distinction between 3D Printing & Conventional Manufacturing.
Applications: Brief overview of applications in Aerospace, Automotive, Biomedical, Defense, Construction, Jewelry, Coin and Tableware Industry.

UNIT – II:
Liquid Based 3D Printing Systems: Introduction, Principle, Processes and Applications of Material Jetting and Stereolithography.

UNIT – III:
Solid Based 3D Printing Systems: Introduction, Principle, Processes and Applications of Fused Deposition Modeling (FDM) and Laminated Object Manufacturing (LOM).

UNIT – IV:
Powder Based 3D Printing Systems: Introduction, Principle, Processes and Applications of Selective Laser Sintering (SLS), Three-Dimensional Printing (3DP).

UNIT – V:
CAD for 3D Printing: CAD data formats, CAD model preparation, Part orientation and support generation, Overview of 3D Printing softwares like MAGICS and MIMICS only.

UNIT – VI:
Post Processing: Introduction, Post Processing Techniques like Support material removal, Cleaning, Sanding and Polishing.

Inspection: Introduction, Significance, Inspection techniques like Dimensional measurement along X, Y and Z axes, visual inspection of the surface finish (overall aesthetics and intact features), flatness or warp check, and FOD (foreign objects or debris) check.

TEXT BOOKS:

1. Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Ian Gibson, David W. Rosen, Brent Stucker, Springer, 2010
2. Rapid Prototyping: Principles and Applications, Chua C. K., Leong K. F., and Lim C. S., 3rd Edition, World Scientific, 2010

REFERENCES:

1. Rapid Prototyping and Engineering Applications: A Toolbox for Prototype Development, Liou L. W. and Liou F. W., CRC Press, 2007
2. Rapid Prototyping: Theory and Practice, Kamrani A. K. and Nasr E. A., Springer, 2006
3. Rapid Tooling: Technologies and Industrial Applications, Hilton P. D. and Jacobs P. F., CRC Press, 2000
4. Rapid Prototyping, Gebhardt A., Hanser, Gardener Publications, 2003

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(A19OE1EC09) EMBEDDED SYSTEMS FOR IOT

COURSE PRE-REQUISITES: Programming through C

COURSE OBJECTIVES:

- To understand the basics of computing with embedded systems
- To expose the students to various smart sensors
- To make the students familiar with the programming concepts of embedded development board
- To understand the basics of Internet of Things and cloud of things

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Familiar with architectural and programming issues of embedded systems
CO-2: Able to select proper smart sensor for a specific measurement application
CO-3: Analyze various protocols for Internet of Things
CO-4: Apply Internet of Things to different applications in the real world

UNIT – I:

Embedded System Design: Numbering and Coding Systems, Digital Premier, Inside the Computer

Embedded System - Definition, Characteristics of embedded computing applications, Design challenges, Requirements, Specification, Architecture design, Designing hardware and software components, system integration.

UNIT – II:

Smart Sensors & Applications: Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters, Compensation, Information Coding/Processing, Data Communication, Standards for Smart Sensor Interface, the Automation.

UNIT – III:

Sensors Applications: Introduction, On-board Automobile Sensors (Automotive Sensors), Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing, Sensors for environmental Monitoring.

UNIT – IV:

Micro Controller Board: Features of Arduino, Arduino components and IDE, Interfacing: Seven Segment Display, Pulse Width Modulation, Analog Digital Converter, Wireless connectivity to Arduino. Case study: From BT To WiFi: Creating WiFi Controlled Arduino Robot Car.

UNIT – V:

Introduction to Internet of Things: Definition and Characteristics of IoT, Physical Design of IoT, Logical Design of IoT, IoT enabled Technologies – Wireless Sensor Networks,

Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Deployment Templates, M2M, IoT vs M2M.

UNIT – VI:

Domain Specific Applications of IoT: IoT Design Methodology, Applications of IoT– Home, Health, Environment, Energy, Agriculture, Industry and Smart City.

TEXT BOOKS:

1. The 8051 Microcontroller: Programming, Architecture, Ayala & Gadre, 3rd Edition, Cengage Publications, 2008
2. Sensors and Transducers, D. Patranabis, 2nd Edition, PHI Learning Private Limited, 2013
3. Internet of Things: A Hands-On Approach, Vijay Madisetti, Arshdeep Bahga, Universities Press, 2015

REFERENCES:

1. Embedded Systems: Architecture, Programming and Design, 2nd Edition, TATA MCGRAW-HILL
2. The 8051 Microcontroller and Embedded Systems: Using Assembly and C, Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, 2nd Edition, 2005
3. Internet of Things with Raspberry Pi and Arduino, Singh R., Gehlot A., Gupta L., Singh B., Swain M., Boca Raton, CRC Press, 2020

