

B.TECH INFORMATION TECHNOLOGY

SEMESTER - 1

19I101 CALCULUS AND ITS APPLICATIONS

3 1 0 4

DIFFERENTIAL CALCULUS: Functions of two variables, limit, continuity, partial derivatives, differentiability, linearization and total differential, extreme values and saddle points, Taylor's formula for two variables. (9 + 3)

MULTIPLE INTEGRALS I: Double integrals over rectangles, double integrals as volumes, Fubini's theorem, double integrals over general regions, changing the order of integration, double integrals in polar form, applications to area, volume. (9 + 3)

MULTIPLE INTEGRALS II: Triple integrals in rectangular coordinates, spherical and cylindrical coordinates, applications to volume. (9 + 3)

SECOND ORDER LINEAR ORDINARY DIFFERENTIAL EQUATIONS: Homogeneous equations with constant coefficients, superposition principle, initial value problem, general solution, Euler-Cauchy equation, non-homogeneous linear equations, method of variation of parameters, modeling of electric circuits. (9 + 3)

VECTOR CALCULUS: Directional derivative and gradient vectors, vector fields, divergence, curl. Integration in vector field - line integrals, work, circulation and flux, path independence. Green's, Gauss divergence and Stokes's theorems. (9 + 3)

Total L: 45 +T: 15 = 60

TEXT BOOKS:

1. Maurice D. Weir, Joel Hass, Christopher Heil "Thomas' Calculus", Pearson Education., New Delhi, 2018
2. Erwin Kreyszig "Advanced Engineering Mathematics", Wiley India Pvt Ltd., New Delhi, 2015

REFERENCES:

1. Gilbert Strang "Calculus", Wellesley-Cambridge Press., USA, 2017
2. Marsden J E, Tromba A J, Weinstein A "Basic Multivariable Calculus", Springer Verlag., New York, 2019
3. James Stewart "Multivariable Calculus", Cengage Publishing., Boston, 2017
4. Howard Anton, Irl Bivens, Stephen Davis "Calculus", John Wiley and Sons, INC., USA, 2016

19I102 ELECTRICAL AND ELECTRONICS SYSTEMS

3 0 0 3

DC CIRCUIT: Current-voltage –power-energy, electrical circuit elements: resistors-inductor- capacitor, source of electrical energy. Ohm's law- Kirchhoff's laws, series and parallel circuits, Maxwell's loop current method, Network theorems: superposition theorem- Thevenin's theorem- Norton's theorem-maximum power transfer theorem. (9)

AC CIRCUITS: Single phase AC circuits: Average and RMS values of sinusoidal wave form-RLC Circuit-Phasor representation-active ,reactive apparent power –power factor, analysis of RLC Circuit, three phase circuit: star and delta connection-phase and line quantities-balance and unbalance systems. (9)

ELECTROMAGNETISM AND MAGNETIC CIRCUITS: Electromagnetic induction: induced currents, Faraday's law, induction and energy, motional emf and Lenz's law. Magnetic field-magnetic circuit-inductance and mutual inductance-magnetic materials –ideal transformers and real transformers. (8)

SEMICONDUCTOR DEVICES: Basic diode concepts-diode circuit: half wave rectifier-full wave rectifier-bridge rectifier-special purpose diodes-zener diode - transistor fundamentals transistor biasing-bipolar junction transistors-basis amplifier concept-loading effect-power supplies and efficiency. (10)

OPERATIONAL AMPLIFIERS: Definition of terms - Inverting and non-inverting amplifiers, inverting summing amplifier, integrators and differentiators. (9)

Total L: 45

TEXT BOOKS:

1. John Hiley, Keith Brown, Ian McKenzie Smith, Edward Hughes "Electrical and Electronic Technology", Pearson education., New Delhi, 2016 , twelfth edition
2. Murugesh Kumar K "Basic Electrical Science and Technology", Vikas Publishing House., New Delhi, 2009

REFERENCES:

1. Leach D P "Digital Principles & Applications", Tata McGraw Hill., 2014 , eighth edition
2. Hambley A R "Electrical Engineering Principles and Applications", PHI Learning Pvt. Ltd., New Delhi, 2011
3. Boylestad R. L., Nashelsky L "Electronic Devices and Circuit Theory", Pearson Education., Noida, 2014 , eleventh edition
4. Theraja B. L. "Basic electronic Solid State", S. Chand & Company Ltd.,, New Delhi, 2010

191103 CHEMISTRY OF ELECTRONIC MATERIALS

3 0 0 3

CONDUCTING PROPERTIES OF MATERIALS: Molecular orbital treatment of bonding in metals, insulators, semiconductors — direct band and indirect band, elemental, p-doped, n-doped, stoichiometric compound semiconductors and chalcogen semiconductors. Crystal defects and their influence on properties of materials — intrinsic defects - schottky and frenkel, non-stoichiometric compounds, extrinsic defects - oxide ion conductors - applications. Nanoscale materials – Quantum dots-band gap – size dependant optical properties. (9)

POLYMERIC MATERIALS: Classification, degree of polymerization, average molecular weights, polydispersity. Polymerization reactions — chain and condensation. Thermal properties -glass transition temperature(Tg) — factors affecting Tg - determination by DSC. Mechanical properties — significance in fabrication of electronics. Electrical insulating properties - dielectric breakdown - aging of polymer insulations - discharges in voids, electrical treeing. Thermal and photochemical degradations. Additives - plasticisers, stabilisers, functional additives. (9)

FLEXIBLE ELECTRONIC MATERIALS: Conjugated polymers — electronic energy bands - mechanism of charge transport — intrachain and interchain - solitons, polarons and bipolarons. Factors influencing charge transport — structural features - defects, molecular weight, crystalline/amorphous nature, doping- oxidative and reductive. Synthesis, properties and applications of polyaniline, polythiophene and polypyrrole. Molecular electronics - graphene, fullerenes, carbon nanotubes — structure, synthesis, properties and applications. (9)

OPTOELECTRONIC MATERIALS: Electroluminescence- exciton, OLED materials– emitters- charge transfer complexes, metal chelates, polycyclic aromatic oligomers, conjugated polymers — polyphenylenes, polyfluorenes. Liquid crystalline polymers- classification of liquid crystals, chemical constitution, stability and applications. Organic and dye sensitized photovoltaics — working principle, materials, advantages and disadvantages. Preparation of ultrathin polymer films - Langmuir-Blodgett Films –self assembled monolayers. (9)

MATERIALS FOR ELECTRONICS PROCESSING: Semiconductor wafer fabrication -Overview and challenges –high purity chemicals, air filters for clean rooms, electronic grade water- quality parameters, water treatment stages for ultrapure water production — membranes and ion-exchange resins, electro dialysis. Photoresists for wafer fabrication — microlithography, resist requirements, material chemistry. Electronic packaging materials-adhesives, connectors, eutectic alloys, phase change materials-phase diagrams, applications. (9)

Total L: 45

TEXT BOOKS:

1. Lesley E.Smart, Elaine A.Moore "Solid State Chemistry - an Introduction", CRC Press., London, 2005. , fourth edition
2. Cowie J.M.G, Valeria Arrighi "Polymers: Chemistry and Physics of modern materials", CRC Press., London, 2007. , third edition

REFERENCES:

1. Bansi D. Malhotra "Handbook of Polymers in Electronics", Rapra Technology Ltd.,, UK, 2002. , first edition
2. Stergios Logothetidis "Handbook of Flexible Organic Electronics Materials - Manufacturing and Applications", WoodHead publishing., London, 2015. , first edition
3. Peter Van Zant "Microchip Fabrication: A Practical Guide to Semiconductor Processing", Mc Graw Hill,, 2014. , sixth edition
4. Shashi Chawla "A Textbook of Engineering Chemistry", Dhanpat Rai and Co.,, New Delhi, 2005 , first edition

191104 C PROGRAMMING

3 0 0 3

INTRODUCTION: Evolution of programming languages, Algorithm and flow chart, Structured program development, Program execution, Embedded C, C Preliminaries: Character set - Identifiers and keywords, Data types, Enumeration, Declarations, Expressions, Statements, Pre-processor directives and symbolic constants - Operators and Expressions - Input and Output Statements (9)

CONTROL STATEMENTS: Unconditional Statements - Conditional Statements - Branching and Looping Statements. (9)

FUNCTIONS AND POINTERS: Library functions and user defined functions, Call by value - Recursion - Macros, Storage types - Pointers: Operations on pointers, Pointer arithmetic, Call by reference - Function Pointer. (9)

ARRAYS: Concept of one dimensional and multi-dimensional array, Defining and processing array - Array as function argument - Strings - Pointer to an Array, Array of pointers, C99 standards. (9)

STRUCTURES, UNION AND DATA FILES: Defining and processing a structure, Nested structures, Passing structure to functions - Array of Structure, Pointer to Structure - Union - Dynamic Memory Allocation - Files: Streams, Opening and closing file, Reading and writing a file, Command line arguments. (9)

Total L: 45

TEXT BOOKS:

1. Deitel.H.M, Deitel.P.J "C: How to Program", Pearson., New Delhi, 2016, Eighth Edition
2. Herbert Schildt "C: Complete Reference Guide", Mc Graw Hill., Noida, 2011, Fourth Edition

REFERENCES:

1. PradipDey, ManasGhosh "Programming in C", Oxford University., New Delhi, 2018, First Edition
2. YashwantKanetkar "Let us C", BPB Publications., New Delhi, 2017, Sixteenth Edition
3. Gottfried B "Programming with C", McGraw Hill., Noida, 2018, Fourth Edition
4. Kernighan B. W., Ritchie D.M. "The C Programming Language", Pearson., New Delhi, 2015, Second Edition

19G105 ENGLISH LANGUAGE PROFICIENCY

2 1 0 3

LEARNING LANGUAGE THROUGH STANDARD LITERARY AND GENERAL TEXTS: Integrated tasks focusing on language skills; Training based on Text based vocabulary, tone, register and Syntax features (12 + 0)

GRAMMAR IN CONTEXT: Word Order; Subject Verb Concord; Style features - Tenses, Conditionals, Prepositions, Active and Passive Voice, Modals, Cloze and Spotting Error exercises (10 + 0)

GUIDELINES FOR WRITTEN COMMUNICATION: Principles of clear writing, Paragraph writing, Essay writing, Emphasis Techniques, Summarizing and Paraphrasing, Analytical writing. (8 + 0)

FOCUS ON SPOKEN ENGLISH: Task — based activities: Graded levels of difficulty and with focus on language functions - Level 1: Self — expression — Greetings in Conversation, Hobbies, Special interests, Daily routine - Level 2: General Awareness — Expression of Concepts, Opinions, Social Issues, Description of a process / picture/chart, news presentation / review - Level 3: Advanced Skills — Making Short Speeches and Participating in Role Plays. (0 + 10)

LISTENING ACTIVITY: Task based activities using Language Laboratory. (0 + 5)

Total L: 30 +T: 15 = 45

TEXT BOOKS:

1. Faculty Incharge "Course Material on "English Language Proficiency", PSG College of Technology., Coimbatore, 2019

REFERENCES:

1. Jill Singleton "Writers at Work: The Paragraph", Cambridge University Press., New York, 2012
2. Simon Haines, Mark Nettle and Martin Hewings "Advanced Grammar In Use", Cambridge University Press., New Delhi, 2008
3. Anne Laws "Writing Skills", Orient Black Swan., Hyderabad, 2011
4. Sinha DK "Specimens of English Prose", Orient Black Swan., Hyderabad, 2012

19I110 ENGINEERING GRAPHICS

0 0 4 2

INTRODUCTION:

1. Introduction to Engineering Drawing. BIS. Principles of dimensioning, Geometrical Constructions. (8)

ORTHOGRAPHIC PROJECTION BASICS:

1. Principles of orthographic projection-projection of points, straight lines (12)

ORTHOGRAPHIC PROJECTION:

1. Planes and solids. Orthographic projection of simple engineering components — missing view exercises. Drawing orthographic projections of computer components. (14)

SECTION OF SOLIDS:

1. Section of regular solids, types of sections, selection of section views. Sectional views of simple engineering components. Drawing sectional views of assemblies like electric motor, mobile phone. (14)

DEVELOPMENT OF SURFACES:

1. Development of lateral surfaces of regular solids and truncated solids. Preparing parts like tray, funnel, CPU housing using cardboard material. (12)

Total P: 60

TEXT BOOKS:

1. Venugopal K, Prabhu Raja V "Engineering Graphics", New Age International Publishers., Chennai, 2015
2. Natarajan K. V "Engineering Drawing and Graphics", M/s Dhanalakshmi N., Chennai, 2016

REFERENCES:

1. K.C. John "Engineering Graphics for Degree", PHI Learning Pvt Ltd., New Delhi, 2011 , 1st Edition
2. Bhatt N. D., Panchal V. M. "Elementary Engineering Drawing", Charotar Publishing House., 2014
3. Warren J Luzadder, Jon M Duff "Fundamentals of Engineering Drawing: with an Introduction to Interactive Computer Graphics for Design and Production", PHI Learning., New Delhi, 2011
4. Bureau of Indian Standards "Engineering Drawing Practices for Schools and Colleges SP 46-2003", BIS., New Delhi, 2003

19111 PHYSICS AND CHEMISTRY LABORATORY

0 0 4 2

PHYSICS (ANY EIGHT EXPERIMENTS) :

1. Determination of Hysteresis loss of a ferromagnetic material
2. Determination of resistivity of metal and alloy using Carey Foster bridge
3. Determination of Temperature Coefficient of Resistance of metallic wire using post office box
4. Determination of capacitance using LCR bridge
5. Study of reverse bias characteristics of Germanium diode and determination of its band gap
6. Study of I-V characteristics of solar cell and determination of its efficiency
7. Thermistor: Measurement of temperature and band gap
8. Study of characteristics of Photo Diode
9. Operational Amp. (741) – Inverting and non inverting modes
10. Operational Amp. (741) – Integrator and differentiator

(30)

CHEMISTRY (ANY EIGHT EXPERIMENTS) :

1. Determination of hardness, TDS, pH and conductivity of a water sample.
2. Determination of molecular weight of polymers by Ostwald / Ubbelohde Viscometer.
3. Construction of phase diagram for eutectic system – for application in electronic cooling system.
4. Study of a galvanic cell.
5. Conductometric estimation of acid strength of a pickling bath.
6. Potentiometric estimation of ferrous ion in an effluent.
7. Anodizing of aluminium and determination of thickness of anodised film.
8. Preparation of chloride ion sensor by anodizing silver and calibration.
9. Electroplating of nickel & copper and determination of cathode efficiency.
10. Examination of different forms of corrosion using Ferroxy indicator and determination of corrosion rate by current measurement.

(30)

Total P: 60

REFERENCES:

1. Department of Chemistry "Chemistry Laboratory Manual", .., 2019

19I112 C PROGRAMMING LABORATORY

0 0 4 2

1. Input and Output Statements
2. Control Statements - Branching
3. Control Statements - Looping
4. Functions
5. Recursion
6. Arrays
7. Pointers
8. String Operations
9. Structures
10. File Operations

Total P: 60

19IP15 INDUCTION PROGRAMME

0 0 0 0

As per AICTE guidelines

SEMESTER - 2

19I201 TRANSFORMS AND ITS APPLICATIONS

3 1 0 4

LAPLACE TRANSFORMS: Laplace transform, inverse transform, linearity, s-shifting, transforms of derivatives and integrals, unit step function, t — shifting, Dirac's delta function, periodic functions, differentiation and integration of transforms. (9 + 3)

APPLICATION OF LAPLACE TRANSFORMS: Convolution, solving differential equations with constant coefficients and variable coefficients, integral equations, systems of ODEs by using Laplace transform technique. (9 + 3)

Z TRANSFORMS: Z transform, inverse transform, shifting theorem, convolution theorem, initial and final value theorem, difference equation, application of Z transform to solve difference equations. (9 + 3)

FOURIER SERIES: Fourier series — even and odd functions, half range expansion, convergence of Fourier series, basic concepts of PDE's, wave equation, solution by separating variables, solution of one dimensional heat equation and steady state two dimensional heat equation. (9 + 3)

FOURIER TRANSFORMS: Fourier integral, Fourier cosine and sine integrals, Fourier transform, Discrete Fourier transform, Fast Fourier transform – DIT algorithm. (9 + 3)

Total L: 45 +T: 15 = 60

TEXT BOOKS:

1. Erwin Kreyszig "Advanced Engineering Mathematics", John Wiley & Sons., New Delhi, 2015
2. Dean G. Duffy "Advanced Engineering Mathematics", CRC., USA, 2017

REFERENCES:

1. Peter V.O. Neil "Advanced Engineering Mathematics", Cengage., New Delhi, 2018
2. Wylie C. R. and Barrett L. C "Advanced Engineering Mathematics", Tata McGraw-Hill., New Delhi, 2019
3. Jain. R. K. and Iyenger. S. R. K. "Advanced Engineering Mathematics", Narosa Publishing House., New Delhi, 2018
4. Alexander D Poularikas "Transforms and Applications Primer for Engineers with Examples and MATLAB", CRC press.,

19I202 MATERIALS SCIENCE**3 0 0 3**

QUANTUM MECHANICS: Wave particle duality, de Broglie waves- Heisenberg's uncertainty principle. Wave function-normalization. The wave equation. Schrodinger's equation of motion: Time dependent form, steady-state form. Particle in a box. Quantum Tunneling and applications to Scanning Tunneling Microscope and Tunnel diode. (9)

ELECTRICAL PROPERTIES: Conducting materials-quantum free electron theory -Fermi Dirac Statistics-Band theory of solids-the density of states. Dielectrics-types of polarization-measurement of dielectric permittivity-Loss factor-Dielectric loss mechanisms. Magnetostriction. Electron ballistics- materials for thermionic emission electron guns-electron gun for electron beam machining-electric discharge plasma-EDM machining. (9)

MAGNETIC PROPERTIES: Types of magnetic materials-domain theory-hysteresis- hard and soft magnetic materials-Applications-eddy current brakes, regenerative braking. Magnetic lenses. Superconductivity –Meissners effect-Josephson junction, SQUID magnetometer, applications of squid magnetometer- superconducting Magnets, and Magnetic levitation. (8)

PHYSICS OF SEMICONDUCTOR DEVICES: P type and N type semiconductors-the effective mass-P-N junction, rectifier equation -Hall effect-Quantum tunneling. Bipolar transistor. The field effect transistor- Integrated circuits— Hetero junction-Quantum well, wire, dots- Optical properties of Semiconductors: LD, LED, Photo diode. Introduction to MEMS. (10)

STORAGE DEVICES: Computer Data Storage, Types of Storage, Primary Storage - RAM, ROM, Cache. Secondary Storage - Hard disk, Tertiary Storage - Magnetic tape, Compact disc, Digital versatile disc, Blue-ray. Off-line Storage - USB Flash drive, memory card. Storage Device Features. (9)

Total L: 45**TEXT BOOKS:**

1. William D CallisterJr "Materials Science and Engineering-An Introduction", John Wiley and Sons Inc., NewYork, 2018 , tenth edition
2. Shaffer J P, Saxena A, Antolovich S D, Sanders T H Jr, Warner S B "The Science and Design of Engineering Materials", McGraw Hill Companies Inc., New york, 2000 , second editon

REFERENCES:

1. Arthur Beiser "Concepts of Modern Physics", Tata Mcgraw Hill., India, 2003 , sixth editon
2. Van Vlack "Elements Of Material Science And Engineering", Pearson Education., India, 2008 , sixth edition
3. Sze S.M "Physics of Semiconductor Devices", John Wiley and Sons., USA, 2007 , third edition
4. Donald R Askeland, Wendelin J Wright "Essentials of Materials Science and Engineering", Cengage Learning., 2013 ,third edition
5. James F Shackelford S "Introduction to Materials Science for Engineers", Macmillan Publishing Company., New york, 2015 , eighth edition

19I203 INDUSTRIAL ELECTROCHEMISTRY**2 0 0 2**

ELECTROCHEMISTRY: Conductance of strong and weak electrolytes, mobility of ions - transport number, applications of conductance measurement. Electrode potential — standard and reference electrodes, Nernst equation, emf series — applications. Galvanic and concentration cells. Applications of emf measurements — glass electrode - pH measurement, potentiometric- redox titrations. (6)

CORROSION: Mechanisms - Galvanic and differential aeration corrosion. Corrosion rate — factors influencing corrosion - galvanic series. Corrosion control - corrosion inhibitors, cathodic protection - sacrificial anode, current impression, conversion coatings — anodizing — determination of thickness of anodized film. Nature inspired coatings-superhydrophobic coatings, self healing coatings. Corrosion in electronic components — control by vapour phase inhibitors. (6)

METAL FINISHING IN ELECTRONIC INDUSTRY: Electroplating — plating parameters- polarization and overvoltage, current and energy efficiency. Electroplating of Cu, Ni, and Cr. Electroless deposition of Ni and Cu. Production of plated through hole PCBs, electroforming - fabrication of CD stampers, electrochemical etching of Cu from PCBs, Electrophoretic painting, Electrochemical etching of semiconductors. (6)

ELECTROCHEMICAL POWER SOURCES: Batteries- types, characteristics. Fabrication and working of lechlanche cell, primary lithium cell, lead- acid battery, Ni-metal hydride and lithium ion batteries. Supercapacitors. Fuel cells - Classification, working principle, components, applications of proton exchange membrane, direct methanol and solid oxide fuel cells. Hydrogen as a fuel-production and storage. (6)

SENSORS: Components of electrochemical sensors, electrochemical transducers-potentiometric, amperometric and conductometric methods – ion-selective electrodes – solid-state electrode, liquid ion-exchange membrane electrodes. Gas sensors—CO₂, O₂ and NH₃ sensing. Sensors for health care—glucose and urea. (6)

Total L: 30

TEXT BOOKS:

1. Derek Pletcher and Frank C. Walsh "Industrial Electrochemistry", Chapman and Hall., London, 1993. , second edition
2. John O'M.Bockris and Amulya K. N. Reddy "Modern Electrochemistry 2B", Kluwer Academic/Plenum Publishers., New York, 1998. , second edition

REFERENCES:

1. Dell R. M. and Rand D. A. J "Understanding Batteries", Royal Society of Chemistry., UK, 2001. , first edition
2. Brian Eggins "Chemical Sensors and Biosensors", John Willey & Sons., US, 2002. , first edition
3. Zaki Ahmad, Digby Macdonald "Principles of Corrosion Engineering and Corrosion Control", Butterworth- Heinemann., London, 2013. , second edition
4. Shashi Chawla "A Textbook of Engineering Chemistry", Dhanpat Rai and Co., New Delhi, 2005. , first edition

19I204 COMMUNICATION SYSTEMS

3 0 0 3

INTRODUCTION: Elements of a communications system, Types of electronic communication, Modulation, Major applications of electronic communication, Electromagnetic spectrum, Bandwidth. (9)

CONTINUOUS WAVE MODULATION: Amplitude modulation, Double sideband suppressed carrier modulation, Single sideband modulation, Angle modulation, Frequency modulation, Phase modulation, Comparison of various CW modulation schemes. (9)

PULSE MODULATION: Sampling, Quantization, Pulse code modulation, Differential pulse code modulation, Delta modulation, Line codes, Inter symbol interference, Correlative level coding (9)

DIGITAL MODULATION: Information capacity, Bit rate, Baud, M-ary encoding, Amplitude shift keying, Frequency shift keying, Phase shift keying, Differential phase shift keying, Quadrature phase shift keying, Comparison of digital modulation schemes (9)

SOURCE AND CHANNEL CODING: Entropy, Source coding theorem, Shannon fano coding, Huffman coding, Channel coding theorem, Linear block codes, Convolutional codes. (9)

Total L: 45

TEXT BOOKS:

1. Louis E. Frenzel "Principles of Electronic Communication Systems", McGraw-Hill Education., Noida, 2015 , 4th Edition
2. Wayne Tomaci "Electronics Communications Systems: Fundamentals through advanced", Pearson., 2008 , 6

REFERENCES:

1. P.Lathi, Zhi Ding "Modern digital and analog communication systems", Oxford University Press., Noida, 2018 , 5th Edition
2. Leon W. Couch "Digital and Analog Communication Systems", Pearson Education India., Noida, 2018 , 8th Edition
3. Lapidoth, Amos "A foundation in digital communication", Cambridge University Press., Delhi, 2017 , 2nd Edition
4. Simon Haykin "An introduction to Analog & Digital Communication", Wiley., 2012 , 2

19I205 DIGITAL LOGIC DESIGN

2 2 0 4

NUMBER SYSTEMS AND BOOLEAN ALGEBRA: Number Systems, Conversions, Signed and unsigned numbers, Binary codes, Binary addition and subtraction, Binary logic, Boolean laws, Axioms, Theorems and properties, Boolean functions, Canonical and standard forms of Boolean expression, Digital logic gates, Digital logic families. (9+3)

SIMPLIFICATION OF BOOLEAN FUNCTIONS: Sum-of-products, Truth table to Karnaugh map, K-map simplification, Product-of-sums simplification, Hardware implementation, NAND and NOR implementation, two level and multi level implementation, Hazard and hazard covers, Hardware description language (HDL) (9+3)

COMBINATIONAL LOGIC: Analysis procedure, Design procedure, Binary adder, Binary subtractor, Binary multiplier, Multiplexers, Demultiplexers, Decoders, Encoders, Parity generators and checkers, Magnitude comparator, HDL implementation of combinational circuits (9+3)

SEQUENTIAL LOGIC: Latches, Flip flops, Shift registers, ripple counters, Synchronous counters, Modulo-N counters, Analysis of clocked sequential circuits, State reduction and assignment, Design procedure, Excitation tables, Analysis of Asynchronous sequential circuits, Design of Asynchronous sequential circuits, HDL implementation of registers and counters. (9+3)

MEMORY AND PROGRAMMABLE LOGIC: Magnetic memory, Optical memory, Memory addressing, Random Access Memory, Memory decoding, Error detection and correction, Read Only Memory, Erasable Programmable Read Only Memory, Programmable Logic Array, Programmable Array Logic. (9+3)

Total L: 45 +T: 15 = 60

TEXT BOOKS:

1. Donald P Leach, Albert Paul Malvino, Goutam Saha "Digital Principles and Applications", Tata McGraw Hill., New Delhi, 2006 , Sixth edition
2. Morris M Mano, Michael D Ciletti "Digital Design with an introduction to Verilog HDL", Pearson Education., New Delhi, 2015 , Fifth edition

REFERENCES:

1. Anand Kumar A "Fundamentals of Digital Circuits", PHI Learning., New Delhi, 2011 , Third Edition
2. Roger L Tokheim "Theory and Problems of Digital Principles", Tata McGraw Hill., New Delhi, 2007 , Third Edition
3. John P Uyemura "A First Course in Digital Systems Design: An Integrated Approach", Cengage Learning., New Delhi, 2011 , First Edition
4. Ronald J Tocci, Neal S Widmer, Gregory L Moss "Digital Systems: Principles and Applications", Pearson Education., New Delhi, 2011 , Tenth Edition

19I210 PYTHON PROGRAMMING LABORATORY

0 0 4 2

1. Basic Programs
2. Control Statements and Looping
3. Functions and Lambda Functions
4. String Handling
5. Lists , Tuples, Set and Dictionary
6. Files and I/O Handling
7. Packages & Modules
8. Exception Handling
9. Class and Inheritance
10. Database Connectivity

Total P: 60

19I211 ENGINEERING PRACTICES

0 0 2 1

MODULE-1 :

1. Study of electronic components and instruments
2. Construction of half-wave and full wave rectifier without and with capacitor filter and observation of input and output waveforms

3. Assembly Language programming for 8085 microprocessor – write simple assembly language programs, assemble and execute machine code
4. Study of basic hardware components of a personal computer, disassembly and assembly of PC components
5. Installation of Operating system and drivers for peripheral devices
6. Installation of application software and configuring PC for networking
7. Preventive maintenance and basic troubleshooting

(16)

MODULE-2 :

1. Foundry- Tools, preparation of molding s and, patterns, cores, foundry exercises
2. Welding - Metal arc welding tools and equipment, exercises by Arc welding and TIG welding Processes
3. Fitting - Tools, operations, exercises Make "T"-Joint and "L" Joint, types of joints
4. Carpentry- Tools, carpentry process, carpentry exercises, types of joints
5. Power Tools- Demonstration of tools and operations
6. Plumbing-exercises-external thread cutting and joining
7. Sheet metal work & Soldering - Tools, operations, exercises Make a Rectangular Tray in Galvanized Iron sheet

(14)

Total P: 30

REFERENCES:

1. Rajaraman V. "Fundamentals of Computers", Prentice Hall of India., New Delhi, 2011
2. Mechanical Department "Laboratory Manual", ., 2010
3. Chapman W.A.J "Workshop Technology", Edward Arnold., 2001

19I215 INTERNSHIP

0 0 0 2

OBJECTORIENTEDANALYSISANDESIGN:Introduction - Unified Process - UML diagrams - Use Case - Class Diagrams - Interaction Diagrams - State Diagrams - Activity Diagrams - Package Diagram.

PRINCIPLES OF OOP: Classes and Objects - Abstraction - Encapsulation – Data Hiding – Inheritance – Polymorphism – Compile time and Run-time polymorphism – message passing, Introduction to C++, Structure of C++ program, Data types, Operators and control statements, Input and output operators, Reference variables, Class specification - Member function definition - Access qualifiers, Dynamic memory allocation - Function prototype, Inline function, Default arguments, Static data members and member functions, Static objects, Objects as function arguments, Function return type as objects – Call by value – Call by reference – Call by address - Constructors and destructors - Parameterized constructor - Overloaded constructors -Templates – Exception Handling.

MS OFFICE - EXCEL, POWER POINT, MS WORD FOR PROFESSIONAL ACTIVITIES: Document Preparation: Creating and editing a document, checking spelling and grammar, enhancing a document with various formats, inserting graphics. Spreadsheet Creation: Entering text, numbers, and formulas; saving, closing and opening workbooks; specifying ranges, enhancing a worksheet. Creating a variety of charts and enhancing them. Database Handling: Creating a database, creating tables, entering and editing data, creating forms and reports. Presentation: Creating presentations, inserting slides, inserting graphics, enhancing a presentation, previewing. Project: Solving real world industrial / business / engineering problems using office automation methods.

SOFTWARE FOR PROBLEM SOLVING: Introduction – software environment overview- Basic Commands - Data types- Expression syntax - Vectors and matrix manipulations- Reading inputs - Displaying outputs- Polynomials - roots of polynomials - 2D and 3D Plots - Reading files - Equation solving- Integration – multiple integrals – Differentiation – solving differential equations- plotting of differential equations - Introduction to programming - Control structures - Looping statements - Unconditional statements - Writing and debugging the scripts - Introduction to functions - Function definition - Uses of function - Function calling - Function handling.

SEMESTER – 3

19I301 LINEAR ALGEBRA

3 1 0 4

LINEAR EQUATIONS: Systems of linear equations - row reduction and echelon forms - vector equations - matrix equation - solution sets to linear systems - linear independence. (9 + 3)

VECTOR SPACES: General vector spaces - real vector spaces - Euclidean n-space - subspaces - basis and dimension - row space, column space and null space - rank and nullity. (9 + 3)

LINEAR TRANSFORMATIONS: General linear transformation - kernel and range - matrices of linear transformations - change of basis - geometry of linear operators on \mathbb{R}^2 . (9 + 3)

INNER PRODUCT SPACES: Inner products - angle and orthogonality in inner product spaces, orthonormal bases, Gram - Schmidt process, QR decomposition, best approximation - least squares. (9 + 3)

EIGENVALUES AND EIGENVECTORS: Eigenvalues and eigenvectors, diagonalization - orthogonal diagonalization - quadratic forms - application of conic sections - quadratic surfaces - spectral decomposition - singular value decomposition - discrete dynamical systems. (9 + 3)

Total L: 45 +T: 15 = 60

TEXT BOOKS:

1. Howard Anton and Chris Rorres, "Elementary Linear Algebra", Wiley India, New Delhi, 2018.
2. David C Lay, "Linear Algebra and its Applications", Pearson, New Delhi, 2016.

REFERENCES:

1. Gareth Williams, "Linear Algebra with Applications", Narosa Publishing House, New Delhi, 2012.
2. Gilbert Strang, "Linear Algebra and its Applications", Cengage, New Delhi, 2012.
3. Friedberg, Insel and Spence, "Linear Algebra", Pearson Education, USA, 2015.
4. Kenneth Hoffman and Ray Kunze, "Linear Algebra", Prentice Hall, New Jersey, 2015.

191302 COMPUTER ARCHITECTURE

3 1 0 4

INTRODUCTION: Basics of computer architecture - Stored program organization - Register transfer language - Arithmetic - Logic - Shift micro operations - Instruction code - Timing and control - Instruction cycle - Basic computer design (9 + 3)

CENTRAL PROCESSING UNIT: CPU Organization: General register organization - Stack organization - Instruction formats - Addressing modes - Data transfer and manipulation - Program control. (9 + 3)

COMPUTER ARITHMETIC AND CONTROL UNIT: Fixed point arithmetic operations: Addition - Subtraction - Multiplication - Division - Floating point arithmetic operations: Basics - Control unit design: Hardwired control - Micro-programmed control. (9 + 3)

MEMORY AND I/O SYSTEMS: Memory hierarchy - Main memory - Auxiliary memory - Associative memory - Cache memory - Virtual memory - Interleaved memories - I/O SYSTEMS: Asynchronous data transfer - Modes of data transfer: Programmed I/O - Interrupt initiated I/O - Direct Memory Access (DMA) - I/O processor. (9 + 3)

PARALLEL PROCESSING AND ADVANCED ARCHITECTURE: Pipelining - Instruction and arithmetic pipelining - Design Issues - RISC and CISC architectures. (9 + 3)

Total L: 45 +T: 15 = 60

TEXT BOOKS:

1. Morris Mano M. and Rajib Mall, "Computer System Architecture", 3rd Edition, Pearson Education, New Delhi, 2019.
2. John L. Hennessy and David A. Patterson, "Computer Architecture: A Quantitative Approach", 5th Edition, Elsevier, New Delhi, 2017.

REFERENCES:

1. John P Hayes, "Computer Organization and Architecture", 3rd Edition, McGraw Hill International Edition, New Delhi, 2014.
2. William Stallings, "Computer Organization and Architecture, Designing for Performance", 10th Edition, Pearson Education, USA, 2018.
3. Kai Hwang and Briggs F.A, "Computer Architecture and Parallel Processing", Tata McGraw Hill, New Delhi, 2016.
4. Heuring V.P., Jordan H.F. and Venkatesh T.G., "Computer Systems Design and Architecture", 2nd Edition, Pearson Education, New Delhi, 2013.

191303 DATA STRUCTURES

3 0 0 3

ARRAYS AND LISTS: Data structures - Types of data structures - Abstract Data Types (ADT) - operations - Analysis of algorithms: Complexity of algorithms: Time and Space complexity - Asymptotic notation - Linear arrays - Representation of array in memory - Insertion and deletion - Linked lists - Representation of linked list in memory - Operations on linked list: Traversal - Search - Insertion - Deletion - Doubly linked list - Circular linked list - Applications: Execution of matrices and vectors, Representation of sparse matrices. (11)

STACKS AND QUEUES: Array representation of stack - Linked representation of stack - Primitive operations on stack - Recursion - Infix to postfix conversion - Evaluation of postfix expression - Queues: Basic operations on queue - Array and linked representation - Deque - Circular queue - Priority queues - Applications: Expression evaluation, Resource sharing. (8)

TREES: Types - Binary tree - Representations of tree in memory - Tree traversals: Preorder - Inorder - Postorder - Binary search tree (BST) - Operations on BST: Search - Insertion - Deletion - Height balanced tree: AVL search tree - Application: File System. (9)

SORTING AND SEARCHING: Bubble sort - Insertion sort - Selection sort - Merge sort - Quick sort - Radix sort - Shell sort - Counting sort - Linear search - Binary search - Applications: Finding a word in Dictionary, Playing music in alphabetical order. (8)

GRAPHS: Graph theory terminologies - Representations of graph - Traversal: Breadth first search - Depth first search - Warshall's algorithm - Application: Map Coloring. (9)

Total L: 45

TEXT BOOKS:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 4th Edition, Pearson Education, New Delhi, 2014.
2. Ellis Horowitz, Sartaj Sahni and Susan Anderson Freed, "Fundamentals of Data Structures in C", 2nd Edition, Universities Press, Hyderabad, 2018.

REFERENCES:

1. Seymour Lipschutz, "Data Structures", McGraw Hill Education, New Delhi, 2016.
2. Venkatesan R and Lovelyn Rose S, "Data Structures", 2nd Edition, Wiley India Pvt Ltd, New Delhi, 2019.
3. Yedidyah Langsam, Moshe J Augenstein and Aaron M Tanenbaum, "Data Structures using C and C++", 2nd Edition, Pearson Education, Chennai, 2017.
4. Michael T Goodrich, Roberto Tamassia and Michael H Goldwasser, "Data Structures and Algorithms in Python", Wiley India Pvt Ltd, New Delhi, 2018.

191304 DISCRETE MATHEMATICS AND AUTOMATA THEORY

3 0 0 3

MATHEMATICAL LOGIC AND ALGEBRAIC STRUCTURES: Statements and Notation – Connectives – Normal Forms – Inference Theory – Set Theory – Representation of Discrete Structures – Relations and ordering – Functions – recursion - Algebraic Structures: Algebraic systems – Semi groups and monoids – Groups – Subgroups – Homomorphism's - Rings and Fields. (9)

COMBINATORICS, RECURRENCE RELATIONS AND MATHEMATICAL PROOFS: Basics of counting – The Pigeonhole principle - Generating permutations and combinations in lexicographic order. Recurrence relations: Models – Solving linear homogeneous recurrence relations and linear non-homogeneous recurrence relations - Introduction to Formal Proof, Additional Forms of Proof, Proof by Contradiction, Inductive Proofs. (9)

FINITE AUTOMATA AND REGULAR LANGUAGES: Central Concepts of Automata Theory, Alphabets, Strings, Languages, Chomsky Hierarchy- Finite Automata: Deterministic Finite Automata (DFA), Non Determinism Finite Automata (NFA) – NFA with epsilon - Equivalence of DFA, NFA and NFA with epsilon. Regular Expression: Finite Automata and Regular Expression - Closure Properties of Regular Language, Pumping Lemma for Regular Languages. (9)

CONTEXT FREE GRAMMAR AND PUSH DOWN AUTOMATA: Context Free Grammar (CFG): Derivation Trees, Ambiguity, Left factoring and Left Recursive Grammar, Chomsky and Greibach Normal Form - Pumping Lemma for Context Free Languages- Push Down Automata (PDA): PDA Definition, Languages of PDA - Equivalence of PDA and CFG. (9)

TURING MACHINES AND UNDECIDABILITY: Definitions, Models, Turing machine constructions, Universal Turing Machine, undecidable Problems, Reductions and the Halting Problem, Post's Correspondence Problem, Primitive Recursive Functions, Recursive and Recursively Enumerable Languages. (9)

Total L: 45

TEXT BOOKS:

1. R. Dube, A Pandey, Ritu Gupta, "Discrete Structures and Automata Theory", Narosa Publishing House, New Delhi, 2011.
2. John E Hopcroft, Rajeev Motwani and Jeffrey D Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education, New Delhi, 2014.