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(A19OE1CS09) ARTIFICIAL INTELLIGENCE – A BEGINNER'S GUIDE

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

- To understand and analyze the basic concepts of artificial intelligence
- To identify, explore the complex problem-solving strategies and approaches
- To analyze the concepts of basic concepts of neural networks and learning process
- To explore and analyze the methodology used in machine learning and computer vision

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand and apply the basic concepts of artificial intelligence and its use cases. lives
CO-2: Explore the various search strategies and approaches for problem solving
CO-3: Correlate the fields related to AI, and articulate various learning paradigms
CO-4: Describe several issues and ethical concerns surrounding AI

UNIT – I:
Introduction to AI: What is AI-On Overview, History of AI, Applications and Examples of AI, AI Concepts, Terminology, Key fields of AI. AI Issues, Concerns, and Ethical Considerations.

UNIT – II:
AI as Search Process: On overview of Search Strategy. Types of Searches- Uninformed, Informed, Bidirectional search, Heuristic search. Local search, Local beam search, Adversarial Search.

UNIT – III:
AI as Knowledge Exploration: Introduction to Propositional Logic, Rules of Inference, First Order Logic (FOL) Syntax, Semantics, Entailment, Tools to represent knowledge.

UNIT – IV:
AI as a Learning Task: Introduction to Learning, Learning types -Supervised, Unsupervised, Reinforcement Learning, Machine learning, Deep Learning, The link between AI, ML, DL.

UNIT – V:
AI as Neural Networks: Introduction to biological neural networks. Link between biological neuron and artificial neuron. Architecture of artificial neural network, Types of Neural networks-single layer, multilayer, Back propagation networks.

UNIT – VI:

The future of AI: Computer Vision - Seeing the World Through AI, Bots - Conversation as a Platform, AI and the society, AI in action-the Use Cases, Building AI Projects.

TEXT BOOKS:

1. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, 3rd Edition, Prentice Hall, 2010
2. Machine Learning, Tom M. Mitchell, McGraw-Hill
3. Neural Networks-A Comprehensive Foundation, Simon Haykin, 2nd Edition, Pearson Education, 2004

REFERENCES:

1. Artificial Intelligence, Elaine Rich & Kevin Knight, 2nd Edition, TATA MCGRAW-HILL
2. Artificial Intelligence- A New Synthesis, Nils J. Nilsson, Elsevier
3. Artificial Neural Networks, Yegnanarayana B., PHI

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(A19OE1CS10) BLOCKCHAIN TECHNOLOGY ESSENTIALS

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

- To introduce and get the technological overview of blockchain technologies
- To study the foundation of Blockchain Technology and demonstrate the various types of Blockchain
- To explore the application area of Blockchain Technology
- To introduce smart contract, consensus algorithm and security mechanism
- To introduce available platforms for implementing Blockchain Technology

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand and explore the Blockchain Technology
CO-2: Describe smart contract concepts
CO-3: Explore different types of Blockchain
CO-4: Develop the platforms to implement Blockchain Technology

UNIT – I:
Fundamental of Blockchain Part I: Introduction to Centralized, Decentralized and Distributed system, computer network peer to peer connection
Fundamental of Blockchain Part II: History of Blockchain, Various technical definitions of Blockchain. Generic elements of a blockchain: Block, Transaction, Node, Why It's Called "Blockchain", Characteristics of Blockchain Technology, Advantages of blockchain technology, Limitations of blockchain as a technology

UNIT – II:
Concept of Blockchain Technology Part I: Applications of blockchain technology, Tiers of blockchain technology Blockchain 0, Blockchain 1, Blockchain 2, Blockchain 3, Generation of Blockchain X, smart contract
Concept of Blockchain Technology Part II: Types of blockchain: Public blockchain, private blockchain, hybrid blockchain, examples of Public, private, hybrid blockchain and it merit and demerit.

UNIT – III:
Technical Foundations Part I: Component of block, Structure of Block chain, Technical Characteristics of the Blockchain, genesis block, Nonce
Technical Foundations Part II: Cryptography, Hashing, Distributed database, Consensus mechanisms, and basic of Cryptographic primitives, Technical Characteristics of Secure Hash Algorithms (SHA), Digital signature.