REFERENCES:

1. Jean-Paul Tremblay, R Manohar, "Discrete Mathematical Structures with Applications to Computer Science", McGraw-Hill, New Delhi, 2011.
2. Kenneth H Rosen, "Discrete Mathematics and its Application", McGraw Hill, New Delhi, 2011.
3. John C Martin, "Introduction to Languages and the Theory of Computation", McGraw Hill, New Delhi, 2014.
4. Peter Linz, "An Introduction to Formal Language and Automata", Jones and Barlett India Pvt. Ltd, New Delhi, 2011.

191305 OBJECT ORIENTED PROGRAMMING AND JAVA

3 0 0 3

INTRODUCTION: Features of OOP and development environment, Data types, Arrays, Methods, Classes, Inheritance, Interface Polymorphism, String handling, Packages. (9)

EXCEPTION AND THREADS: Exceptions handling, Multithreading, Thread synchronization, Thread priority, Inter thread communication. (6)

USER INTERFACES: Event handling: Event classes - Event listener interfaces, Adapter classes, Swing Components, Window, Frame, Layout managers, Menus, Applet class. (9)

COLLECTION AND UTILITY CLASSES: Collection Interfaces, ArrayList, LinkedList, Set, Maps, Iterators, Collection Algorithms, Legacy Classes and Interfaces, Date, Calendar, String Tokenizer, Random, Currency. (9)

FILES, STREAM AND JDBC: File class, Streams: Byte stream - Character stream, Stream class hierarchy, Serialization, Stream Tokenizer, Java Database Connectivity: Driver loading, Connection establishment – Query execution. (12)

Total L: 45

TEXT BOOKS:

1. Patrick Naughton and Herbert Schildt, "Java 2 - The Complete Reference", 5th Edition, Mc-Graw Hill, New Delhi, 2015.
2. Deitel H M and Deitel P I, "Java - How to Program", 2nd Edition, Pearson Education, New Delhi, 2013.

REFERENCES:

1. Sachin Malhotra and Saurabh Choudhary, "Programming in Java", Oxford University, New Delhi, 2010.
2. Daniel Liang Y, "Introduction to Java Programming", Pearson Education, New Delhi, 2014.
3. Joyce Farrell, "Java for Beginners", Cengage Learning, USA, 2013.
4. Ivan Bayross, "Web Enabled Commercial Application Development using HTML, Javascript, DHTML and PHP", BPB Publications, New Delhi, 2011.

190306 ECONOMICS FOR ENGINEERS

3 0 0 3

INTRODUCTION: Definition - Nature and Scope - Central Problems of an Economy - Positive and Normative Economics - Micro Economics and Macro Economics, Significance of Economics, Economic Assumptions. (9)

THEORY OF CONSUMER BEHAVIOR: Utility— Indifference Curve Analysis - Properties, Consumer's Budget Line - Demand Analysis: Demand Function and Law of Demand, Elasticity of Demand. Demand forecasting using Econometric Techniques. Supply - Factors Affecting Supply, Market Equilibrium Price, Consumer Surplus. (9)

PRODUCTION, COST AND REVENUE: Production Function, Total Product, Average Product and Marginal Product, Returns to Scale Costs, Nature of Costs, Short-run and Long-run Cost Curves, Revenue concepts. (9)

MARKET STRUCTURE: Types of Markets - Perfect Competition - Characteristics - Imperfect Competition: Monopoly - Monopolistic Competition - Oligopoly and Duopoly - Price Discrimination and Product Differentiation under Different Markets - Price and Output Determination in Short run and Long run and profit maximization. (9)

PERFORMANCE OF AN ECONOMY (MACRO ECONOMICS): Demand and Supply of Money - Quantity Theory of Money, Banking – Functions of Commercial Banks and Central Bank – Inflation - Causes - Control Measures - National Income - Concepts - Methods of Calculating National Income - Problems in Calculating National Income. (9)

Total L: 45

TEXT BOOKS:

1. Varian H.R., "Intermediate Microeconomics", East– West Press, New Delhi, 2014.
2. Dewett.K.K and Navalur. M.H., "Modern Economic Theory", S. Chand, New Delhi, 2015.

REFERENCES:

1. William A, McEachern and Simrit Kaur , "Micro ECON", Cengage Learning, Noida, 2013.
2. William A, McEachern and Indira A , "Macro ECON", Cengage Learning, Noida, 2014.
3. Deepashree, "Principles of Economics", Ane Books Pvt Ltd, New Delhi, 2010.
4. Dwivedi, "Essentials of Business Economics", Vikas Publishing House Pvt Ltd, New Delhi, 2010.

191310 DATA STRUCTURES LABORATORY

0 0 4 2

LIST OF EXPERIMENTS:

1. Arrays
2. Singly Linked List
3. Doubly Linked List
4. Stacks
5. Queues
6. Binary Tree Traversals
7. Binary Search Trees
8. Sorting Techniques
9. Searching Techniques

10. Graph Algorithm

Total P: 60

19I311 OBJECT ORIENTED PROGRAMMING LABORATORY

0 0 4 2

LIST OF EXPERIMENTS:

1. Methods, Classes, and Inheritance.
2. Interface and Package.
3. String manipulation and Exception handling.
4. Multithreading
5. Event handling
6. Swing Components
7. Collection classes
8. Utility classes
9. File and Stream
10. Database connectivity

Total P: 60

19K312 ENVIRONMENTAL SCIENCE

2 0 0 0

INTRODUCTION TO ENVIRONMENT: Environment - Definition, scope and importance. Types and composition of atmosphere - particles, ions and radicals. Ozone layer - significance, formation and depletion. Ecosystems- Structure and functions, components, energy flow, food chains, food web, Biodiversity-levels, values and threats - India as a mega - diversity nation - hotspots of biodiversity - endangered and endemic species of India - conservation of biodiversity. (6)

ENERGY RESOURCES: Introduction - National and International status- exploitation - sustainable strategies- Fossil fuels-classification, composition, physico-chemical characteristics and energy content of coal, petroleum and natural gas; solar energy - introduction, harnessing strategies. Wind energy - availability, wind power plants, wind energy conversion systems, site characteristics, and types of wind turbines. Supporting renewable energy resources - tidal – geothermal - hydroelectric. (6)

ENVIRONMENTAL POLLUTION: Definition - Sources, causes, impacts and control measures of (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards (h) RF hazards - Role of an individual in prevention of pollution. Disaster Management: Floods, earthquake, cyclone and landslides -Case studies, consequences and rescue measures. (6)

WASTE MANAGEMENT: Wastewater - Characteristics of domestic and industrial wastewater - COD and BOD - Various stages of treatment -primary, secondary, tertiary treatment- Biological and advanced oxidation processes. Solid waste management - Characteristics of municipal solid waste (MSW), biomedical, automobile and e-wastes and their management -landfills, incineration, pyrolysis, gasification and composting. (6)

SOCIAL ISSUES AND THE ENVIRONMENT: Environmentally Sustainable work practices - Rain water harvesting - Role of non-governmental organizations. Human ethics and rights - impact on environment and human health - role of information technology on environment and human kind. Green IT policies, Process of EIA - ISO 14000. Legislation- Environment protection act - Air (Prevention and Control of Pollution) act - Water (Prevention and control of Pollution) act-Wildlife protection act-Forest conservation act. (6)

Total L: 30

TEXT BOOKS:

1. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi, 2004.
2. De A K , "Environmental Chemistry", New Age International P Ltd, New Delhi, 2006.

REFERENCES:

1. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.
2. Koteswara Rao MVR, "Energy Resources: Conventional & Non-Conventional", BSP Publications, New Delhi, 2006.
3. Deswal S and Deswal A, "A Basic Course in Environmental Studies", Dhanpat Rai and Co, New Delhi, 2004.

SEMESTER - 4

19I401 PROBABILITY, STOCHASTIC PROCESSES AND STATISTICS

3 1 0 4

PROBABILITY AND DISCRETE RANDOM VARIABLES: Probability, axiomatic approach to probability, Baye's theorem, discrete random variables, probability mass function, families of discrete random variables - binomial, poisson and geometric random variables, cumulative distribution functions, expectations. (9 + 3)

CONTINUOUS RANDOM VARIABLES: Continuous random variables, cumulative distribution functions, probability density function, families of continuous random variables - uniform, exponential, Erlang and Gaussian random variables, expectations. (9 + 3)

PAIRS OF RANDOM VARIABLES: Joint cumulative distribution function - joint probability mass function - marginal probability mass function - joint probability density function - marginal probability density function - expected values - independent random variables - covariance - correlation. (9 + 3)

STOCHASTIC PROCESSES: Types of stochastic processes - discrete time Markov chains - classification of states - limiting state probabilities - Poisson process - continuous time Markov chain - steady state probabilities. (9 + 3)

STATISTICAL INFERENCE: Point estimation and interval estimation for means, proportions and variances - hypothesis concerning mean, proportion and variance - single and two samples - goodness of fit - test for independence. (9 + 3)

Total L: 45 +T: 15 = 60

TEXT BOOKS:

1. Roy D Yates and David J Goodman , "Probability and Stochastic Processes - A friendly Introduction for Electrical and Computer Engineers", Wiley India, New Delhi, 2014.
2. Ronald E. Walpole, Raymond H Myers, Sharon L Myers and Keying Ye , "Probability and Statistics for Engineers and Scientists", Pearson, New Delhi, 2016.

REFERENCES:

1. Saeed Ghahramani, "Fundamentals of Probability with Stochastic Processes", CRC Press, Taylor & Francis Group, USA, 2018.
2. Douglas C Montgomery and George C Runger, "Applied Statistics and Probability for Engineers", Wiley India, New Delhi, 2018.
3. Athanasios Papoulis and Unnikrishna Pillai S, "Probability, Random Variables and Stochastic Processes", Tata McGraw Hill, New Delhi, 2011.
4. Arnold O Allen, "Probability, Statistics and Queueing theory: with computer science applications", Academic press, New York, 2014.

191402 ADVANCED DATA STRUCTURES

2 2 0 4

BALANCED SEARCH TREES: Tree terminologies - Red Black Trees - B Trees - Splay Trees - Tries - Applications: Indexing, Auto corrector and Spell checker. (6 + 6)

SKIP LISTS AND HASHING: Skip list representation: Ideal case - Insertion - Deletion - Assigning levels - Hash table representation - Ideal hashing - Hash functions and tables - Open addressing - Separate chaining - Performance evaluation - Application: Database indexing. (6 + 6)

PRIORITY QUEUES: Heaps, Heap sort, Leftist trees, Applications, External sorting: Model for external sorting, Multiway merge, Polyphase merge, Replacement selection - Application: Database applications. (6 + 6)

STRING MATCHING TECHNIQUES: Naïve string matching algorithm, Rabin Karp algorithm, String matching with finite automata, Knuth Morris Pratt algorithm - Applications: Search engines. (6 + 6)

GRAPHS: Directed and undirected graphs, Topological sort, Biconnectivity, Euler circuits, Hamiltonian cycles, Isomorphism, Finding strong components - Applications: Connections/relations in social networking sites, Routing. (6 + 6)

Total L: 30 +T: 30 = 60

TEXT BOOKS:

1. Michael T. Goodrich and Roberto Tamassia, "Algorithm Design and Applications", Wiley, USA, 2015.
2. Benjamin Baka, "Python Data Structures and Algorithms", PACKT, UK, 2017.

REFERENCES:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 4th Edition, Pearson, USA, 2014.
2. Suman Saha and Shailendra Shukla, "Advanced Data Structures: Theory and Applications", CRC, London, 2019.
3. Dr. Basant Agarwal and Benjamin Baka, "Hands-On Data Structures and Algorithms with Python: Write complex and powerful code using the latest features of Python", 2nd Edition, Packt, UK, 2018.
4. Narasimha Karumanchi, "Data Structure and Algorithmic Thinking with Python", 2nd Edition, CareerMonk, India, 2018.

191403 DATABASE MANAGEMENT SYSTEMS

3 0 0 3

INTRODUCTION AND DATA MODELS: Databases and database users, Database system concepts and architecture, Data models: Entity relationship model - Enhanced entity relationship model - Relational Model, Relational database constraints, Relational algebra, Conceptual to relational mapping, SQL, DB Vault. (11)

DATABASE DESIGN THEORY AND METHODOLOGY: Functional dependencies, Axioms, Normal Forms: First normal form - Second normal form - Third normal form - Boyce Codd normal form, Multi-valued dependency, Join dependency. (9)

DATA STORAGE AND INDEXING: Overview, Record storage, Primary file organization, Caching, Index structures for files: Single level Indexing - Multilevel Indexing. (7)

SYSTEM IMPLEMENTATION TECHNIQUES: Query processing, Query optimization, Transaction management: Transaction - Concurrency control - Recovery system. (9)

NON RELATIONAL DATABASES: Need for NOSQL Databases, Types, MongoDB - Datatypes, Creating, Updating and Deleting Documents, Querying the database. (9)

Total L: 45

TEXT BOOKS:

1. Ramez Elmasri and Shamkant B Navathe, "Fundamentals of Database Systems", 7th Edition, Pearson Education, New Delhi, 2016.
2. Abraham Silberschatz, Henry F Korth and Sudharshan S , "Database System Concepts", 7th Edition, Tata McGraw Hill, New Delhi, 2017.

REFERENCES:

1. Atul Kahate, "Introduction to Database Management Systems", 3rd Edition, Pearson Education, New Delhi, 2009.
2. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", 3rd Edition, McGraw Hill, New Delhi, 2014.
3. Kristina Chodorow and Michael Dirolf, "MONGODB: The Definitive Guide, Powerful and Scalable Storage", 3rd Edition, Shroff Publishers, Mumbai, 2019.
4. Rajiv Chopra, "Database Management System: A Practical Approach", 5th Edition, S. Chand and Company Ltd, New Delhi, 2014.

19I404 OPERATING SYSTEMS

3 0 0 3

INTRODUCTION: Operating System Evolution, Operating System types, Operating System Structures: System components, Operating System Services, System Calls, System Programs, System Structure, Virtual Machines, System Design and Implementation. (9)

PROCESS MANAGEMENT: Process Model - Creation - Termination - Hierarchies - States - Implementation - Scheduling Criteria - Scheduling Algorithms - Multithreading Models - Thread Libraries - Threading Issues - Thread and Multiprocessor Scheduling Algorithms - Interprocess Communication. (9)

PROCESS SYNCHRONIZATION: The Critical Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Critical Regions, Monitors, Dining Philosophers Problem - Readers Writers Problem, Deadlocks: Characterization - Prevention - Avoidance - Detection and Recovery. (9)

MEMORY MANAGEMENT: Logical Versus Physical Address Space, Basics of linking and loading, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement algorithms, Allocation of Frames, Thrashing- Working set. (9)

FILE AND DISK MANAGEMENT: Files: Naming - Structure - Types - Access - Attributes - Operations - Implementation. Directories: Operations - Path Names - Hierarchical Directory System - Implementation - Allocation Methods - Free Space Management, Mass Storage: Disk Structure - RAID Levels - Disk Scheduling Algorithms - Swap Space Management - Streams; Case Study: Linux, Introduction to RTOS. (9)

Total L: 45

TEXT BOOKS:

1. Silberschatz A, Galvin P and Gagne G, "Operating Systems Concepts", John Wiley and Sons, Singapore, 2016.
2. William Stallings, "Operating Systems: Internals and Design Principles", Pearson Education, New Delhi, 2018.

REFERENCES:

1. Andrew S. Tanenbaum, "Modern Operating System", 4th Edition, PHI Learning, New Delhi, 2018.
2. Achyut Godbole and Atul Kahate, "Operating Systems", 3rd Edition, Tata McGraw Hill, New Delhi, 2011.
3. Dhamdhare, "Operating Systems: A Concept Based approach", 3rd Edition, Tata McGraw Hill, New Delhi, 2015.
4. Harvey M Deitel, Paul J Deitel and David R Choffnes, "Operating Systems", 3rd Edition, Pearson Education, New Delhi, 2013.

19I405 COMPUTER NETWORKS

3 0 0 3

PHYSICAL LAYER: Transmission media, Data communications, Switching techniques, Network topologies, OSI and TCP/IP models, Protocols and Standards, Network components: Hubs - Switches - Routers - Gateways. (9)

DATA LINK LAYER: Design issues, MAC addressing, MAC Protocols: Ethernet - Token ring, Error detection and correction techniques: Checksum - Cyclic Redundancy Check -Hamming code. (9)

INTERNET LAYER: IP addressing: Classful- Classless addressing, Sub-netting, Routing algorithms: Distance vector - Link state routing, Protocols: IP- ARP- RARP, Software Defined Network. (9)

TRANSPORT LAYER: Design Issues, Port and Socket addressing, Protocols: UDP – TCP - SCTP, Flow, Error and Congestion control techniques, TCP connections, Quality of service. (9)

APPLICATION LAYER: Application layer services: DNS – WWW - Webmail, VoIP, Protocols: HTTPS - SMTP - TFTP – TELNET - SNMP. (9)

Total L: 45

TEXT BOOKS:

1. James F. Kurose, "Computer Networking: A Top-Down Approach Featuring the Internet", 7th Edition, Addison Wesley, Delhi, 2016.
2. William Stallings, "Data and Computer Communications", 10th Edition, Pearson Education, USA, 2017.

REFERENCES:

1. Douglas E. Comer, "Computer Networks and Internets", 6th Edition, Pearson Education, USA, 2016.
2. Shashi Banzal, "Data and Computer Network Communication", 2nd Edition, Firewall Media, Delhi, 2016.
3. Behrouz A. Forouzan, "Data Communication and Networking", 5th Edition, Tata McGraw Hill, Delhi, 2017.
4. Larry Peterson, Bruce Davie, "Computer Networks: A Systems Approach", 5th Edition, Elsevier, USA, 2015.

191410 DATABASE MANAGEMENT SYSTEMS LABORATORY

0 0 4 2

LIST OF EXPERIMENTS:

1. Simple SQL Queries, Constraints, Aggregation and Set operations
2. Joins, sub-queries, Embedded SQL
3. Creation of Views, Synonyms, Sequence, Indexes and Savepoint
4. Creation of Database Triggers , Procedures, Functions
5. Creation of a PL/SQL block to handle Exceptions
6. Mini Project

Total P: 60

191411 COMPUTER NETWORKS LABORATORY

0 0 4 2

LIST OF EXPERIMENTS:

1. Study of Ethreal.
2. Demonstration of Data link layer protocols using LAN Trainer Kit.
3. Traffic Analysis using Wireshark.
4. Configure switches and routers.
5. Client Server Communication using Putty
6. Demonstrate port blocking.
7. Implement e-mail server and client (SocketProgram).
8. Simulate FTP (file download and upload using Socket Program).
9. Demonstrate SNMP for monitoring the network devices
10. Simulation of RIP and OSPF using NS3/Qualnet/JSim/OmneT++.