UNIT – IV:
Consensus Algorithm: Proof of work (PoW), Proof-of-Stake (PoS), Byzantine Fault Tolerance (BFT), Proof of authority (PoA), Confidentiality, Integrity, Authentication,

Permissioned ledger, Distributed ledger, Shared ledger, Fully private and proprietary blockchains, Tokenized blockchains, Tokenless blockchains, CAP theorem and blockchain

UNIT – V:

E-Governance and other contract enforcement mechanisms, Financial markets and trading, Trading, Exchanges, Trade life cycle, Order anticipators, Market manipulation. **Crypto Currency:** Bitcoin, Bitcoin definition, Keys and addresses, Public keys in Bitcoin, Private keys in Bitcoin, Bitcoin currency units

UNIT – VI:

Implementation Platforms: Hyperledger as a protocol, Reference architecture, Hyperledger Fabric, Transaction Flow, Hyperledger Fabric Details, Fabric Membership, Fabric Membership

TEXT BOOKS:

1. Mastering Blockchain, Imaran Bashir, 2nd Edition, Packt
2. Blockchain Basic, Daniel Drescher, A Press

REFERENCES:

1. Blockchain For Dummies®, IBM Limited Edition, John Wiley & Sons

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(A19OE1EI05) FUNDAMENTALS OF ROBOTICS AND DRONES

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

- To classification by coordinate system and control system
- To acquire knowledge on different types power sources and sensors
- To classify different types of manipulators, actuators and grippers
- To acquire knowledge on kinematics and vision systems used for different robots
- To acquire knowledge on the basics of drones

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Acquire knowledge on different types of Power Sources (actuators) and sensors, manipulators, actuators and grippers

CO-2: Acquire knowledge on different applications of various types of robots

CO-3: Analyze the direct and the inverse kinematic problems and calculate the manipulator dynamics

CO-4: Acquire knowledge on the applications of machine vision in robotics

CO-5: Acquire Knowledge on the basics of drones

UNIT – I:

Basic Concepts & Fundamentals: An overview of Robotics, classification of Robots, Robot Components, Robot degrees of freedom, Robot Joints, Robot Coordinates, Robot reference frames, Programming modes, Robot Characteristics.

UNIT – II:

Sensors and Actuators:

Sensors: Sensors characteristics, Position sensors, velocity sensors, acceleration sensors, torque sensors, micro switches, lighten infrared sensors, touch and tactile sensors, proximity sensors, range finders.

Actuators: Characteristics of activating system, comparison of activating system Hydraulic devices, Pneumatic devices, electric motors, magneto-strictive actuators.

UNIT – III:

Manipulators and Grippers:

Grippers: Robot end effectors, Classification, drive system for Gripper, Mechanical Grippers, Magnetic Grippers, Vacuum Grippers, Adhesive Grippers, Hooks, Scoops and other Miscellaneous Devices, Gripper force Analysis and Gripper Design, Active and passive Grippers.

UNIT – IV:

Kinematics: Matrix representation of translational and Rotational motion – Homogeneous Transformation-DH representation of standard configuration Robots-Inverse Kinematics. Joint space vs. Cartesian space-Basics of Trajectory planning in

joint and Cartesian space.

UNIT – V:

Robot Vision: Low level and High-level vision

Image acquisition, Illumination Techniques, Imaging Geometry, Some Basic Relationships between Pixels, Segmentation, Description, Segmentation and Description of 3-D Structures, Recognition, Interpretation.

UNIT – VI:

Basics of Drones: Theory behind how drones work, individual components that makeup a drone, basic concepts involved radio-controlled model flying, building a complete quad copter drone from scratch

TEXT BOOKS:

1. Introduction To Robotics: Analysis, Control, Applications, Saeed B. Niku, 2nd Edition, Wiley
2. Industrial Robotics, Technology Programming and Applications, Mikell P. Groover, Nicholas G. Odrey, Mitchel Weiss, Roger N. Nagel, Ashish Dutta, McGraw-Hill, 2012

REFERENCES:

1. Robotics Technology and Flexible Automation, Deb S. R., John Wiley
2. Robots and Manufacturing Automation, Asfahl C. R, John Wiley
3. Robotic Engineering–An Integrated Approach, Klafter R. D., Chimielewski T. A., Negin M., Prentice Hall of India
4. Drones for Beginners, Udemy

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(A19OE1IT08) FUNDAMENTALS OF CYBER SECURITY

COURSE PRE-REQUISITES: Basic Knowledge of Computers, Basic Knowledge of Networking and Internet

COURSE OBJECTIVES:

- To identify the key components of cyber security in network
- To describe the techniques in protecting Information security
- To define types of analyzing and monitoring potential threats and attacks
- To access additional external resources to supplement knowledge of cyber forensics and laws

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand, appreciate, employ, design and implement appropriate security technologies

CO-2: Demonstrate policies to protect computers and digital information

CO-3: Identify & Evaluate Information Security threats and vulnerabilities in Information Systems

CO-4: Understand computer forensics and analyzing them

UNIT – I:

Introduction to Cyber Security: Cybersecurity objectives, Cybersecurity roles, Differences between Information Security & Cybersecurity, Cybersecurity Principles - Confidentiality, integrity, & availability, Authentication & nonrepudiation, The Trinity of IT Security (CIA), Computer Protocols, Cookies, The TCP/IP