Total P: 60

191412 OPERATING SYSTEMS LABORATORY

0 0 2 1

LIST OF EXPERIMENTS:

1. Study of Linux Commands
2. Shell Programming and awk commands
3. Process Management using System Calls: Fork, Exit, Getpid, Wait, Close, Stat
4. Implement Interprocess Communication using Pipes, Shared Memory and Message Queues
5. Implement CPU Scheduling Algorithms
6. Implement Banker's Algorithm
7. Implement Memory Management Schemes
8. Implement Page Replacement Algorithms
9. Implement Mini File Manager — Open, Close, Read, Write, Seek, Delete
10. Implement Disk Scheduling Algorithms

Total P: 30

190412 INDIAN CONSTITUTION

2 0 0 0

INTRODUCTION: Evolution of Indian Constitution; Significance of Constitution; Composition; Preamble and its Philosophy. (4)

RIGHTS, DUTIES AND DIRECTIVE PRINCIPLES: Fundamental Rights- Writs and Duties, Directive Principles of State Policy. (6)

COMPOSITION OF PARLIAMENT AND FEDERALISM: Union Government, President and Vice President, Houses of

the Parliament and their functions; Composition of State Legislature; Powers, Functions and Position of Governor, Function of Chief Ministers, Council of Ministers; The Indian Federal System, Administrative Relationship between Union and States. (8)

BILLS AND CONSTITUTION AMENDMENT PROCEDURE: Types of Bills, Stages of passing of Bill into an Act, Veto Power, Constitution Amendment Procedure, Various Amendments made and their significance for India. (6)

JUDICIARY: Supreme Court and High Court; Functions and powers, Judicial Review. (6)

Total L: 30

TEXT BOOKS:

1. Subash C. Kashyap, "Our Constitution", 5th Edition, NBT, India, New Delhi, 2015.
2. Basu D D, "Introduction to the Constitution of India", 20th Edition, Prentice Hall of India, New Delhi, 2011.

REFERENCES:

1. Brijji Kishore Sharma, "Introduction to the Constitution of India", 8th Edition, Prentice Hall of India, New Delhi, 2017.
2. Hoshiar Singh, "Indian Administration", 1st Edition, Pearson Education, New Delhi, 2011.
3. Jain M C, "The Constitution of India", 5th Edition, State Mutual Book & Periodical Service, Limited, New Delhi, 1988.
4. Shukla V N, "Constitution of India", 13th Edition, Eastern Book Company Limited, New Delhi, 2017.

19Q413 SOFT SKILLS DEVELOPMENT

0 0 2 1

SOFT SKILLS DEVELOPMENT:

1. Body Language and Professionalism
2. Interpersonal skills
3. Goal setting
4. Impression Management
5. Team Building
6. Time Management
7. Stress Management
8. Convincing Skills
9. Motivation
10. Change Management
11. Communication Confidence
12. Group discussion basics
13. Personal Interview basics
14. Resume writing

Total P: 30

REFERENCES:

1. Jeff Butterfield, "Soft Skills for Everyone", 6th Edition, Cengage Learning, Delhi, 2015.
2. Rao M S, "Soft Skills - Enhancing Employability", LK International Publishing House, New Delhi, 2011.

SEMESTER - 5

19I501 DESIGN AND ANALYSIS OF ALGORITHMS

3 0 0 3

INTRODUCTION: Role of algorithm in computing, Growth of functions, Asymptotic notations, Permutations and Combinations, Recurrences, Substitution method, Recursion tree method, Master method, Basics of Problem Classes: P, NP, NP-Complete, NP-Hard. (9)

GREEDY METHOD: Interval Scheduling, Matroids, Minimum spanning trees, Load Balancing, Single source shortest path method, Huffman coding. (9)

DIVIDE AND CONQUER : Analysis of sorting algorithms: Merge sort - Quick sort, Heap Sort, Selection sort, Binary search, Counting Inversions, Finding the Closest Pair of Points. (9)

DYNAMIC PROGRAMMING: Principles of Dynamic Programming, Weighted Interval Scheduling, All pairs shortest path, Optimal binary search tree, Multistage graphs, Knapsack problem. (9)

BACKTRACKING: Solution space and tree organization, N-queens problem, Sum of subset problem, Graph coloring, Knapsack problem, Branch and bound: 0/1 Knapsack problem, Traveling salesman problem, Assignment problem, Least Cost branch and bound. (9)

Total L: 45

TEXT BOOKS:

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", 2nd Edition, Pearson Education, New Delhi, 2017.
2. Thomas H.Cormen, Charles Leiserson, Ron Rivest and Cliff Stein, "Introduction to Algorithms", 3rd Edition, PHI Learning Pvt Ltd, New Delhi, 2018.

REFERENCES:

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press, New Delhi, 2014.
2. Steven S Skiena, "The Algorithm Design Manual", 2nd Edition, Springer, New Delhi, 2012.
3. Michael T Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis and Internet Examples", Wiley Publications, New Delhi, 2014.
4. Udit Agarwal, "Algorithms Design and Analysis", 6th Edition, Dhanpat Rai & Co, New Delhi, 2017.

19I502 SOFTWARE ENGINEERING

3 1 0 4

SOFTWARE PROCESS AND AGILE DEVELOPMENT: The Evolving Role of Software, Software Characteristics, Software Process: Software Process Models - Linear Sequential Model - Prototyping Model - RAD Model - Evolutionary Software Process Models - Incremental model - Spiral model, Agile Methodology: Extreme Programming (XP) - Scrum and Kanban, ITIL. (9 + 3)

REQUIREMENT ENGINEERING AND COST ESTIMATION: Requirements Engineering: Elicitation - Analysis and Negotiation - Validation - Management, Software Requirement Specification (SRS), Cost estimation: Function Point-Cococo Models. (9 + 3)

DESIGN MODELING: Design concepts: Abstraction, Architecture, patterns, Separation of Concerns, Modularity, Information Hiding, Functional Independence, Cohesion - Coupling, Refinement and Refactoring, Modeling with UML- Use Case Diagrams- Class Diagrams - Interaction Diagrams - Sequence Diagrams - Activity Diagrams - Component Diagrams - Deployment Diagrams. (9 + 3)

SOFTWARE CODING AND TESTING: Coding standards, Styles and Guidelines, Software testing fundamentals - White box testing - Basis path testing - Control structure testing - Black box testing - Unit Testing – Integration Testing - Validation Testing - System Testing and Debugging. (9 + 3)

SOFTWARE MAINTENANCE AND MANAGEMENT: Software Maintenance and Configuration Management, Types of Software Maintenance, Re-Engineering, Reverse Engineering, Forward Engineering, SCM Process, Version Control and Change Control. (9 + 3)

Total L: 45 +T: 15 = 60

TEXT BOOKS:

1. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", 8th Edition, McGraw Hill, USA, 2019.
2. Ian Sommerville, "Software Engineering", 10th Edition, Addison Wesley, New Delhi, 2017.

REFERENCES:

1. Richard E. Fairley, "Software Engineering Concepts", Tata McGraw Hill, New Delhi, 2008.
2. Harry Hariom Choudhary, "JAVA Coding Standards", Amazon Kindle, USA, 2013.
3. Bernard Homes, "Fundamentals of Software Testing", Wiley & Sons, USA, 2013.
4. Marnie L. Hutcheson, "Software Testing Fundamentals", Wiley & Sons, USA, 2010.

19I503 INTERNET OF THINGS

3 0 0 3

IOT CONCEPTS : Definition, Enabling technologies: Sensors - Actuators - RFID - WSN - Embedded Systems - Cloud computing - Big data analytics, IoT Prototyping platforms, Applications of IoT. (9)

COMMUNICATION PROTOCOLS, MODULE AND ARCHITECTURE : SPI, I2C, USART, UART, Modbus, TCP/IP, RF Module, Bluetooth, GSM, Zigbee, Wifi, Low Power Wide Area Networking Technologies, Layered and protocol architecture, Infrastructure protocols, Service Discovery. (9)

CLOUD - IOT SERVICES: Building blocks, Application enablement platform, Software defined networking, Cloud technology, IoT and cloud - inspired smarter environments, Emergence of Edge/Fog Clouds, Building Blocks of Software - Defined Clouds. (9)

IOT DATA ANALYTICS: Data retrieval and visualization, Fog Computing, Case Studies: Smart Cities, Smart Logistics and retail, Agriculture, Pollution Control, Health and Lifestyle, Home Automation System. (9)

SECURITY & IIOT: Threats, vulnerability and risks, Attacks and Countermeasures, IoT Attacks, Secure Design, Device level Security, Industrial IoT: Industrial process and devices, Industrial IoT data flow Architecture, Custom industrial IoT platform. (9)

Total L: 45

TEXT BOOKS:

1. Arshdeep Bahga and Vijay Madiseti, "Internet of Things: A Hands-on Approach", Universities Press (India), Hyderabad, 2014.
2. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press, United States, 2017.

REFERENCES:

1. Giacomo Veneri and Antonio Capasso , "Hands-On Industrial Internet of Things, Build a Strong and Efficient IoT Infrastructure at Industrial and Enterprise Level by Mastering Industrial IoT Network", Packt, United Kingdom, 2018.
2. Chintan Patel and Nishant Doshi, "Internet of Things Security: Challenges, Advances, and Analytics", CRC Press, United States, 2018.
3. Olivier Hersent, David Boswarthick and Omar Elloumi, "The Internet of Things: Key Applications and Protocols", John Wiley and Sons Ltd, UK, 2015.
4. Russell, Brian and Drew Van Duren, "Practical Internet of Things Security", Packt Publishing, United Kingdom, 2016.

19I504 DATA MINING**3 0 0 3**

INTRODUCTION: Data Mining Functionalities, Confluence of Data Mining: Machine Learning - Deep Learning, Data Preprocessing: Data Summarization - Data Cleaning - Data Transformation - Data Reduction: Dimensionality Reduction Techniques. (9)

ASSOCIATION MINING: Basic Concepts, Types of Association Rules, Frequent Itemset Mining Methods. (9)

CLASSIFICATION AND PREDICTION: Introduction, Decision Tree Induction, Bayesian Classification, Neural Networks: Architecture - Perceptron - Back propagation, k-Nearest Neighbor, Linear Regression, Support Vector Machine, Accuracy measures, Model Evaluation. (9)

CLUSTER ANALYSIS: Similarity and distance measures, Hierarchical Methods, Partitioning Methods, Density Based Methods, Outlier detection: Statistical Distribution Based Methods, Proximity Based Methods, Density Based Methods, Deviation Based Methods. (9)

APPLICATIONS: Natural Language Processing: Text mining - Web Mining - Graph Mining - Social Mining. (9)

Total L: 45**TEXT BOOKS:**

1. Jiawei Han, Micheline Kamber and Jian Pei, "Data Mining: Concepts and Techniques", 3rd Edition, Elsevier, New Delhi, 2012.
2. Pang Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Pearson Education, Noida, 2016.

REFERENCES:

1. Mohammed J. Zaki and Wagner Meira, "Data Mining and Analysis: Fundamental Concepts and Algorithms", Cambridge India, New Delhi, 2016.
2. Rajan Chattamvelli, "Data Mining Methods", 2nd Edition, Narosa Publishers, New Delhi, 2016.
3. Gupta G K, "Introduction to Data Mining with Case Studies", 2nd Edition, PHI Learning, New Delhi, 2014.
4. Mehmed Kantardzic, "Data Mining: Concepts, Models, Methods, and Algorithms", 3rd Edition, Wiley- IEEE Press, New Delhi, 2019.

19I510 DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY**0 0 2 1****LIST OF EXPERIMENTS:**

1. Analysis of Algorithms
2. Sorting Algorithms
3. Hashing: Collision Resolution Techniques
4. String Matching Algorithms
5. Graph Algorithms
6. Greedy Algorithms
7. Divide and Conquer
8. Dynamic programming
9. Backtracking
10. Branch and Bound

Total P: 30**19I511 DATA MINING LABORATORY****0 0 4 2****LIST OF EXPERIMENTS:**

1. Data Preprocessing
2. Association Mining Algorithms
3. Data Classification Algorithms
4. Data Prediction Algorithms
5. Data Clustering Algorithms
6. Mini Project

Total P: 60

191512 INTERNET OF THINGS LABORATORY

0 0 4 2

LIST OF EXPERIMENTS:

1. Programming with Embedded C
2. Water Level monitoring system with Peripheral devices
3. Weather Forecasting System (Via Internet)
4. Smoke Detection System
5. Workplace Monitoring System
6. Mini Project

Total P: 60

19Q513 BUSINESS AND MANAGERIAL COMMUNICATIONS

0 0 2 1

BUSINESS AND MANAGERIAL COMMUNICATIONS:

1. Advanced Group discussion
2. Advanced Resume writing
3. Mock Group discussion
4. Advanced Personal Interview
5. Mock Personal Interview
6. Cracking special Interviews
7. Essential Grammar for Placements
8. Vocabulary for Placements
9. Email writing
10. Paragraph writing
11. Essay writing

Total P: 30

REFERENCES:

1. Priyadarshi Patnaik, "Group Discussion and Interview Skills", Cambridge, New Delhi, 2011.
2. Hari Mohan Prasad and Rajnish Mohan, "How to Prepare for Group Discussion and Interview", 2nd Edition, Tata McGrawhill, New Delhi, 2009.

SEMESTER - 6

191601 WIRELESS NETWORKS

3 0 0 3

WIRELESS LAN, PAN AND WAN: IEEE 802.11 Wireless LAN Architecture - latest versions of IEEE 802.11 standards. IEEE 802.15.1 PAN - Bluetooth, UWB, IEEE 802.15.4 Low Rate WPAN - Zigbee, IEEE 802.15.6 WPAN Body Area Networks, IEEE 802.16 - WiMax. (10)

ADHOC WIRELESS NETWORKS: Characteristics of Adhoc networks, Table driven and Source Initiated on Demand routing protocols - DSDV, DSR and AODV Protocols. (10)

CELLULAR SYSTEM DESIGN: Frequency reuse, Channel assignment strategies, Handoff strategies, Improving coverage and capacity in cellular systems, GSM system architecture, 2G and 3G cellular Networks. (10)

CELLULAR 4G-5G NETWORKS: Features of 4G and 5G cellular networks, VoLTE using IP multimedia service. MIMO and OFDM Technologies for high speed wireless transmission, multicarrier chaotic sequence spread spectrum technologies for 5G cellular networks. (10)

WIRELESS SECURITY TOOLS: Kismet, Backtrack, Gerix and Aircrack-ng Tools for penetration testing, Net Stumbler and Wireshark for network scanning and packet/protocol analyzer. (5)

Total L: 45

TEXT BOOKS:

1. William Stallings, "Wireless Communications and Networks", 2nd Edition, Pearson Education, UK, 2013.
2. Siva Ram Murthy C and Manoj B S, "Ad Hoc Wireless Networks: Architectures and Protocols", 2nd Edition, Pearson, India, 2017.

REFERENCES:

1. Iti Saha Misra, "Wireless Communications and Networks 3G and Beyond", 2nd Edition, McGraw Hill Education (India) Pvt. Ltd, New Delhi, 2016.
2. Anwer Al-Dulaimi, Xianbin Wang and Chih-Lin I, "5G Networks: Fundamental Requirements, Enabling Technologies, and Operations Management", Wiley-IEEE Press, London, 2018.
3. Martin Sauter, "3G, 4G and Beyond: Bringing Networks, Devices and the Wen Together", 2nd Edition, John Wiley & Sons, United Kingdom, 2013.
4. Pallapa Venkataram and Sathish Babu B, "Wireless and Mobile Network Security", Tata Mc-Graw Hill, New Delhi, 2010.

19I602 WEB TECHNOLOGIES

3 0 0 3

INTRODUCTION: Basics of World Wide Web (WWW), Web browser, Web server, Web page: Types - Issues, Concepts of tiers, Plug-ins, Markup languages: Hypertext Markup Language 5, Extensible Markup Language (XML): Fundamentals - Schema - XML Path Language - XML Query - eXtensible Stylesheet Language Transformations (XSLT) - Namespaces, Full Stack. (7)

CLIENT SIDE SCRIPTING: Java Script: Basics - Operations and Expressions - Screen Output - Control statements - Object creation and modification - Arrays - Functions - Constructors - Events - Form validations, Document Object Model, JavaScript Object Notation, Asynchronous JavaScript and XML(AJAX). (9)

SERVER SIDE SCRIPTING AND PROGRAMMING: PHP: Validation - Cookie - Session - File handling - PHP Data Objects, Java Servlets: Introduction - Cookie - Session tracking, Java Server Pages: Elements - Java bean, Active Server Page. (9)

BACKEND FRAMEWORK: Spring: Spring beans- Spring injection- Java Persistence API handling - Web Model View Controller basics - Aspect oriented programming- Spring templates - Lombok, Hibernate: Object-Relational Mapping - Object/Grid Mapper - Java Persistence API - Annotations - Mapping - Log4j- Hibernate Query Language, RedBean. (10)

FRONTEND FRAMEWORK: ReactJS: Elements - Components, Forms - Events, Node.js: Basics - Dynamic content - Template engine - Dynamic routes - Session tracking, Validation - Error and File handling - Asynchronous await, Introduction to Angular toastr, jQuery. (10)

Total L: 45

TEXT BOOKS:

1. John Dean, "Web Programming with HTML5, CSS, and JavaScript", Jones & Bartlett Learning, US, 2018.
2. Paul Deitel, Harvey Deitel and Abbey Deitel, "Internet and World Wide Web How To Program", 5th Edition, Pearson Education, US, 2012.

REFERENCES:

1. Ashish Sharin, "Getting Started with Spring Framework", 4th Edition, Create Space Independent Publishing Platform, US, 2017.
2. Valeri Karpov and Diego Netto, "Professional AngularJS", John Wiley & Sons, Indiana, 2015.
3. Artemij Fedosejev, "React.js Essentials", Packt Publishing, UK, 2015.
4. Andrew Mead, "Advanced Node.js Development: Master Node.js by building real-world applications", Packt Publishing Ltd, UK, 2018.

19I603 ARTIFICIAL INTELLIGENCE

3 1 0 4

INTRODUCTION TO AI AND INTELLIGENT AGENTS: Foundations, History, Intelligent agents, Relationship between AI and Internet of Things, Agents, Nature of Environments, Structure of agents, Problem solving by Intelligent Search, Problem formulation, State space, Search space, Problem reduction, Searching for solutions: Uninformed search strategies. (9 + 3)

HEURISTIC AND ADVERSARY SEARCH: Informed search strategies, Local search algorithms, Online search agents, Constraint satisfaction problems, Game Playing: Minimax, Alpha-beta pruning, Stochastic games. (9 + 3)

KNOWLEDGE REPRESENTATION: Knowledge representation, Knowledge based agents, Logic, Proposition, Inference, First order logic, Inference in FOL, Resolution, Semantic networks, Frames. (9 + 3)

PLANNING AND PROBABILISTIC AGENTS: Planning problem, Partial order planning, Multi agent planning, Uncertainty and probabilistic reasoning, Bayesian Theory, Bayesian Networks. (9 + 3)

LEARNING AGENTS: Overview of different forms of learning, Learning from observations, Learning decision trees, Statistical learning methods, Instance based learning, Neural network, Case Study: Realization of Cognition for Mobile Robots. (9 + 3)

Total L: 45 +T: 15 = 60

TEXT BOOKS:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", 3rd Edition, Pearson Education, New Delhi, 2015.
2. Kevin Knight, Elaine Rich and Shivashankar B Nair, "Artificial Intelligence", 3rd Edition, Tata McGraw Hill, New Delhi, 2017.