UNIT – II:

Who are the Cyber Criminals: Classification of cybercrimes, E-mail Spoofing, Spamming, Cyber defamation, Internet Time Theft, Salami Attack/ Salami Technique, Data Diddling, Forgery, Web Jacking, Newsgroup Spam/ Crimes Emanating from Usenet Newsgroup, Industrial Spying/Industrial Espionage, Hacking, Online Frauds, Pornographic Offenses, Software Piracy, Computer Sabotage, E-mail Bombing/Mail Bombs, UseNet Newsgroup as the Source of Cybercrimes, Computer Network Intrusions, Password Sniffing, Credit Card Frauds, Identity Theft.

UNIT – III:

Cyber Offenses: How Criminals Plan Them: Introduction, Categories of Cybercrime, How Criminals Plan the Attacks, Reconnaissance, Passive Attacks, Active Attacks, Scamming and Scrutinizing Gathered Information, Attack (Gaining and Maintaining the System Access), Social Engineering, Classification of Social Engineering, Cyber stalking, Types of Stalkers, Cases Reported on Cyber stalking, How Stalking Works?, Real-Life Incident of Cyber stalking, Cyber cafe and Cybercrimes,

UNIT – IV:

Security Threats: Introduction to security threats-Virus, Worms, Trojan horse, Bombs, Trap Door, E-Mail Virus, Virus Life cycle, How virus works?, Malware, Network and Services attack- Dos attacks, Types of Dos attacks, Methods of attacks, Examples of attacks-SYN flooding, TCP flooding, UDP flooding, ICMP flooding, Smurf, Ping of death, Tear drop, Security threats to E-commerce-Electronic payment system, Credit card/Debit cards, Smart cards, E- money, Electronic Fund Transfer, E-commerce security System, Electronic Cash, Digital Signatures

UNIT – V:

Introduction to Computer Forensics: computer crimes, evidence, extraction, preservation, etc. Overview of hardware and operating systems: structure of storage media/devices; windows/Macintosh/ Linux -- registry, boot process, file systems, file metadata. Data recovery: identifying hidden data, Encryption/Decryption, Steganography, recovering deleted files. Digital evidence controls: uncovering attacks that evade detection by Event Viewer, Task Manager, and other Windows GUI tools, data acquisition, disk imaging, recovering swap files, temporary &cache files, Computer Forensic tools, Network Forensic.

Computer Crime and Legal Issues: Intellectual property, privacy issues, Criminal Justice system for forensic, audit/investigative situations and digital crime scene, investigative procedure/standards for extraction, preservation, and deposition of legal evidence in a court of law.

UNIT – VI:

Fundamentals of Cyber law: Evolution of the IT Act, Genesis and Necessity, Salient features of the IT Act, 2000, various authorities under IT Act and their powers, Penalties & Offences, amendments, Impact on other related Acts Cyber Space Jurisdiction - Jurisdiction issues under IT Act, 2000- Traditional principals of Jurisdiction - Extra-terrestrial Jurisdiction- Case Laws on Cyber Space Jurisdiction Sensitive Personal Data or Information (SPDI) in Cyber Law (a) SPDI Definition and Reasonable Security Practices in India (b) Reasonable Security Practices – International perspective

TEXT BOOKS:

1. Cyber Security- Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunit Belpure, Wiley
2. Fundamentals of Cyber Security, Mayank Bhusan, Rajkumar Singh Rathore, Aatif Jamshed, BPB Publications
3. Cyber Law & Cyber Crimes, Advocat Prashant Mali, Snow White Publications,

REFERENCES:

1. Computer Forensics and Cyber Crime: An Introduction, Marjie T. Britz, 3rd Edition, 2013
2. Digital Forensics with Open-Source Tools. Cory Altheide and Harlan Carvey, Elsevier, 2011
3. Network Forensics: Tracking Hackers Through Cyberspace, Sherri Davidoff, Jonathan Ham Prentice Hall, 2012
4. Cyber Law in India, Farooq Ahmad, Pioneer Books
5. Information Technology Law and Practice, Vakul Sharma, Universal Law Publishing

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(A19OE1IT09) FUNDAMENTALS OF DATA SCIENCE

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

- To learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration
- To exploring data analysis, predictive modeling, descriptive modeling, data product creation, evaluation, and effective communication
- To understand the basic knowledge of algorithms and reasonable programming experience and some familiarity with basic linear algebra and basic probability and statistics
- To identify the importance of recommendation systems and data visualization techniques

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand basic terms what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modeling. Fit a model to data