REFERENCES:

1. Amit Konar, "Artificial Intelligence and Soft Computing: Behavioral And Cognitive Modeling of The Human Brain", CRC Press, New York, 2018.
2. Dan W Patterson, "Introduction to Artificial Intelligence and Expert Systems", PHI Learning Pvt. Ltd., New Delhi,

- 2015.
- David Poole and Alan Mackworth, "Computational Intelligence: Logical Approach", Oxford Publishing, New York, 2010.
 - Mishra R B, "Artificial Intelligence", PHI Learning Pvt. Ltd, New Delhi, 2011.

191610 WEB TECHNOLOGIES LABORATORY

0 0 4 2

LIST OF EXPERIMENTS:

- Basics of markup languages
- XML — XSD, XPath
- XML-XQuery, XSLT
- HTML, Java Script
- JSON, jQuery
- PHP - PDO (RedBean)
- JSP, Servlet — JDBC
- Programming: Python (DJANGO)
- Backend Framework
- Frontend Framework

Total P: 60

191611 MOBILE APPLICATION DEVELOPMENT LABORATORY

0 0 2 1

LIST OF EXPERIMENTS:

- Activity, Service, Broadcast Receiver, ContentProvider
- List, Expandable List View, Fragments and Notifications
- Action Bar Icon, Menu, Swipe Tab and Navigation View
- Dynamic List View from Database
- Creation of Alarm App
- Mini Project

Total P: 30

REFERENCES:

- Jeff Mcwherter, Scott Gowell and David Smith , "Professional Mobile Application Development", Wiley India Pvt Ltd, New Delhi, 2013.
- Richard Rodger, "Beginning Mobile application Development in the Cloud", Wiley India Pvt Ltd, New Delhi, 2012.
- Leigh willamson and Roland Barcia , "Enterprise Class Mobile Application Development: A Complete Lifecycle Approach for Producing Mobile Apps", IBM Press, Austin, 2015.
- Annuzzi Joseph, Lauren Darcey and Shane Conder , "Introduction to Android Application Development: Android Essentials", 5th Edition, Addison-Wesley Professional, United Kingdom, 2015.

191620 INNOVATION PRACTICES

0 0 4 2

Project based laboratory that encourages students to

- Identify real world problems from Industry.
- Understand and analyze the requirements in solving the problem.
- Design and provide effective and innovative solutions.
- Demonstrate and exhibit the project with documentation.

Total P:60

19Q613 QUANTITATIVE AND REASONING SKILLS

0 0 2 1

QUANTITATIVE AND REASONING SKILLS:

- Number System, Time and Work
- Percentages , Simple and Compound Interests
- Time, Speed and Distance
- Permutation, Combination and Probability
- Ratio and Proportion
- Profit, Loss and Partnership
- Logarithms, Progressions, Geometry and Quadratic Equations
- Coding and Decoding
- Series, Analogy and Odd Man Out
- Visual Reasoning
- Data Arrangements
- Blood Relations
- Clocks, Calendars and Direction Sense
- Cubes, Logical Connectives and Syllogisms
- Venn Diagrams, Interpretations and solving

Total P: 30

REFERENCES:

- Aggarwal R S, "Quantitative Aptitude for Competitive Examinations", 3rd Edition, S Chand Publishing, New Delhi, 2017.

2. ETHNUS, "Aptimithra", 1st Edition, McGraw-Hill Education Pvt Ltd, 2013.
3. FACE, "Aptipedia Aptitude Encyclopedia", 1st Edition, Wiley Publications, Delhi, 2016.

SEMESTER - 7

19I701 CLOUD COMPUTING

3 0 0 3

INTRODUCTION: Roots of cloud computing, Cloud characteristics, Deployment models - private, public, hybrid and community, Service models - SaaS, PaaS, IaaS, BaaS, Challenges of cloud computing - security risks and threats, Microservices. (9)

VIRTUALIZATION: Basics of Virtualization, Types of virtualization, Benefits, Provisioning and manageability, Migration, Emulation, Virtualization environment, Study on virtualization tool, Linux Container - Docker, Kubernetes, Serverless computing. (9)

CLOUD DATA STORAGE: Storage system architecture, Storage as a Service, Cloud storage landscape, Hybrid storage networking technologies: NAS and SAN - Configuration, File System: GFS, HDFS, Programming Model: Map reduce paradigm and its applications, Bigtable+GFS, Hbase+HDFS+HIVE, Amazon Simple Storage Service(S3). (9)

QUALITY OF SERVICE: Interoperability, Scalability, SLA management: Types - Lifecycle - Automated policy management in cloud, Identity management, billing and accounting, Fault tolerance, API's to interact with cloud, secure access to cloud software services. (9)

CLOUD COMPUTING FRAMEWORK: Amazon AWS, Microsoft Windows Azure, Google App Engine, OpenStack, Jelastic, iCloud, Live Mesh. (9)

Total L: 45

TEXT BOOKS:

1. Ian Foster and Dennis B Gannon, "Cloud Computing for Science and Engineering", MIT Press, Massachusetts, 2017.
2. RajkumarBuyya, James Broberg and AndrzejGoscinski, "Cloud Computing: Principles and Paradigms", Wiley India Pvt Ltd, New Delhi, 2017.

REFERENCES:

1. Mathew Portnoy, "Virtualization Essentials", Wiley India Pvt Ltd, New Delhi, 2017.
2. Thomas Erl, ZaighamMahmood and Ricardo Puttini, "Cloud Computing: Concepts, Technology and Architecture", Pearson Education, Chennai, 2017.
3. Anthony T Velte, Toby J Velte and Robert Eisenpeter, "Cloud Computing — A Practical Approach", McGraw Hill Education (I) P Ltd, Chennai, 2017.
4. Kris Jamsa , "Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security, and More", Jones and Bartlett, New Delhi, 2014.

19I702 CRYPTOGRAPHY

3 0 0 3

INTRODUCTION: Groups, Euclidean algorithm, Extended euclidean algorithm, Fermat's and Euler's theorem, Security services, Threat model, Security attacks, Characteristics of good ciphers, Shannon ciphers and perfect secrecy, Cryptanalysis: Linear and differential cryptanalysis. (9)

SYMMETRIC CIPHERS: Substitution ciphers, Transposition ciphers, Symmetric versus asymmetric techniques, Block versus stream ciphers, Symmetric cipher model, Data Encryption Standard, Advanced Encryption Standard, Block cipher modes of operation, Use of random numbers, Pseudorandom number generators, Stream ciphers, RC5. (9)

ASYMMETRIC CIPHERS: Principles of public key cryptosystems, Encryption, Key exchange, RSA, Diffie-Hellman, Fields and finite fields, ElGamal, Elliptic curve cryptography. (9)

HASH FUNCTIONS AND MESSAGE AUTHENTICATION: Requirements and applications of hash functions, Message Digest, Secure Hash Algorithm, Authentication requirements, Authentication functions, Message Authentication Codes, Hash based MAC - Block cipher based MAC: Data Authentication Algorithm and Cipher-based Message Authentication Code. (9)

DIGITAL SIGNATURE: Properties and requirements, Elgamal digital signature scheme, Schnorr digital signature scheme, Digital Signature Standard, Basics of Post-Quantum Cryptography. (9)

Total L: 45

TEXT BOOKS:

1. William Stallings, "Cryptography and Network Security - Principles and Practices", Pearson, Chennai, 2018.
2. Behrouz A Forouzan and Debdeep Mukhopadhyay, "Cryptography and Network Security", McGraw Hill Education, Chennai, 2017.

REFERENCES:

1. Bernard L Menezes and Ravinder Kumar, "Cryptography, Network Security, and Cyber Laws", Cengage Learning India, New Delhi, 2018.
2. Douglas R Stinson, "Cryptography - Theory and Practice", CRC Press, Boca Raton, 2015.
3. Atul Kahate, "Cryptography and Network Security", McGraw Hill Education, New Delhi, 2016.
4. Wenbo Mao, "Modern Cryptography", Pearson, New Delhi, 2013.

19I710 SOFTWARE TESTING LABORATORY**0 0 4 2****LIST OF EXPERIMENTS:**

1. Develop an e-commerce application by creating user stories and Agile Methodology.
2. Challenges of Testing and writing Manual Test cases for an e-commerce application.
3. Create Test plan document an e-commerce application
4. Build Requirement Traceability Matrix for an e-commerce Application
5. Web application manual testing and automated testing using SELENIUM Automation Tool.
6. Test database using automation tool DbFit/Apache JMeter.
7. Track the defects of a web application using tracking tool JIRA
8. Implement Load testing for a web application.
9. Implement Unit Testing, System Testing and Regression testing for an application.
10. Develop Software Test Metrics for the given application.

Total P: 60**REFERENCES:**

1. Sadeep Desai and Abhishek Srivastava, "Software Testing: A Practical Approach", 2nd Edition, PHI, Delhi, 2016.
2. Raghavendra Prasad MG, "Learning Selenium Testing Tools", 3rd Edition, PACKT, Birmingham, UK, 2015.
3. Ravi Sagar, "Mastering JIRA", PACKT, Birmingham, UK, 2015.

19I720 PROJECT WORK I**0 0 4 2**

The project work I involves the following:

- Identification of Real World problems
- System Requirement Analysis and Specification
- Developing a Model and Solution for the identified Problem
- Consolidated Report Preparation and Presentation

Total P:60**SEMESTER - 8****19I820 PROJECT WORK II****0 0 8 4**

The Project work II involves

- Preparing a project - brief proposal including
 - Problem Identification
 - A statement of system / process specifications proposed to be developed
 - List of possible solutions including alternatives and constraints
 - Cost benefit analysis
 - Time Line of activities
- Presentation highlighting the
 - Design based on functional requirements
 - Implementation
 - Testing & Validation
 - Results and future work
- Consolidated report based on standards

Total P:120**PROFESSIONAL ELECTIVES****19I001 BIG DATA ANALYTICS****3 0 0 3**

INTRODUCTION: Big Data Overview, Evolution of Big Data, Definition of Big Data, Challenges with Big Data - State of practice in Analytics, Key roles for New Big Data Ecosystem, Data Analytics Lifecycle Overview, Examples for Big Data Analytics. (9)

MAP REDUCE: HDFS Overview, Hadoop and Spark, Map Reduce Programming Basics, Analyzing the data with Hadoop: Java MapReduce - Developing Map Reduce Application. (9)

DATA ANALYTICS: Map reduce solution: Market Basket Analysis, K-means Clustering, Naive Bayes, Implementation in Spark - KNN Classification, Logistic Regression, streaming data analytics. (9)

TECHNOLOGY AND TOOLS: Hadoop Ecosystem: PIG - Data Storage: Value of Relational Databases - The emergence of NoSQL, Aggregate Data Models: Key value - Document Data Models - Column Family Stores - Hbase. (9)

DATA ANALYTICS USING PYTHON AND APPLICATIONS: Data Loading, Storage and File Formats - Python Libraries: NumPy - pandas - Scikit - Plotting and Visualization, Recommendation Systems, Time series Analysis, Text Analysis. (9)

Total L: 45

TEXT BOOKS:

1. EMC Education services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", John Wiley & Sons, Indiana, 2015.
2. Mahmoud Parsian, "Data Algorithms: Recipes for Scaling Up with Hadoop and Spark", O'Reilly Publishers, USA, 2015.

REFERENCES:

1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilly, USA, 2015.
2. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly Media, USA, 2017.
3. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley, USA, 2014.
4. Pramod J. Sadalage, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison Wesley, New Delhi, 2012.

19I002 COMPILER DESIGN

3 0 0 3

INTRODUCTION: Language Processors, Structure of a Compiler, Syntax-Directed Translator. (9)

LEXICAL ANALYZER: The Role of the Lexical Analyzer, Input Buffering, Specification and Recognition of Tokens - The Lexical-Analyzer Generator, Finite Automata, Regular Expressions to Automata, Design of a Lexical-Analyzer Generator. (9)

SYNTAX ANALYZER: Context-Free Grammars, Top-Down Parsing, Bottom-Up Parsing, LR Parsing. (9)

INTERMEDIATE CODE GENERATION: Variants of Syntax Trees, Three-Address Code, Types and Declarations - Translation of Expressions, Type Checking, Control Flow, Back patching, Switch-Statements, Intermediate Code for Procedures. (9)

RUN TIME ENVIRONMENT: Storage Organization, Stack Allocation of Space, Access to Nonlocal Data on the Stack - Heap Management, Garbage Collection - Trace-Based Collection - Short-Pause Garbage Collection - Code Generator: Design - DAG - A Simple Code Generator Algorithm. (9)

Total L: 45

TEXT BOOKS:

1. Alfred V Aho, Ravi Sethi and Jeffrey D.Ullman, "Compilers Principles, Techniques and Tools", 2nd Edition, Pearson Education, New Delhi, 2013.
2. Raghavan V, "Principles of Compiler Design", McGraw Hill, New Delhi, 2017.

REFERENCES:

1. Dhamdhare D M, "Compiler Construction Principles and Practice", Macmillan India Ltd, New Delhi, 2008.
2. Jean Paul Tremblay and Paul G Serenson, "The Theory and Practice of Compiler Writing", McGraw Hill, New Delhi, 2009.
3. Dick Grone, Kees van Reeuwijk, Henri E. Bal, Ceriel J.H. Jacobs and Koen Langendoen, "Modern Compiler Design", 2nd Edition, John Wiley, 2016.
4. Sudha Sadasivam G., "Compiler Design", Scitech Publications (India) Private Limited, Chennai, 2010.

19I003 COMPUTER VISION

3 0 0 3

IMAGE FORMATION: Geometric Camera Models, Intrinsic and Extrinsic Parameters, Geometric Camera Calibration - Linear and Non - linear approach, Light and Shading - Inference from shading, Modelling Interreflection, Human Color Perception. (9)

EARLY VISION: Linear Filters - Convolution, Fourier Transforms, Sampling and Aliasing, Filters as Templates, Correlation, Local Image Features - Computing the Image Gradient, Gradient - Based Edge Detectors,

Orientations, Texture - Local Texture Representations using Filters, Shape from Texture. (9)

MID-LEVEL VISION: Segmentation by Clustering: Basic Clustering Methods - The Watershed Algorithm - Segmentation Using K-means, Grouping and Model Fitting - Fitting Lines with Hough Transform, Fitting Curved Structures, Tracking - Tracking by Detection, Tracking Translations by Matching, Tracking Linear Dynamical Models with Kalman Filters. (9)

HIGH-LEVEL VISION: Registration, Registering Rigid and Deformable Objects, Smooth Surfaces and their Outlines - Contour Geometry, Koenderink's Theorem, The Bitangent Ray Manifold, Object Matching using Interpretation Trees and Spin Images, Classification, Error and Loss. (9)

OBJECT DETECTION AND RECOGNITION: Detecting Objects in Images - The Sliding Window Method, Face Detection, Detecting Humans, Boundaries and Deformable Objects, Object Recognition - Categorization, Selection, Applications - Tracking People, Activity Recognition. (9)

Total L: 45

TEXT BOOKS:

1. Forsyth and Jean Ponce David A, "Computer Vision: A Modern Approach", 2nd Edition, Pearson Education Limited, London, 2015.
2. Szeliski and Richard, "Computer vision: algorithms and applications", Springer Science & Business Media, New York, 2010.

REFERENCES:

1. Hau and Chen Chi, "Handbook of pattern recognition and computer vision", 5th Edition, World Scientific, Singapore, 2015.
2. Muhammad Sarfraz, "Computer Vision and Image Processing in Intelligent Systems and Multimedia Technologies", IGI Global, Pennsylvania, 2014.
3. Theo Gevers, ArjanGijssenij, Joost van de Weijer and Jan-Mark Geusebroek, "Color in Computer Vision: Fundamentals and Applications", Wiley, New Jersey, 2012.
4. Kale, K. V, Mehrotra S.C and Manza. R.R., "Advances in Computer Vision and Information Technology", IK International Pvt Ltd, New Delhi, 2013.

19I004 CYBER PHYSICAL SYSTEMS

3 0 0 3

INTRODUCTION: Concepts - Design challenges - Mobile cyber physical systems - Design principles - Physical system controls - Intelligence application of HDP - HMM in recognition of dynamic hand gestures. (9)

MODELING: Introduction to models of computation - Languages and tools for system design - Physical System Modeling on cognitive Unmanned Aerial vehicle - Concurrent models of computation - Continuous time model - A causal model - Mixed model - Hybrid systems. (9)

SENSOR BASED CYBER PHYSICAL SYSTEMS: Wireless Sensor and Actuator Networks for Cyber Physical Systems - Applications - Community Sensing - Wireless Embedded/Implanted Micro Systems - Architecture and Security - Application of Machine Learning in monitoring - Robotics. (9)

CIVILIAN APPLICATIONS: Energy efficient building Cyber Physical System for Smart Grid Applications - Cyber Physical System for transportation applications - Video communications - Drones - Digital Manufacturing/Industry 4.0. (9)

HEALTH CARE APPLICATIONS: CPS to improve health care - Augmented cognition for Intelligent Rehabilitation - Using Wiimote and Kinect for Cognitive Rehabilitation - Functional near - IR Spectroscopy for Auto rehabilitation. (9)

Total L: 45

TEXT BOOKS:

1. Fei Hu, "Cyber-Physical Systems: Integrated Computing and Engineering Design", CRC Press, London, 2013.
2. Rajeev Alur, "Principles of Cyber Physical Systems", MIT Press, Cambridge, 2015.

REFERENCES:

1. E. A. Lee and S. A. Seshia, "Introduction to Embedded Systems, A Cyber -Physical Systems Approach", 2nd Edition, MIT Press, Cambridge, 2017.
2. Rolf Drechsler and Ulrich Kühne, "Formal Modeling and Verification of Cyber-Physical Systems", Springer, Germany, 2015.
3. Stefan Posald, "Ubiquitous Computing: Smart Devices, Environments and Interactions", John Wiley Sons Ltd, New Delhi, 2009.
4. Maya Dimitrova and Hiroaki Wagatsuma, "Cyber-Physical Systems for Social Applications", IGI Global, Japan, 2019.

19I005 CYBER SECURITY

3 0 0 3

NETWORK AND SECURITY CONCEPTS: Information assurance - Basic cryptography - DNS - Firewalls - Virtualization, Microsoft windows security principles, Creating a managed network, Defining the boundaries of trust, Implementing the network security function- Cyber Laws. (9)

ATTACKER TECHNIQUES: Tunneling and fraud techniques, Threat infrastructure, Exploitation: Techniques to gain a foothold - Misdirection, Reconnaissance and disruption methods, Malicious code: Self-replicating codes - Evading detection and elevating privileges - Stealing information and exploitation. (9)

PHYSICAL SECURITY: Plan, Design for physical protection, Incorporating physical security into the information protection scheme, Physical access control, Implementing the measures to control access, Process evaluation, Case study: Aadhaar - Banking - Credit cards. (9)

INTRUSION DETECTION: Network vs Host based detection, Anatomy and process, Network based and host based intrusion detection systems: Architecture - Detection engine - Operational concept - Benefits and challenges, Honey pots. (9)

DETECTION TECHNOLOGY: Overview, Detection mechanism, Signatures, Traffic analysis, Intrusion detection project life cycle: Project phases - Resource estimates - Project planning - Acquisition - Deployment phase - Tuning - Deployment issues - Maintenance. (9)

Total L: 45

TEXT BOOKS:

1. James Graham, Richard Howard and Ryan Olson, "Cyber Security Essentials", Auerbach Publications, USA, 2016.
2. Dan Shoemaker and Arthur Conklin, "Cyber Security: The Essential Body of Knowledge", Cengage Learning, USA, 2012.