CO-2: Discuss the significance of exploratory data analysis (EDA) in data science and to apply basic tools (plots, graphs, summary statistics) to carry out EDA

CO-3: Apply basic machine learning algorithms and to identify common approaches used for Feature Generation

CO-4: Analyze fundamental mathematical and algorithmic ingredients that constitute a Recommendation Engine and to Build their own recommendation system using existing components

UNIT – I:

Introduction: What is Data Science? - Big Data and Data Science hype – and getting past the hype - Why now? – Datafication - Current landscape of perspectives - Skill sets needed - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model - Intro to R

UNIT – II:

Exploratory Data Analysis and the Data Science Process: Basic tools (plots, graphs and summary statistics) of EDA - Philosophy of EDA - The Data Science Process - Case Study: Real Direct (online real estate firm) - Three Basic Machine Learning Algorithms-Linear Regression - k-Nearest Neighbors (k-NN) - k-means

UNIT – III:

One More Machine Learning Algorithm and Usage in Applications - Motivating application: Filtering Spam - Why Linear Regression and k-NN are poor choices for Filtering Spam - Naive Bayes and why it works for Filtering Spam

UNIT – IV:

Data Wrangling: APIs and other tools for scrapping the Web - Feature Generation and Feature Selection (Extracting Meaning From Data) - Motivating application: user (customer) retention - Feature Generation (brainstorming, role of domain expertise, and place for imagination) - Feature Selection algorithms – Filters; Wrappers; Decision Trees; Random Forests

UNIT – V:

Recommendation Systems: Building a User-Facing Data Product - Algorithmic ingredients of a Recommendation Engine - Dimensionality Reduction - Singular Value Decomposition - Principal Component Analysis - Exercise: build your own recommendation system - Mining Social-Network Graphs - Social networks as graphs - Clustering of graphs - Direct discovery of communities in graphs - Partitioning of graphs - Neighbourhood properties in graphs

UNIT – VI:

Data Visualization: Basic principles, ideas and tools for data visualization 3 - Examples of inspiring (industry) projects - Exercise: create your own visualization of a complex dataset - Data Science and Ethical Issues - Discussions on privacy, security, ethics - A look back at Data Science - Next-generation data scientists

TEXT BOOKS:

1. Doing Data Science, Straight Talk From The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014
2. Mining of Massive Datasets v2.1, Jure Leskovek, Anand Rajaraman and Jeffrey Ullman, Cambridge University Press, 2014
3. Machine Learning: A Probabilistic Perspective, Kevin P. Murphy, 2013

REFERENCES:

1. Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani and Jerome Friedman, 2nd Edition, 2009
2. Foundations of Data Science, Avrim Blum, John Hopcroft and Ravindran Kannan
3. Data Mining and Analysis: Fundamental Concepts and Algorithms, Mohammed J. Zaki and Wagner Miera Jr. Cambridge University Press, 2014
4. Data Mining: Concepts and Techniques, Jiawei Han, Micheline Kamber and Jian Pei, 3rd Edition, 2011

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(A19OE1AE05) INTRODUCTION TO ADVANCED VEHICLE TECHNOLOGIES

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

- To understand the layout of an automobile and functionalities chassis elements
- To provide the concepts of automotive electrical systems and electric & hybrid vehicles
- To present various intelligent automotive systems and levels of vehicle autonomy

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Explain the functionalities of automotive systems and subsystems

CO-2: Discuss the concepts of automotive electrical systems and electric & hybrid vehicles

CO-3: Describe various intelligent automotive systems and levels of vehicle autonomy

UNIT – I:

Introduction: Classification of automobiles, layout of an automobile and types of bodies.

Automotive Chassis: Introduction to chassis systems - engine, cooling, lubrication, fuel feed, ignition, electrical, driveline - clutch, transmission, propeller shaft, differential, axles, wheels and tyres, steering, suspension and braking.

UNIT – II:

Engine: Working principle of four stoke and two stroke SI and CI engines, fuel system – layout of petrol and diesel fuel systems, electronic fuel injection - multi-point fuel injection, gasoline direct injection, common rail direct injection.

UNIT – III:

Electrical System: Simple automotive wiring diagram and components of electrical system, starting system – starter circuit, standard Bendix and over running clutch drive, charging system – alternator, cut-outs and regulators, ignition system - conventional and electronic ignition system.

UNIT – IV:

Electric and Hybrid Vehicles: Electric vehicle – Layout, components, configurations, advantages and limitations. Hybrid vehicle - Concepts of hybrid electric drivetrain based on hybridization and powertrain configuration, architecture of series, parallel and series-parallel hybrid electric drivetrains, modes of operation, merits and demerits.

UNIT – V:

Intelligent Vehicle Systems: Automotive navigation, night vision, head-up display, airbag, seat belt tightening system, immobilizers, adaptive cruise control, forward collision warning, lane departure warning and anti-lock braking system.