REFERENCES:

1. Paul E Proctor, "The Practical Intrusion Detection Handbook", Prentice Hall, USA, 2007.
2. Edward G Amoroso, "Cyber Security", Silicon Press, USA, 2006.
3. Ankit Fadia and Manu Zacharia, "Network Intrusion Alert: An Ethical Hacking Guide to Intrusion Detection", Thomson Course Technology, USA, 2010.
4. Alfred Basta, Nadine Basta and Ravinder Kumar, "Cyber Security and Cyber Laws", Cengage, New Delhi, 2018.

19I006 DEEP LEARNING

3 0 0 3

INTRODUCTION: Motivation for deep learning, Machine learning Basics: Learning algorithms - Capacity, Overfitting and Underfitting -Hyperparameters and Validation Sets - Estimators, Bias and Variance - Supervised and Unsupervised Machine Learning Algorithms - Building a Machine Learning Algorithm - Challenges in Machine Learning. (7)

DEEP FEEDFORWARD NETWORKS: Perceptron - Perceptron Learning Rule - Multi layer Perceptron - Gradient based learning - Architectural design - Activation Functions - Back-propagation for Multi Layer Perceptron- Deep Networks - Data Representation - Regularization: Parameter Regularization - Parameter Sharing and Parameter Tying - Data Augmentation - Dropout - Early Stopping -Optimization algorithms - Stochastic, Barch, Mini-Batch Methods - Adaptive learning rates: Adagrad, RMSprop. (11)

CONVOLUTION NEURAL NETWORKS: Architecture - Pooling - Convolution and its variants - State of art models - AlexNet, LeNet, ResNet - Case Study: Train Convolutional Neural Network for MNIST Digit Recognition. (9)

SEQUENCE MODELING: Recurrent Neural Networks (RNN) - Finding Gradients in Recurrent Neural Networks - Backpropagation Through Time - Bi-directional RNN - Challenges in Training RNN – LSTM (Long Short Term Memory) - Gated RNN - Case Study: Recognize the sentiments in a text. (9)

DEEP GENERATIVE MODELS: Learning in Unsupervised Setting - Principal Component Analysis - Autoencoders: Sparse, Denoising - Generative Models - Variational Autoencoder - Generative Adversial Networks. (9)

Total L: 45

TEXT BOOKS:

1. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press, USA, 2017.
2. S. Lovelyn Rose, L. Ashok Kumar and D. Karthika Renuka, "Deep Learning using Python", Wiley, New Delhi, 2019.

REFERENCES:

1. Josh Patterson and Adam Gibson, "Deep Learning: A practitioner's approach", O'Reilly, USA, 2017.
2. Francois Chollet, "Deep Learning using Python", Manning Publications, USA, 2017.
3. Yusuke Sugomori, Bostjan Kaluza, Soares and Alan M. F. Souza, "Deep Learning: Practical Neural Networks with Java", PACKT Publishing, UK, 2017.

4. N D Lewis, "Deep Learning made easy with R: A Gentle Introduction for Data Science", Createspace Independent Publishing Platform, USA, 2016.

19I007 DIGITAL IMAGE PROCESSING

3 0 0 3

FUNDAMENTALS: Digital image processing steps, Components of an image processing system, Image sampling and quantization, Basic relationships between pixels, Image Acquisition and sensing, Google Photos. (6)

IMAGE TRANSFORM: Need for image transform, 2-D Discrete Fourier transform, Properties, Discrete wavelet transform, Hadamard transform, Discrete cosine transform, Karhunen-Loeve (KL) transform. (10)

IMAGE ENHANCEMENT AND MORPHING: Intensity transformation functions, Histogram processing, Histogram equalization, Spatial filtering: Fundamentals - Smoothing and sharpening using spatial filters, Filtering in the frequency domain: Smoothing and sharpening using frequency domain filters, Introduction of morphological image processing. (10)

IMAGE SEGMENTATION: Point, Line and edge detection, Thresholding, Region based segmentation: Region growing - Region splitting and merging, Representation and description: Chain codes - Shape numbers. (10)

IMAGE COMPRESSION: Lossy and lossless compression, Coding redundancy, Spatial and temporal redundancy, Image compression models, Huffman coding, Run length coding. (9)

Total L: 45

TEXT BOOKS:

1. Rafael C Gonzalez and Richard E Woods, "Digital Image Processing", 3rd Edition, Pearson Education, New Delhi, 2017.
2. Anil K Jain, "Fundamentals of Digital Image Processing", PHI Learning, New Delhi, 2019.

REFERENCES:

1. Annadurai S, Shanmugalakshmi R, "Fundamentals of Digital Image Processing", Pearson Education, New Delhi, 2011.
2. William K Pratt, "Digital Image Processing", 4th Edition, Wiley India, New Delhi, 2011.
3. Alasdair McAndrew, "Introduction to Digital Image Processing with MATLAB", Cengage Learning, New Delhi, 2011.
4. Bhabatosh Chanda and Dwijesh Dutta Majumder, "Digital Image Processing and Analysis", 2nd Edition, PHI Learning, New Delhi, 2011.

19I008 DISTRIBUTED COMPUTING

3 0 0 3

INTRODUCTION: Characterization of distributed systems, System models: Architectural models - Fundamental models, Distributed Computing Environment. (9)

COMMUNICATION IN DISTRIBUTED ENVIRONMENT: Inter process communication, Application Program Interface for the Internet protocols, External data representation and marshaling, Client/server communication, Group communication, Remote Procedure Call communication. (9)

DISTRIBUTED ALGORITHMS: Clocks, Event and Process states, Clock synchronization, Event ordering, Logical time and logical clocks, Distributed Mutual Exclusion, Election algorithms, Consensus problems. (9)

DISTRIBUTED TRANSACTIONS: Flat and nested distributed transactions, Concurrency control, Actor model, Distributed deadlocks, Replication, Fault tolerance. (9)

DISTRIBUTED OBJECTS TECHNOLOGY: Distributed objects and remote invocation, Directory and discovery services, Case study: Synchronous and Asynchronous Remote Procedure Call - Common Object Request Broker Architecture - JAVARemote Method Invocation - Component Object Model/Distributed Component Object Model - Simple Object Access Protocol - Java Enterprise Edition and Enterprise Computing, RESTful Application Program Interface, Service-Oriented Architecture and Cloud Computing. (9)

Total L: 45

TEXT BOOKS:

1. George Coulouris and Jean Dollimore, "Distributed Systems Concept and Design", 5th Edition, Pearson Education, England, 2017.
2. Andrew S Tanenbaum and Marteen van steen, "Distributed Systems Principles and Paradigms", Prentice Hall of India, New Delhi, 2015.

REFERENCES:

1. Tanenbaum A S and Van Steen M, "Distributed Systems", 3rd Edition, Pearson Education, England, 2017.
2. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", 5th Edition, Prentice Hall of India, New Delhi, 2011.
3. Kshemkalyani, Ajay D., and Mukesh Singhal, "Distributed computing: principles, algorithms, and systems", 2nd

- Edition, Cambridge University Press, United Kingdom, 2011.
- Maarten van Steen and Andrew S. Tanenbaum, "Distributed Systems", Create space Independent Publishing Platform, USA, 2017.

19I009 GRAPHICS AND MULTIMEDIA

3 0 0 3

INTRODUCTION TO GRAPHICS: Video Display Devices, Raster-Scan systems, Random-Scan Systems, Graphics Monitors and workstations, Input Devices, Graphics Software. (9)

MULTIMEDIA: Overview, Uses of multimedia, Text, Images, Sound, Animation, Video. (9)

MULTIMEDIA TOOLS: Text Editing and Word Processing Tools, OCR Software, Painting and Drawing Tools, 3D Modeling and Animation Tools, Image-editing Tools, Sound-editing Tools, Animation, Video and Digital Movie tools.(9)

DATA COMPRESSION: Source entropy and hybrid coding, JPEG: Image preparation - Lossy sequential DCT based mode - Expanded lossy DCT based mode - Lossless mode - Hierarchical mode, MPEG: Video encoding - Audio encoding - Data stream, H.261: Image Preparation - Data stream, DVI, Data Optimization. (9)

MULTIMEDIA OPERATING SYSTEMS: Real time OS, Resource management, Process management, File systems, Database systems: Multimedia Database Management System (MDBMS) - Characteristics of an MDBMS - Data analysis - Data structure - Operations on data - Integration in a database model. (9)

Total L: 45

TEXT BOOKS:

- Ralf Steinmetz and Klara Nahrstedt, "Multimedia: Computing, Communications and Applications", Pearson, New Delhi, 2012.
- Donald D.Hearn and M.Pauline Baker, "Computer Graphics", 3rd Edition, Pearson, New Delhi, 2017.

REFERENCES:

- Ranjan Parekh, "Principles of Multimedia", Tata McGraw Hill, New Delhi, 2017.
- John F Koegel Buford, "Multimedia Systems", Addison Wesley, New York, 2009.
- Gokul S, "Multimedia Magic", BPB Publications, New Delhi, 2008.
- Fred Halsall, "Multimedia Communication, Application Networks, Protocols and Standard", Addison Wesley, New Delhi, 2009.

19I010 HEALTHCARE INFORMATICS

3 0 0 3

INTRODUCTION: Health information technology and health informatics, Language of biomedical informatics: data - information & knowledge; standards and vocabularies, Information systems and Applications for the delivery of Healthcare, Role of IT, Infrastructure challenges. (9)

ELECTRONIC HEALTH RECORDS: Evidence based Practice Models, Practice based Evidence: Features and Challenges, Relationship of EBP and PBE, Knowledge transformation, Knowledge discovery, Knowledge building, EHR Component Model, System Integration and Interoperability, Networking Systems, EHR Benefits, Key Issues. (9)

CLINICAL DECISION SUPPORT SYSTEMS: Mathematical foundations of Decision Support Systems, Decision support types, Impact, Clinical Decision Support Standards, Design and Implementation Issues, Decision Rules and Expressions, Guidelines and Workflow Models. (9)

DATA SCIENCE AND ANALYTICS: Data science in Healthcare, Characteristics of Big Data, Benefits of Data Science for Clinical Research, Approached to Analyses, Knowledge discovery and Mining: Dataset Retrieval, Preprocessing clinical, text and structured data, Sampling and Partitioning, Model Evaluation, Model Deployment. (9)

ETHICAL ISSUES IN HEALTH INFORMATICS: Legal Issues, Federal Regulations and Accreditation, Billing Issues related to EHR use, Importance of Information Security, Current Security Vulnerabilities and Challenges: Internal, External Events, Managing Security Risks: Administrative, Technical, Physical Control. (9)

Total L: 45

TEXT BOOKS:

- Hoyt R.E., Yoshihashi A.K. and Bailey N.J, "Medical informatics: A practical guide for healthcare and informatics technology professionals", 6th Edition, Lulu.com, North Carolina, 2014.
- Nelson, Ramona and Nancy Staggars, "Health Informatics - E-Book: An Interprofessional Approach", 2nd Edition, Elsevier Health Sciences, China, 2016.

REFERENCES:

- Shortliffe E. H. and Cimino, J. J, "Biomedical Informatics: Computer Applications in Health Care and Biomedicine", 4th Edition, Health Informatics, New York, 2014.
- Greenes Robert A., "Clinical decision support: the road to broad adoption", 2nd Edition, Academic Press, Cambridge, 2014.

3. Gordon D. Brown, Timothy B. Patrick and Kalyan Pasupathy, "Health Informatics: A Systems Perspective", Health Administration Press, Chicago, 2013.
4. Coiera E., Magrabi F. and Sintchenko V, "Guide to Health Informatics", 3rd Edition, CRC Press, Florida, 2015.

191011 HUMAN COMPUTER INTERACTION

3 0 0 3

HUMANS IN HCI: Perceptual - Motor Interaction: Implications for Human - Computer Interaction, Human Information Processing: An Overview for Human - Computer Interaction, Mental Models in Human - Computer Interaction, Task Loading and Stress in Human - Computer Interaction, Choices and Decisions of Computer Users. (9)

COMPUTERS IN HCI: Input Technologies and Techniques, Sensor and Recognition - Based Input for Interaction, Visual Displays, Haptic Interface, Non-speech Auditory and Cross modal Output, Network-Based Interaction, Wearable Computers, Design of Fixed, Portable, and Mobile Information Devices. (9)

REQUIREMENTS SPECIFICATION: User Experience Requirements Analysis within the Usability Engineering Lifecycle, Task Analysis, Contextual Design, Grounded Theory Method in Human-Computer Interaction and Computer-Supported Cooperative Work, An Ethnographic Approach to Design Module. (9)

DESIGN AND DEVELOPMENT: Putting Personas to Work, Prototyping Tools and Techniques, Scenario-Based Design, Participatory Design. (9)

APPLICATION/DOMAIN SPECIFIC DESIGN: Human-Computer Interaction in Health Care, Motor Vehicle-Driver Interfaces, Human - Computer Interaction in Aerospace, Human-Computer Interaction for Kids Module, Emerging Phenomena in HCI: Augmenting Cognition in HCI, Social Networks and Social Media. (9)

Total L: 45

TEXT BOOKS:

1. Andrew sears, Julie A Jacko and Lawrence Erlbaum, "The Human Computer Interaction Hand Book: Fundamentals, Evolving Technologies and Emerging Applications", CRC Press, USA, 2008.
2. John Helen Sharp, Yvanno Rogers and Jenny preece, "Interaction Design: Beyond Human Computer Interaction", Wiley, USA, 2011.

REFERENCES:

1. Ben Shneiderman, "Designing the User Interfaces Strategies for Effective Human Computer Interaction", Pearson, New Delhi, 2009.
2. Alan Dix, Janet Finlay, Gregory D Abowd and Russell Beale, "Human Computer Interaction", Pearson, New Delhi, 2012.
3. Jan Noyes and Chris Baber, "User Centered Design of Systems", Springer, Germany, 2013.
4. Don Norman, "The Design of Everyday Things", Perseus Books Group, New York, 2013.

191012 INFORMATION ETHICS

3 0 0 3

INTRODUCTION: Definition of ethics, Ethics in business world: Corporate social responsibility - Improving corporate ethics - Creating an ethical work environment, Ethical considerations in decision making, Ethics in information technology. Utilitarianism, Intrinsic and instrumental value, Acts Vs. rules, Critique of utilitarianism, Deontological theory, Rights, Rights and social contract theory, Virtue ethics, Analogical reasoning in computer ethics. (9)

PRIVACY: Privacy protection and the law: Information privacy - Privacy laws, applications and court rulings, Key privacy and anonymity issues: Data breaches - Electronic discovery - Consumer profiling - Workplace monitoring, Advanced surveillance technology. (9)

INTELLECTUAL PROPERTY: Copyrights, Patents, Trade secrets, Key intellectual issues, Ethics of IT organizations: Key ethical issues for organization - Contingent workers - Outsourcing - Whistleblowing - Green computing. (9)

PROFESSIONAL ETHICS IN COMPUTING: Formal organization - Autonomy - Codes of ethics - The culture of computing, Professional relationships: Employer - employee - Client-professional - Other stakeholders - professional - Professional-professional - Conflicting responsibilities, A legal perspective on professionalism in computing: Licensing - Selling software. (9)

COMPUTER AND INTERNET CRIME: Types of exploits - Types of perpetrators - Federal laws for prosecuting computer attacks, Implementing trustworthy computing: Risk assessment - Establishing a security policy - Educating employees and contract workers - Prevention - Detection - Response. (9)

Total L: 45

TEXT BOOKS:

1. George Reynolds, "Ethics in Information Technology", Thomson Asia Pvt. Ltd, Chennai, 2015.
2. Deborah G Johnson, "Computer Ethics", Pearson Education, New Delhi, 2009.

REFERENCES:

1. Giannis Stamatellos, "Computer Ethics - A Global Perspective", Jones and Bartlett Publishers, Canada, 2008.
2. Deborah E Bouchoux, "Intellectual Property: The law of Trademarks, Copyrights, Patents, and Trade Secrets" McGraw Hill Education, New Delhi, 2012.
3. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", 2nd Edition, Tata McGraw Hill, New Delhi, 2006.
4. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.

19I013 INTELLIGENT SYSTEMS**3 0 0 3**

INTRODUCTION: Approaches to IS Developments, Key Events and a History of Artificial Intelligence/Intelligent System, Characteristics of Intelligent System Problems, Turing Test, Representation in Intelligent System, Tools for Representation, Semantic Web, Structuring the Representation, Ontology Concepts and Tools, Expert System. (9)

PRODUCTION SYSTEM: Logic-Based Underpinnings of Rule-Based Chaining systems, Implementing Rule-Based Chaining, OO Representation, Production systems, Production Systems to Distributed, Autonomous Agents, Basic Agent Structures and Types of Agents. (9)

FUZZY LOGIC: Fuzzy System Concepts, Fuzzy System Structure, Design Procedure, Application Example, Exploring Uncertainty and Fuzzy Concepts with CLanguage Integrated Production System (CLIP) (8)

BIOLOGICALLY-INSPIRED COMPUTING AND IS: Relationship of IS to ANNs, Biology and ANN Building Blocks, Recurrent Networks and IS Applications: Basic Parameters and Recurrent Network Design-CAM Applications, Self-Organizing Systems: Self-Organization via Clustering-The c-Means Algorithm- Self-Organizing Feature Maps. (10)

COGNITIVE INTELLIGENCE: Three Faces of Cognitive Processes, The PASS Model, Cognitive Remediation, Intelligence as a Cognitive Process, The Brain and Psychometrics: PASS to CAS, Interventions: From PASS/CAS to Remediation, Modernization of PASS. (9)

Total L: 45**TEXT BOOKS:**

1. Robert J, Schalkoff, " Intelligent Systems Principles, Paradigms and Pragmatics", Jones and Bartlett Publishers, United Kingdom, 2011.
2. Timothy Papadopoulos Rauno K. Parrila John R. Kirby "Cognition, Intelligence, and Achievement", Academic Press, 2014

REFERENCE BOOKS:

1. Kosko B, "Neural Networks and Fuzzy Systems: A dynamical system approach to machine intelligence", Prentice Hall of India, 2009.
2. G.J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic Theory and Applications", Prentice Hall of India, 2009.
3. Timothy S. Ross, "Fuzzy Logic with engineering applications", Wiley India Pvt. Ltd., 2011.
4. R Beale and T Jackson, "Neural Computing, An Introduction", Adam Hilger, 1990.
5. Rao V.B and Rao H.V., "C++, Neural Networks and Fuzzy Logic", BPB Publications, 2003.

19I014 MACHINE LEARNING**3 0 0 3**

MATHEMATICAL BASICS: Definition of learning systems, Goals and applications of machine learning, Statistical decision theory, Learning versus design, Feasibility of learning, Training versus testing, Labeled versus unlabeled dataset, Error, Noise, Theory of generalization, Hypothesis class, Vapnik-Chervonenkis (VC) dimension, Bias, Variance, Learning curve, Under-fitting and over-fitting. (11)

SUPERVISED LEARNING: Learning a class from examples, Learning multiple classes, Dimensions of a supervised machine learning algorithm, Discriminant functions, Probabilistic generative models, Probabilistic discriminative models, Logistic regression, Linear regression, Perceptron Learning Algorithm. (11)

UNSUPERVISED LEARNING: Clustering, Expectation maximization (EM) for soft clustering, Semi-supervised learning with EM using labeled and unlabeled data. (8)

REINFORCEMENT LEARNING: Model-free reinforcement learning: Q Learning, Algorithm for learning Q, Convergence, Updating sequences strategies, Model based learning: Value iteration-Policy iteration, K-Armed bandit - elements. (8)

ADVANCED LEARNING APPROACHES: Ensemble learning: Boosting, Bagging, Bayesian Networks, Basic sampling methods, Markov Chain Monte Carlo. (7)

Total L: 45**TEXT BOOKS:**

1. Christopher Bishop, "Pattern Recognition and Machine Learning", Springer, New York, 2011.

2. Tom Mitchell, "Machine Learning", McGraw Hill, New York, 2017.

REFERENCES:

1. Abu Mostafa Y S, MagdonIsmail M, Lin H T, "Learning from Data", AML Book Publishers, New York, 2012.
2. Ethem Alpaydm, "Introduction to Machine Learning", 3rd Edition, PHI, New Delhi, 2015.
3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical learning", 2nd Edition, Springer, New York, 2009.
4. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, Cambridge, 2012.

19I015 MODELLING AND SIMULATION

3 0 0 3

INTRODUCTION: Advantages and Disadvantages of simulation - Areas of application - System environment - Components of a system - Discrete and continuous system - Model of a system, Types of models - Steps in a simulation study, Simulation Examples: Simulation of Queueing Systems - Simulation of Inventory Systems. (9)

MATHEMATICAL AND STATISTICAL MODELS: Statistical Models in simulation: Terminology and Concepts - Discrete Distribution - Continuous Distribution - Poisson Process, Estimation of statistical parameters, Queueing Models: Characteristics - Queueing Notation - Long run measures of performance of queueing system - Steady-State Behavior of Infinite-Population Markovian Models - Steady-State Behavior of Finite-Population Models. (9)

RANDOM NUMBER: Random Number Generation: Properties of Random Numbers - Generation of Pseudo- Random Numbers - Techniques for Generating Random Numbers - Tests for Random Numbers, Random-Variate Generation: Inverse-Transform Technique - Acceptance-Rejection Technique - Special Properties. (9)

ANALYSIS OF SIMULATION DATA: Input Modeling: Estimation of parameters - Fit tests of distributions - Data collection - Identifying the Distribution with Data - Multivariate and Time - Series Input Models, Verification and Validation of Simulation Models: Model-Building, Verification, and Validation - Verification of Simulation Models - Calibration and Validation of Models. (9)

SIMULATION OF COMPUTER SYSTEMS: Simulation Tools: Process Orientation - Event Orientation, Model Input: Modulated Poisson Process - Virtual-Memory Referencing - High level computer system simulation, CPU simulation, Memory Simulation, Monte Carlo simulation, Simulation softwares: NS-3 - OpenSim - SageMath - Tortuga, Simulation in testing. (9)

Total L: 45

TEXT BOOKS:

1. Jerry Banks and John Carson, "Discrete Event System Simulation", 4th Edition, PHI, USA, 2017.
2. Pushpa Singh and Narendra Singh, "Modeling and Simulation", S.K.Kataria and sons, New Delhi, 2012.

REFERENCES:

1. Geoffrey Gordon, "System Simulation", 2nd Edition, PHI, USA, 2012.
2. Frank L. Severance, "System Modeling and Simulation", Wiley, England, 2005.
3. Averill M. Law and W.David Kelton, "Simulation Modeling and Analysis", 3rd Edition, McGraw Hill, New York, 2011.
4. Jerry Banks, "Handbook of Simulation: Principles, Methodology, Advances, Applications and Practice", Wiley-Interscience, USA, 2015.

19I016 MULTI-CORE COMPUTING

3 0 0 3

FUNDAMENTALS OF COMPUTER DESIGN: Classes of Computers - Trends in technology, power, energy and cost, Dependability-Quantitative Principles of Computer Design, Pipelining: Basic Concepts and Hazards. (9)

INSTRUCTION LEVEL PARALLELISM: ILP concepts -Compiler Techniques for Exposing ILP -Dynamic Branch Prediction -Dynamic Scheduling -Multiple instruction Issue -Hardware Based Speculation -Staticscheduling - Multi-threading-Limitations of ILP - VLIWand EPIC. (9)

DATA-LEVEL PARALLELISM: Vector Processor -SIMD extensions - Graphics Processing units - Large scale multiprocessors and scientific applications. (9)

THREAD LEVEL PARALLELISM: Symmetric and Distributed Shared Memory Architectures - Performance - Synchronization - Models of Memory Consistency - Case studies. (9)

MEMORY AND STORAGE SYSTEMS: Optimization of Cache Performance and Memory Technology, Types of Storage Devices - Buses - RAID - Reliability, Availability and Dependability - I/O Performance Measure. (9)

Total L: 45

TEXT BOOKS:

1. John L Hennessey and David A Patterson, "Computer Architecture A Quantitative Approach", 6th Edition, Morgan Kaufmann Elsevier, USA, 2019.
2. Kai Hwang and Faye Briggs, "Computer Architecture and Parallel Processing", Mc Graw-Hill International

Edition, New Delhi, 2016.

REFERENCES:

1. Kai Hwang and Naresh Jotwani, "Advanced Computer Architecture: Parallelism, Scalability, Programmability", 2nd Edition, Mc Graw-Hill International Edition, New Delhi, 2013.
2. Dezsó Sima, Terence Fountain and Peter Karsuk, "Advanced Computer Architectures: A Design Space Approach", Pearson, New Delhi, 2017.
3. Muhammad Yasir Qadri and Stephen J. Sangwine, "Multicore Technology: Architecture, Reconfiguration, and Modelling", CRC Press, USA, 2017.
4. Yan Solihin, "Fundamentals of Parallel Multicore Architecture", CRC Press, Taylor & Francis Group, USA, 2016.

19I017 NATURAL LANGUAGE PROCESSING

3 0 0 3

INTRODUCTION: Origin of NLP - Language - Grammar - Processing Indian Languages - NLP Applications - Information Retrieval - Grammar-based Language Models - Statistical Language Model. (9)

MORPHOLOGY AND PART OF SPEECH TAGGING: Linguistic essentials, Lexical syntax, Morphology and Finite State Transducers, Part of speech Tagging, Rule-Based Part of Speech Tagging, Markov Models: Hidden Markov models, Transformation based Models, Maximum Entropy Models. (9)

SYNTAX PARSING: Syntax Parsing, Grammar formalisms and tree banks, Parsing with Context Free Grammars, Features and Unification, Statistical parsing and probabilistic CFGs (PCFGs) - Lexicalized PCFGs. (9)

SEMANTIC ANALYSIS: Semantic Analysis, Lexical semantics, Word-sense disambiguation, Supervised and Unsupervised Approaches, Compositional semantics Semantic Role Labeling and Semantic Parsing, Discourse Analysis. (9)

APPLICATIONS: Named entity recognition and relation extraction - IE using sequence labeling - Machine Translation (MT), Basic issues in MT - Statistical translation - word alignment - phrase-based translation - Question Answering. (9)

Total L: 45

TEXT BOOKS:

1. Tanveer Siddiqui and U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, New Delhi, 2008.
2. Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", 3rd Edition, Prentice Hall, USA, 2014.

REFERENCES:

1. James Allen, "Natural Language Understanding", 2nd Edition, Benjamin /Cummings publishing company, CA, USA, 2003.
2. Bates M and Weischedel RM, "Challenges in natural language processing", Cambridge University Press, New York, USA, 2006.
3. Bharati A, Sangal R and Chaitanya V, "Natural language processing: a Paninian perspective", PHI, New Delhi, 2000.
4. Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python", O'Reilly Media, USA, 2009.

19I018 NETWORK SECURITY

3 0 0 3

NETWORK SECURITY: Threats in networks, Network security controls, Intruders, Intrusion detection, Password management, Malicious software, Firewalls: Need - Characteristics - Types - Firewall basing - Firewall location and configurations. (9)

AUTHENTICATION AND IP SECURITY: Kerberos, X.509 Authentication Service, Public Key Infrastructure, IP security overview, IP security policy, Encapsulating Security Payload (ESP), Combining security associations, Key Management, VPN. (9)

WEB SECURITY: Web security considerations, Secure Socket Layer (SSL), Transport Layer Security (TLS), HTTPS, Secure Shell (SSH), Secure DNS, Phishing. (9)

ELECTRONIC MAIL SECURITY: Store and forward, Security services, Establishing keys, Privacy, Authentication of the source, Message integrity, Non-Repudiation, Proof of submission and delivery, Pretty Good Privacy (PGP), Secure/Multipurpose Internet Mail Extension (S/MIME), Email spamming. (9)

WIRELESS NETWORK SECURITY: IEEE 802.11 wireless LAN overview, IEEE 802.11i wireless LAN security, Wireless Application Protocol (WAP), Wireless Transport Layer Security (WTLS), WAP end-to-end security. (9)

Total L: 45

TEXT BOOKS:

1. William Stallings, "Cryptography and Network Security - Principles and Practice", 7th Edition, Pearson Education, USA, 2018.
2. Atul Kahate, "Cryptography and Network Security", 4th Edition, McGraw Hill Education, New Delhi, 2018.

REFERENCES:

1. Behrouz A Forouzan and Debdeep Mukhopadhyay, "Cryptography and Network Security", 3rd Edition, McGraw Hill Education, New Delhi, 2017.
2. Bruce Schneier, "Applied Cryptography: Protocols, Algorithms, and Source Code in C", 2nd Edition, Wiley, New Delhi, 2017.
3. Charles P Fleeger, Shari Lawrence P Fleeger and Jonathan Margulies, "Security in Computing", 5th Edition, Prentice Hall, New Delhi, 2018.
4. Bernard L Menezes and Ravinder Kumar, "Cryptography, Network Security, and Cyber Laws", Cengage Learning India, Noida, 2018.

19I019 OPTIMIZATION TECHNIQUES**3 0 0 3**

LINEAR PROGRAMMING: Graphical method, Simplex method, Revised simplex method, Duality in linear programming, Sensitivity analysis, Transportation and assignment problems. (9)

NONLINEAR PROGRAMMING: Unconstrained optimization techniques: Direct search methods - Descent methods, Constrained optimization: Random search methods - Complex method. (9)

PERT/CPM: Network representation, Critical path computation, Crashing, PERT calculations, Resource analysis in network scheduling. (9)

DECISION ANALYSIS AND GAMES: Decision making under certainty: Analytic hierarchy process, Decision making under risk, Decision making under uncertainty, Game theory: Basic terminologies - Optimal solution of two-person zero-sum games - Solution of mixed strategy games. (9)

DYNAMIC PROGRAMMING: Formulation of Multi stage decision problem - Characteristics - Concept of sub-optimization and the principle of optimality - Formulation of Dynamic programming - Backward and Forward recursion - Computational procedure. (9)

Total L: 45**TEXT BOOKS:**

1. Hamdy A Taha, "Operations Research: An Introduction", 9th Edition, Pearson Education, Noida, 2018.
2. Singaresu S Rao, "Engineering Optimization: Theory and Practice", 4th Edition, New Age International, New Delhi, 2016.

REFERENCES:

1. Frederick S Hillier and Gerald J Lieberman, "Introduction To Operations Research: Concepts And Cases", 10th Edition, Tata McGraw Hill, New Delhi, 2018.
2. Sharma J K, "Operations Research: Theory and Applications", 6th Edition, Laxmi Publications Pvt Ltd, New Delhi, 2017.
3. Hedge R K, "Operations Research Theory and Applications", Sapna Book House, New Delhi, 2014.
4. Jon Kleinberg and Eva Tardos, "Algorithm Design", Pearson Publications, Chennai, 2018.

19I020 SECURE CODING**3 0 0 3**

INTRODUCTION: Security Concepts, Common String Manipulation Errors and Vulnerabilities - Stack overflow, Heap overflow - Off-by-one vulnerabilities, Integer Vulnerabilities, Memory management errors - Format string vulnerabilities - Concurrency and File I/O - Race conditions, Rules and recommendations of SEI CERT C and CERT Java coding Standards - Code obfuscation. (9)

THREAT MODELLING: Identifying the threats by using attack trees and rating threats using DREAD, Defense in depth and principle of least privilege - Compiler security features, Static Analysis. (9)

DATABASE AND WEB APPLICATION SECURITY: OWASP top 10 flaws, Cross Site Scripting (XSS) and its types- persistent and non-persistent attack, XSS Countermeasures - Injection flaws and remedies, CSRF, Clickjacking - Mitigation Techniques - Web application hacker's methodology. (9)

SECURE SOFTWARE DEVELOPMENT PRINCIPLES: Secure Software Development Cycle (S-SDLC) - Security Requirements Engineering- Use/Misuse case, Secure by design, default and deployment (SD3) Practices, DevSecOps. (9)

TESTING SECURE APPLICATIONS: Security code overview, Secure software installation, Building the Security Test Plan, Software Assurance overview, - Testing threat categories, Assessing Risk, Secure Testing Methodologies - Attacking Dependencies, Attacking through the User Interface, Attacking Design, Attacking Implementation. (9)

Total L: 45

TEXT BOOKS:

1. Robert C. Seaford, "Secure Coding in C and C++", 2nd Edition, Pearson Education Inc., USA, 2013.
2. Michael Howard and David LeBlanc, "Writing Secure Code", Microsoft Press, USA, 2015.

REFERENCES:

1. Dafydd Stuttard and Marcus Pinto, "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws", 2nd Edition, John Wiley & Sons, USA, 2011.
2. John Viega and Matt Messier, "Secure Programming Cookbook for C and C++", O'Reilly Media, USA, 2003.
3. Mark G Graff and Kenneth R Van Wyk, "Secure Coding: Principles and Practices", O'Reilly Media, USA, 2003.
4. Robert C. Seacord, "The CERT C Coding Standard: 98 Rules for Developing Safe, Reliable, and Secure Systems", 2nd Edition, Addison-Wesley Professional, USA, 2014.

19I021 SOFT COMPUTING

3 0 0 3

NEURAL NETWORKS: Introduction, Architectures, Basic models of ANN, Supervised learning network: Perceptron networks, Adaline, Madaline, Back propagation networks. (9)

ASSOCIATIVE MEMORY AND ART: Autocorrelators, Heterocorrelators, Exponential BAM, Adaptive resonance theory: ART1, ART2 and its Applications. (9)

FUZZY LOGIC: Fuzzy set theory: Crisp Sets, Fuzzy sets, Crisp relations and Fuzzy relations, Fuzzy systems: Crisp logic, Predicate logic, Fuzzy logic, Rule based system, Defuzzification methods. (9)

GENETIC ALGORITHMS: Genetic operators: Selection - Crossover - Reproduction - Mutation, Fitness function, Genetic programming, Applications. (9)

EVOLUTIONARY ALGORITHMS: Basic concepts, Single and multi-objective optimization, Evolutionary strategies and programming, Multi-modal function optimization, Applications. (9)

Total L: 45

TEXT BOOKS:

1. Rajasekaran S and Vijayalakshmi Pai G A, "Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications", PHI Learning, New Delhi, 2014.
2. Kalyanmoy Deb, "Multi-objective optimization using Evolutionary Algorithms", John-Wiley and Sons, New York, 2009.

REFERENCES:

1. Laurene Fausette, "Fundamentals of Neural Networks", Pearson Education, New Delhi, 2012.
2. S.N.Sivanandam and S.N.Deepa, "Principles of Soft Computing", 2nd Edition, Wiley-India, Mumbai, 2014.
3. Eiji Mizutani, Chuen Tsai Sun and Jyh Shing Roger Jang, "Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence", Pearson Education, New Delhi, 2012.
4. Bart Kosko, "Neural Networks and Fuzzy Systems - A Dynamical Systems Approach to Machine Intelligence", PHI Learning, New Delhi, 2012.

19I022 SOFTWARE PROCESS MANAGEMENT

3 0 0 3

INTRODUCTION: Software Measurement Objective, Scope of Software Metrics, Basics of Measurement - Measurement and Models -Scales and Scale Types, Classifying Software Measures. (9)

DATA COLLECTION AND ANALYSIS: Goal - Question - Metric Paradigm, Defining Good data, Quality Terminologies: Fault - Failure - Defect, Data collection Forms and Tools, Data Analysis Techniques - Box Plots, Bar charts, Control Charts, Scatter plots. (9)

EFFORT, COST ESTIMATION AND RISK MANAGEMENT: Effort estimation techniques - COCOMO - Basic COCOMO - Intermediate COCOMO - Detailed COCOMO - Cost estimation techniques - Resource Estimation techniques, Risk management - Causes of risks, Risk Categories, Risk Analysis. (9)

PROCESS MANAGEMENT AND CONTROL: Framework for Management and control - Collection of data Project termination - Visualizing progress - Cost monitoring - Earned Value Analysis- Project tracking - Change control - Software Configuration Management - Managing contracts - Contract Management. (9)

SOFTWARE TESTING: Problems with traditional development model - Verification and Validation - Test strategy and planning - Test Automation - Test Reporting - Test Artifacts. (9)

Total L: 45

TEXT BOOKS:

1. Ashfaq Ahmed, "Software Project Management—A Process driven approach", CRC Press Taylor & Francis Group, USA, 2015.
2. Norman Fenton and James Bieman, "Software Metrics: A Rigorous and Practical Approach", CRC Press, Taylor & Francis Group, USA, 2014.

REFERENCES:

1. Walker Royce, "Software Project Management", 6th Edition, Addison-Wesley, USA, 1998.
2. Gopalaswamy Ramesh, "Managing Global Software Projects", 14th Edition, McGraw Hill Education, New Delhi, 2015.
3. Jurgen Munch, Ove Armbrust and Martin Soto, "Software Process Definition and Management", Springer Publication, Berlin, 2012.
4. Robert K. Wysocki, "Effective Software Project Management", Wiley Publication, USA, 2014.

19I023 SOFTWARE QUALITY ASSURANCE**3 0 0 3**

INTRODUCTION: SQA Definitions and Concepts: Software Quality and Software Quality Assurance, Software Product, Principles of SQA, Software Errors, Faults and Failures, The causes of errors, SQA VS Software Quality Control, SQA and Software Engineering, Software Quality Factors: McCall's Classic model, ISO/IEC25010 model and other alternative models, Software Compliance, Software Quality Challenges. (9)

SQA COMPONENTS AND PROJECT LIFE CYCLE: Software quality assurance activities - Verification & Validation - Reviews - Software testing - Software testing implementations - Quality of software maintenance - Pre-Maintenance of software quality components - Quality assurance tools - CASE tools for software quality. (9)

SOFTWARE QUALITY INFRASTRUCTURE: Procedures and work instructions - Templates - Checklists - 3S development - Staff training and certification, Corrective and preventive actions - Configuration management - Software change control - Configuration management audit - Documentation control - Storage and Retrieval. (9)

SOFTWARE QUALITY MANAGEMENT & METRICS: Project process control - Computerized tools - Software quality metrics - Objectives of quality measurement - Process metrics - Product metrics - Implementation - Limitations of software metrics - Cost of software quality - Classical quality cost model - Extended model - Application of cost model. (9)

QUALITY ASSURANCE MODELS AND TRENDS: Models for Quality Assurance, ISO-9000 series, CMM, CMMI, Test Maturity Models, SPICE, Malcolm Baldrige Model, Quality Assurance Trends, Software Process - PSP and TSP, Defect Injection and prevention, Internal Auditing and Assessments, Inspections & Walkthroughs. (9)

Total L: 45**TEXT BOOKS:**

1. Nina S Godbole, "Software Quality Assurance: Principles and Practice", 2nd Edition, Alpha Science International Ltd, Pune, 2016.
2. Claude Y. Laporte and Alian April, "Software Quality Assurance", Wiley Publication, USA, 2018.