UNIT – VI:

Autonomous Vehicles: Levels of automation, research, challenges, commercial development, sensor systems, sensor suits, environmental challenges, graceful degradation, V2V and V2I communication, sharing the drive, integrity, security, verification and policy implications.

TEXT BOOKS:

1. Advanced Vehicle Technology, Heinz Heisler, Butterworth Heinemann, 2002
2. Intelligent Vehicle Technologies: Theory and Applications, Ljubo Vlacic, Michel Parent and Fumio Harashima, Butterworth-Heinemann, Oxford, 2001
3. Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, Mehrdad Ehsani, Yimin Gao, Sebastien E. Gay and Ali Emadi, CRS Press, 2004

REFERENCES:

1. Automotive Mechanics, Giri N. K., Khanna Publications, 2006
2. Automotive Electrical Equipment, Kohli P. L., Tata McGraw-Hill, 1975
3. Electric and Hybrid Vehicles – Design Fundamentals, Iqbal Husain, CRC Press, 2010
4. Autonomous Vehicle Technology-A Guide for Policymakers, James M. Anderson, Nidhi Kalra, Karlyn D. Stanley, Paul Sorensen, Constantine Samaras, Oluwatobi A. Oluwatola, RAND Corporation, 2016

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(A19OE1CS12) INTRODUCTION TO APPLICATION DEVELOPMENT WITH C#

COURSE OBJECTIVES:

- To create an integrated development environment for object-oriented C# programs
- To build website menus with CSS and JavaScript
- To relate programming language constructs and problem solving techniques
- To analyze and apply modifications to C# programs that solve real-world problems

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand the fundamentals of HTML5 and define the styles for web pages using CSS

CO-2: Create web pages and add dynamic behavior to web pages using Javascript

CO-3: Communicate with the database using SQL

CO-4: Develop a simple CUI [Character User Interface] based application using C# & SQL

UNIT – I:

Computer, Software Engineering Fundamentals & OOP: Introduction to Computer Basics, Basics of Network, Networking Levels and Layers and Protocols, Protocol Stacks, Networking and Internet Service, Software Engineering Fundamentals - Overview of Requirement Analysis, Overview of Software Design, Overview of Software Implementation, Overview of Testing, Overview of Software Maintenance, Overview of Configuration management and version Control, Agile Basics, OOP - Object Oriented Concepts, Objects and Classes, Principles in Object-Oriented technology

Use case: Create a class for Bank Account

UNIT – II:

HTML & CSS: Introduction to Web Technology, Introduction to HTML5, HTML5 Elements, Semantic Elements, Table, List, Working with Links, Image Handling, Form-Input Elements, HTML5 Form elements, HTML5 Attributes, Video & Audio, iframes, CSS - Introduction to CSS3, CSS Syntax, CSS Styling, Text and Fonts properties, CSS Selectors, Different color schemes, CSS Borders, CSS Margins, CSS Backgrounds

Use case: Create a website for college

UNIT – III:

JavaScript, RDBMS Concepts and SQL: JavaScript basics, Functions in Javascript, Javascript validation, Events, Javascript event handling, JavaScript Strings, JavaScript Dates, Array in Javascript, Document Object Model (Window, Frame, Navigator Objects), Working with Document Object (Its Properties and methods, Cookie handling), Introduction to RDBMS Concepts, Introduction to SQL, Creating and Managing Tables, Data Manipulation, Basic SQL SELECT Statements, Scalar & Aggregate Functions, Joins & Subqueries, Views & Index

Use case: Apply validations for Telephone Complaint Registration Form
Use case: Create student table for College Management System(CMS)

UNIT – IV:
Introduction to C# Programming: Introduction to .NET Framework 4.5 - What is .NET Framework, .NET Framework, Languages, and Tools, .NET Framework Major Components, Common Language Runtime (CLR), Compilation and Execution in .NET, Understand the .NET Framework 4.5stack, Exploring VS2017, Introduction to C# 6.0 - Features of C#, C# Compilation and Execution, General Structure of a C# Program, Creating and Using a DLL
Use case: Create a Console Application (.exe) project called CalcClientApp

UNIT – V:
Language Fundamentals of C#: Language Fundamentals - Keywords, Value Types and Reference Types, Implicit and explicit type conversions, Boxing and Unboxing, Enum, Operators and Assignments,Variables and Literals, Flow
Control: C# Control Statements, Nullable, Classes and Objects, Strings, Array, Generic Collections
Usecase: Store employee objects using Generic Collections

UNIT – VI:
Basics of ADO.NET: Various Connection Architectures, Understanding ADO.NET and its class library, Important Classes in ADO.NET, Connection Class, Command Class, DataReader Class, DataAdapter Class, DataSet Class
Use case: Implement ADO.NET classes that belong to both Connected and Disconnected Architectures

TEXT BOOKS:

1. Web Programming, Building Internet Applications, Chris Bates, 2nd Edition, Wiley Dreamtech
2. Introduction to Database Systems, C. J. Date, Pearson Education
3. Professional C# 2012 with .NET 4.5, Christian Nagel et al. Wiley India, 2012

REFERENCES:

1. Programming World Wide Web, Sebesta, Pearson
2. Internet and World Wide Web – How to program, Dietel and Nieto PHI/Pearson Education Asia
3. Database Development and Management, Lee Chao, Auerbach Publications, Taylor & Francis Group
4. Pro C# 2010 and the .NET 4 Platform, Andrew Troelsen, 5th Edition, A Press, 2010
5. Programming C# 4.0, Ian Griffiths, Matthew Adams, Jesse Liberty, 6th Edition, O'Reilly, 2010

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING & TECHNOLOGY

B.Tech.	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1CS13) INTRODUCTION TO APPLICATION DEVELOPMENT WITH JAVA

COURSE OBJECTIVES:

- To create an integrated development environment for object-oriented Java programs
- To build website menus with CSS and JavaScript
- To relate programming language constructs and problem solving techniques
- To analyze and apply modifications to Java programs that solve real-world problems

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand the fundamentals of HTML5 and define the styles for web pages using CSS

CO-2: Create web pages and add dynamic behavior to web pages using Javascript

CO-3: Communicate with the database using SQL

CO-4: Develop a simple CUI [Character User Interface] based application using Java & SQL

UNIT – I:

Computer: Computer Fundamentals, Preface to Networks, Networking Levels, Layers of Computer Networks, Protocol Stacks, Networking, and Internet Service

Software Engineering Fundamentals: Introduction, Requirements Collection & Analysis, Fundamentals of Software Design, Software Implementation, Types of Testing, Software Maintenance, Overview of Configuration management and version Control Tools, Basics of Agile Process

Object Oriented Programming: Object Oriented Paradigm, Classes and Objects, Principles in Object- Oriented technology

Use case: Create a class for Bank Account

UNIT – II:

HTML: Introduction to Web Technology, HTML5 Introduction, HTML5 Elements, Semantic Elements, Table, List, Links in HTML5, Handling of Images, Form Elements, HTML5 Form elements and Attributes, Video & Audio, iframes

Style Sheets:

Introduction to CascadingStyleSheet3, CSS Syntax, CSS Styling, Text and Fonts properties, CSS Selectors, Color schemes, CSS Borders, CSS Margins, CSS Backgrounds

Use case: Design a website for college

UNIT – III:

JavaScript: Introduction to JavaScript, JavaScript Functions, JavaScript validation, Event handling in JavaScript, JavaScript Strings, JavaScript Dates, Array in JavaScript, Document Object Model (Window, Frame, Navigator Objects), Document Object (Its Properties and methods, Cookie handling),

RDBMS Concepts and SQL: Introduction to RDBMS Concepts, Introduction to SQL, Creating and Managing Tables, Data Manipulation, Basic SQL SELECT Statements, Scalar & Aggregate Functions, Joins & Subqueries, Views & Index
Use case: Check the validations for Telephone Complaint Registration Form
Use case: Create student table for College Management System (CMS)

UNIT – IV:
Introduction to Java: Java Environment, Java Fundamentals - Keywords, Primitive Data Types, Operators and Assignments, Java's Control Statements, Wrapper Classes, Using Scanner Class, Strings - String Handling functions, Array - One dimensional array, Array of Objects, Using Arrays class, variable length arguments
Usecase: To keep track of customers data who are buying products from a store

UNIT – V:
The Collection Framework: Lists – Array List, LinkedList, Stack, Vector, Set – HashSet, Linked Hash Set, Tree Set, Map – HashMap, Linked HashMap, Hash table. Retrieving Elements from Collections – Enumeration, Iterator, List Iterator, String Tokenizer – Sorting using Comparable and Comparator.
Usecase: Store employee objects using collection framework

UNIT – VI:
JDBC: Overview of JDBC, JDBC Architecture, Types of JDBC Drivers. Process SQL with JDBC - Create Connection, Query, Update
Use case: Write the menu driven program using JDBC which will have following options
a. Store
b. Display by id
c. Delete by id
d. Update salary by id
e. Exit

TEXT BOOKS:

1. Web Programming, Building Internet Applications, Chris Bates, 2nd Edition, Wiley Dreamtech
2. Introduction to Database Systems, C. J. Date, Pearson Education
3. Big Java, Cay Horstmann, John Wiley and Sons, 2nd Edition

REFERENCES:

1. Programming World Wide Web, Sebesta, Pearson
2. Internet and World Wide Web – How to program, Dietel and Nieto PHI/Pearson Education Asia
3. Database Development and Management, Lee Chao, Auerbach Publications, Taylor & Francis Group
4. Java How to Program, H. M. Dietel and P. J. Dietel, 6th Edition, Pearson Education/PHI
5. Core Java 2, Vol. 1, Fundamentals, CayS. Horstmann and Gary Cornell, 7th Edition, Pearson Education

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING & TECHNOLOGY

B.Tech.	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19OE1CS14) INTRODUCTION TO APPLICATION DEVELOPMENT WITH PYTHON

COURSE OBJECTIVES:

- To create an integrated development environment for object-oriented Python programs
- To build website menus with CSS and JavaScript
- To relate programming language constructs and problem solving techniques
- To analyze and apply modifications to Python programs that solve real-world problems

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand the fundamentals of HTML5 and define the styles for web pages using CSS

CO-2: Create web pages and add dynamic behavior to web pages using Javascript

CO-3: Communicate with the database using SQL

CO-4: Develop a simple CUI [Character User Interface] based application using Python & SQL

UNIT – I:

Concepts of Networks, Overview of Software Engineering & OOP: Computer Basics, Network basics, Networking Levels, Layers and Protocols, Protocol Stacks, Networking and services of Internet

Software Engineering lifecycle - Overview of Requirement Analysis, Software Design, Implementation of software, Outline of Testing, Maintenance, Configuration management and version Control, Agile fundamentals

OOP - Object Oriented Concepts, OOP Principles

Use case: Create a class for Employee Account

UNIT – II:

Introduction to Web Technology: Overview of Web Technology, Introduction to HTML5, HTML5 Elements, Semantic Elements, Table, List, Links, Image Handling, Form-Input Elements, HTML5 Form elements, HTML5 Attributes, Video & Audio, iframes,

CSS - Introduction to CSS3, CSS Syntax, CSS Styling, Text and Fonts properties, CSS Selectors, Different color schemes, CSS Borders, Margins, Backgrounds

Use case: Create a website for an institution

UNIT – III:

Outline of JavaScript, RDBMS Concepts and SQL: JavaScript basics, Functions, validations, Events, handling events, Strings, Dates, Arrays, DOM(Window, Frame, Navigator Objects), Document Object -Properties and methods, handling of Cookies, RDBMS Concepts, SQL, Management of Tables, Manipulation of tables, SQL SELECT Statements, Scalar & Aggregate Functions, Joins &Sub queries, Views & Index

Use case: Apply validations for Telephone Complaint Registration Form

Use case: Create student table for College Management System (CMS)

UNIT – IV:

Introduction to Python: Introduction, Features of Python, Versions, Keywords and Identifiers, Statements & Comments, Variables, Datatypes, Type Conversion, I/O and import, Language Fundamentals - Operators, Namespace, Modules in Python, Python DateTime

Use case: Develop an application using Python for accepting your personal details and display the same

UNIT – V:

Classes and Objects: Classes and Objects in Python? Advantages of Using Classes in Python, Defining a Class in Python, Creating an Object in Python, The self, The_init_() function in Python, class and instance variables, Python Inheritance and its Types, Strings, Lists, Sets, Tuples, Dictionary

Use case: Store employee objects using various data structures

UNIT – VI:

Advance Concepts in Python: Array - What is an Array, Difference between Array and List in Python, Creating an Array, Accessing a Python Array Element, Basic Operations of Arrays, Functions - Creating a Function, Calling a Function, Pass by reference vs value, Required arguments, Keyword arguments, Default arguments, Variable-length arguments, The Anonymous Functions, The return Statement, Global vs. Local variables, Modules - What is a Module?, Create a Module, Use a Module, Variables in Module, Naming a Module, Renaming a Module, Built-in Modules, Using the dir() Function, Import From Module, Packages, NumPy

Use case: Develop an application for Hospital Management System(HMS)

TEXT BOOKS:

1. Web Programming, Building Internet Applications, Chris Bates, 2nd Edition, Wiley Dreamtech
2. Introduction to Database Systems, C. J. Date, Pearson Education
3. Python Programming: A Modern Approach, Vamsi Kurama, Pearson

REFERENCES:

1. Programming World Wide Web, Sebesta, Pearson
2. Internet and World Wide Web – How to program, Dietel and Nieto PHI/Pearson Education Asia
3. Database Development and Management, Lee Chao, Auerbach Publications, Taylor & Francis Group
4. Core Python Programming, W. Chun, Pearson
5. Introduction to Python, Kenneth A. Lambert, Cengage