REFERENCES:

1. Alan C. Gillies, "Software Quality: Theory and Management", 3rd Edition, International Thomson Computer Press, UK, 2011.
2. Basu, Anirban, "Software Quality Assurance, Testing and Metrics", 3rd Edition, PHI Learning, New Delhi, 2015.
3. Solis Tech, "Quality Assurance – Software Quality Assurance Made Easy", Solis Tech, 2015.
4. Daniel Galin, "Software Quality Assurance", Pearson Publication, New Delhi, 2009.

19I024 SWARM INTELLIGENCE**3 0 0 3**

INTRODUCTION: Fundamentals of problems: Optimization - Modeling - Simulation, Search problems, NP problems, Sources of Inspiration: Swarm Intelligence algorithms - Non Swarm Intelligence algorithms, Biological foundations of Swarm Intelligence. (9)

COMPUTING ALGORITHMS: Particle Swarm Optimization: Swarms - Operating Principles - Algorithm - Neighborhood Topologies, Variations, Ant Colony Optimization: Ant Foraging Behavior - Theoretical Considerations - Algorithm - Variations, Introduction to Artificial Bee Colony Optimization, Applications: N-Queens problem - Knapsack problem. (9)

RECENT COMPUTING ALGORITHMS: Bat Algorithm: Basics - Variants, Artificial Fish Swarm: Fish Swarm Optimization - variants, Firefly algorithm: Introduction - Variants, Introduction to Flower Pollination algorithm, Applications: Scheduling, Shortest path. (9)

LOCAL SEARCH AND HYBRID ALGORITHMS: Simulated annealing, Tabu search, Cuckoo Search: Cuckoo Search Algorithm - Cuckoo search variants, Hybrid algorithms, Application: Minimum spanning tree problem – Travelling Salesman Problem. (9)

MULTIOBJECTIVE OPTIMIZATION: Principles of multi objective optimization, Dominance and Pareto Optimality, Methods: Non- Elitist multi objective Algorithms, Elitist multi objective algorithms. (9)

Total L: 45

TEXT BOOKS:

1. Aboul Ella Hassanien and Eid Emary, "Swarm Intelligence: Principles, Advances, and Applications", CRS Press, Boca Raton, 2018.
2. Eiben A.E and Smith J.E, "Introduction to Evolutionary Computing", 2nd Edition, Springer, New York, 2015.

REFERENCES:

1. Neumann, Frank, and Carsten Witt, "Bioinspired Computation in Combinatorial Optimization: Algorithms and their Computational Complexity", Springer, New York, 2010.
2. Satchidananda Dehuri, Alok Kumar Jagadev and Mrutyunjaya Panda, "Multi-objective Swarm Intelligence: Theoretical Advances and Applications", Springer, New York, 2015.
3. Kalyanmoy Deb, "Multi-objective optimization using evolutionary algorithms", John Wiley & Sons, USA, 2010.
4. Andries P. Engelbrecht, "Computational Intelligence: An Introduction", John Wiley & Sons, USA, 2007.

19I025 SYSTEM SOFTWARE

3 0 0 3

SYSTEM ARCHITECTURE: System software and machine architecture, Simplified Instructional Computer (SIC), CISC machines, RISC machines, Evolution of components of programming system. (9)

ASSEMBLERS: Basic assembler functions, Machine dependent assembler features, Machine independent assembler features, Assembler design. (9)

COMPILERS AND INTERPRETERS: Aspects of compilation, Memory allocation, Compilation of expressions, Compilation of control structures, Lexical analysis, Syntax analysis, Code optimization, Interpreters, Case study: Debug monitors - Editors. (9)

MACRO PROCESSORS: Macro instructions, Features of macro facility, Implementation of two-pass and single - pass algorithms, Implementation of macro calls within macros and within an assembler. (9)

LOADERS AND LINKERS: Loader functions - Absolute Loader - Bootstrap Loader - Machine dependent loader features - Relocation - Program Linking - Data Structures - Machine independent loader - Automatic Library Search Design options - Linkage Editors - Dynamic Linking. (9)

Total L: 45

TEXT BOOKS:

1. Leland L Beck, "System Software - An Introduction to Systems Programming", 3rd Edition, Pearson Education, New Delhi, 2002.
2. John J Donovan, "Systems Programming", Tata McGraw Hill, New Delhi, 2017.

REFERENCES:

1. Richard Anthony, "Systems Programming: Designing and Developing Distributed Applications", Morgan Kaufmann Publisher, USA, 2015.
2. Alfred V Aho, Ravi Sethi and Jeffrey D Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education, New Delhi, 2011.
3. Dhamdhare D M, "System Programming", Tata McGraw Hill, New Delhi, 2011.
4. Nithyashri J, "System Software", Tata McGraw Hill, New Delhi, 2010.

19I026 TCP/IP AND SOCKET PROGRAMMING

3 0 0 3

INTERNETWORKING: Concepts, Architecture, Internet addresses: IP address classes - Subnetting - Variable Length Subnetting - Supernetting - Subnet mask, CIDR, ARP, RARP, Migrating from IPv4 to IPv6, Features of IPv6, IPv6 header format. (9)

NETWORK MANAGEMENT OVER TCP: Simple Network Management Protocol (SNMP), Management Information Base (MIB), Agent, Manager, Traps, Configuration management, Fault management, Performance management, Security management, Account management, Internet management. (9)

SECURITY MANAGEMENT: Network Layer Security - IP Security - Virtual Private Network, Transport Layer Security - Secure Socket Layer, Application Layer Security - PGP - S/MIME, Firewalls. (9)

SOCKET INTERFACE: I/O paradigm and Network I/O, Creating a socket, Inheritance and termination, Connecting sockets to destination address, Obtaining information about networks, protocols and host. (9)

SOCKET PROGRAMMING APPLICATIONS: TCP echo client server, UDP echo client server, Implementation of TCP/IP in Windows Embedded CE operating system, Voice over IP, Internet security. (9)

Total L: 45

TEXT BOOKS:

1. Behrouz A Forouzan, "TCP/IP Protocol Suite", 4th Edition, Tata McGraw Hill, Chennai, 2017.
2. Douglas E Comer, "Internetworking with TCP/IP - Principles, Protocols and Architecture", 6th Edition, Pearson, New Delhi, 2013.

REFERENCES:

1. Brandon Rhodes and John Goerzen, "Foundations of Python Network Programming", 3rd Edition, Apress, India, 2014.
2. Richard Stevens W and Stephen A Rago, "Advanced Programming in the UNIX Environment", 3rd Edition, Addison Wesley, London, 2013.
3. Lydia Parziale, David T Britt and Chuck Davis, "TCP/IP 3/X: TCP/IP Tutorial and Technical Overview", 8th Edition, Vervante, 2006.
4. Charles M. Kozierok, "The TCP/IP Guide: A Comprehensive, Illustrated Internet Protocols Reference", San Francisco, 2019.

19I027 LINUX INTERNALS

3 0 0 3

INTRODUCTION TO THE LINUX KERNEL: Evolution of Linux OS, Versions of Linux, Obtaining the kernel source, Kernel source tree, Building the kernel, No libc or Standard Headers, GNU C, Synchronization and Concurrency, Importance of portability. (9)

PROCESS SCHEDULING AND MANAGEMENT: Process, Process descriptor and task structure, Process Creation, Implementation of threads, Process Termination, Process Scheduler, Policy, Scheduling Algorithm, Scheduling implementation. (9)

MEMORY MANAGEMENT: Pages, Zones, Getting Pages, kmalloc, vmalloc, Slub layer, Page cache and page writeback - Linux page cache, Buffer cache. (9)

USER KERNEL INTERFACING AND EXECUTION CONTEXTS: Syscalls, System call handler, System call implementation, System call context, Interrupts, Interrupts handler, Top Halves vs Bottom Halves, Registering - Writing-Implementing an interrupt handler, /proc interrupts, Interrupt control, Bottom Halves, Softirqs. (9)

FILE SYSTEMS, BLOCK LAYER AND DEVICE DRIVERS: Virtual file system, Block I/O Layer - Anatomy of a block device, Buffer and buffer heads, I/O scheduling, Device and Modules-Device Types, Modules, Device model. (9)

Total L: 45

TEXT BOOKS:

1. Robert Love, "Linux Kernel Development", 3rd Edition, Pearson Education Inc, Indiana, USA, 2010.
2. Daniel P. Bovot and Marco Cesati, "Understanding the Linux Kernel", 3rd Edition, O'Reilly Media, Inc, USA, 2005.

REFERENCES:

1. Jonathan Corbet, Alessandro Rubini and Greg Kroah-Hartman, "Linux Device Drivers", 3rd Edition, O'Reilly Media, Inc, CA, USA, 2009.
2. Raghu Bharadwaj, "Mastering Linux Kernel Development", Packt Publishing, UK, 2017.
3. K.C.Wang, "Systems Programming in Unix/Linux", Springer, Switzerland, 2018.
4. Mohn Lal Jangir, "Linux Kernel and Device Driver Programming: A Simpler Approach to Linux Kernel", University Science Press, New Delhi, 2014.

19I028 WEB SERVICES AND SERVICE ORIENTED ARCHITECTURE

3 0 0 3

SOA INTRODUCTION: Common Characteristics and principles of SOA, Comparison of SOA with client server and Distributed architectures, Technical and business benefits of SOA, Service Layers, Applications using SOA. (9)

RESTFUL SERVICES: REST Architectural principles, SOAP Vs REST, RESTful Key elements, RESTful Methods, Java RESTful Web Services API, REST Implementation: Building Web Service using JAX - RS, Django RESTful Web Services. (9)

SOAP COMMUNICATION: XML SOAP Building Blocks, SOAP Message Structure, SOAP Envelope Element, SOAP Attachments, UDDI, WSDL, SOAP Implementation: Building Web Service using JAX - WS, SOAP, UI Testing. (9)

WEB SERVICES AND MICROSERVICES: Role of Web services, Web services protocol stack, Communication model, Micro services -Adopting Micro services in SOA, Architectural Benefits, Deriving Business Value, Define and Apply Goal oriented Layered Approach, Design Process, Docker and Microservices, Role of Service Discovery, Applications of Microservices. (9)

WS SECURITY: WS overarching concern, Core concepts, Challenges, Threats and remedies, Securing the communication layer, Message level security, OAUTH2.2, WS security framework, WS security policy, WS trust,

WSsecure conversation, Data level security, XML encryption, XML signature.

(9)

Total L: 45

TEXT BOOKS:

1. Greg Lomow and Eric Newcomer, "Understanding SOA with Web Services", Pearson Education, New Delhi, 2013.
2. Sanjay Patni, "Pro RESTful APIs: Design, Build and Integrate with REST, JSON, XML and JAX-RS", Springer, USA, 2017.

REFERENCES:

1. Eric Newcomer, "DjangoRESTful Web Services", PACKT Publishing, Birmingham, UK, 2018.
2. IrakliNadareishvili, Ronnie Mitra and Matt McLart, "Microservice Architecture: Aligning Principles, Practices, and Culture", O'Reilly Media, New Delhi, 2016.
3. Jobinesh Purushothaman, "RESTful Java Web Services", PACKT Publishing, Birmingham, UK, 2015.
4. Mike Rosen, Boris Lublinsky, Kevin T. Smith and Marc. J. Balcer, "Applied SOA: Service Oriented Architecture and Design Strategies", 2nd Edition, Wiley, Indianapolis,USA, 2012.

191029 GEO DATABASE AND INFORMATION SYSTEMS

3 0 0 3

SPATIAL DATA MODELS AND DATA ANALYSIS: Introduction to Geographical Information Systems (GIS) - GIS and Information Systems - Components of a GIS. Spatial Data Models: Basic spatial concepts - Raster Data Structures - Raster Data Compression - Vector Data Structures - TIN and GRID data models. Data Analysis: Vector Data Analysis tools - 3D data collection and utilization. (9)

SPATIAL DATABASE MANAGEMENT SYSTEM (SDBMS): Spatial Storage and Indexing: indexing - Spatial Indexing - Grid files - R Tree - Concurrency support - Spatial Join index - Database recovery techniques. Design And Development of Spatial Data Base System (SDBMS): Exploring Spatial Geometry - Organizing spatial data - Spatial data relationships and functionalities - Tools. (9)

SPATIAL DATABASE FOR PUBLIC HEALTH AND DISEASE MAPPING: Health Datasets, Disease Registries - Geolocating Health Data - Data Security and Privacy Issues. Disease Mapping: Spatial patterns of disease - endemic and epidemic zonation - tests for spatial clustering and fragmentation - Applications of Remote Sensing and GIS in disease mapping. (9)

LOCATION AND ALLOCATION STRATEGIES: Location of health centres and service areas: P-median scenarios - Network analysis and services - emergency services and alternative locations - allocation of health resources - allocation of service areas and optimality - improving access to socio economic and geographical contexts – Case study . (9)

WEB-GIS AND APPLICATIONS: Sharing disease data and web - Ontology requirements and applications - Open source service environments - methods of XML and OGC services - Natural Resource Management - Navigation Management - Vehicle tracking and fleet management - Marketing and Business applications. (9)

Total L: 45

TEXTBOOKS:

1. Ian Heywood, Sarah Cornelius and Steve Carver, "An Introduction To Geographical Information Systems", Pearson Education, Pearson Education, United Kingdom, 2011
2. Massimo Craglia and Ravi Maheswaran, "GIS in Public Health Practice", CRC Press LLC, United Kingdom, 2019.

REFERENCES:

1. Goodchild, M. F., Maguire, D. J., Rhind, D. W. and Longley, P. A., "Geographic Information Science and Systems", Wiley, United States, 2015.
2. Kang - Tsung Chang, "Introduction to Geographic Information Systems", McGraw-Hill Education, United Kingdom, 2018.
3. Voisard, A., Rigaux, P. and Scholl, M. "Spatial Databases: With Application to GIS", Elsevier Science, United Kingdom, 2002.
4. Ellen K. Cromley, Sara L and McLafferty, "GIS and Public Health", Guilford Publications, Second Edition, United Kingdom, 2012.

191030 KNOWLEDGE REPRESENTATION AND REASONING

3 0 0 3

INTRODUCTION: Knowledge bases systems, Need for reasoning, Role of logic, Facts, Entailments, Skolemization, Computational Intractability: Herbrand theorem, Propositional case, Implications, SAT solvers. (9)

REASONING: Resolution with Horn clauses, SLD resolution, SLD Derivations: Backward chaining - Forward chaining – First-order case, Production Systems: Basic operation, Production rules, Conflict resolution. (10)

STRUCTURED DESCRIPTION: Description language, Truth in interpretations, Normalization, Structure matching, Subsumption, Applications, Epistemic Logic and Default Reasoning: Circumscription, Minimal models, Event calculus, Default Reasoning: Default logic, Autoepistemic logic, Epistemic logic. (9)

ONTOLOGIES:Semantic Web, Semantic modeling, RDF, OWL, Formal Semantics, Semantic Web application architecture, Inferencing, semantic relation in SKOS, uncertainty modeling, Data Integration. (9)

LINKED DATA: Principle, Open data to linked open data, publishing LOD, Consuming LOD, Applications. (8)

Total L: 45

Text Books:

1. Ronald J. Brachman and Hector J. Levesque, "Knowledge Representation and Reasoning", Elsevier, USA, 2004.
2. Franz Baader, Deborah L. McGuinness, Daniele Nardi and Peter F. Patel-Schneider, "The Description Logic Handbook: Theory, implementation, and applications", Cambridge University Press, 2010.

References:

1. Michael Gelfond and Yulia Kahl, "Knowledge Representation, Reasoning, and the Design of Intelligent Agents", Cambridge University Press, USA, 2014.
2. Pascal Hitzler, Markus Krotzsch and Sebastian Rudolph, "Foundations of Semantic Web Technologies", CRC Press, New York, 2010
3. Florian Bauer and Martin Kaltenböck, "Linked Open Data: The Essentials", Monochrom, Austria, 2012.
4. Bruce Porter, Frank van Harmelen, Vladimir Lifschitz, "Handbook of Knowledge Representation", Elsevier Science, 2008.

19I031 OPERATIONS RESEARCH

3 0 0 3

Introduction: Origin of Operation Research, Historical Standpoint, Methodology, Different Phases, Characteristics, Scope and Application of Operations Research, Operations research and decisionmaking, Types of mathematical models and constructing the model, Role of computers in operations research. (8)

Linear Programming Techniques: Mathematical formulation, Graphical method of solution, Simplex method, Duality in linear programming problems, Dual simplex method, Sensitivity analysis, Transportation and assignment problems, Traveling Salesman Problem, Formulation of linear programming problem, Applications and limitations, The Big M method, The twophase method, Dual problems.(10)

Game Theory: Introduction, Two-person zero-sum games, Basic terms, The maxmini minimax principle, Games without saddle points-Mixed Strategies, Graphic solution of $2 \times n$ and $m \times 2$ games, Gominance property, CPM and PERT, Project scheduling, Critical path calculations, Crashing, Unity. (9)

Queueing Theory: Basic structure of queuing systems, Roles of the Poisson and Exponential Distributions, Classification of queues. Basic results of M/M/1, FIFO systems, Extension to multiserver queues. (9)

Simulation:Simulation concepts, Simulation of a queuing system using event list, Pseudo random numbers, Multiplication congruential algorithm, Inverse transformation method, Basic ideas of Monte-Carlo simulation. (9)

Total L: 45

TEXT BOOKS:

1. Frederick S. Hillier and Gerald J. Lieberman," Introduction to Operations Research", McGraw-Hill, New Delhi, 2017.
2. G Srinivasan, "Operations Research principles and application", PHI Learning Publication Pvt. Ltd, New Delhi, 2010

REFERENCES:

1. Harvey M Wagner, "Principles of operations research with applications to managerial decisions" ,PHILearning Publication Pvt. Ltd, New Delhi, 2010.
2. Hamdy A Taha, "Operation Research – An Introduction", Pearson, New Jersey, 2017.
3. Prem kumar Gupta and Hira.D.S, "Operation Research", S Chand and Company Limited, New Delhi,2017.
4. Asoke Kumar Bhunia, Laxminarayan Sahoo and Ali Akbar Shaikh, "Advanced Optimization and Operations Research", Springer, Singapore,2020

19I032 FULLSTACK DEVELOPMENT

3 0 0 3

Introduction: Raise of Web, Mobile Web, HTML State, Application Vs Websites, Work plan, Identify the requirements, Define the work, Track the work, Kanban, Continuous Improvement, Prioritization and Estimation, Managing Bugs, Continuous Delivery, User Experience, Information Architecture,User experience right and Polish, Implementing user experience. (8)

Design System: System Architecture, Identify user interactions, Handling Commonalities, Working with legacy and external dependencies, Component interactions, Applications Vs Modules, Crossfunctional requirements, Caching, Designing of failure, Design Modules, Refactoring, Tools, Changing the architecture. (8)

Testing and Accessibility: Test-Driven Development, Test Pyramid, BehaviorDriven Development, Three Amigos, Manual Testing, Visual Testing, Cross functional testing, Accessible from the start, Working with assistive technologies, Dealing with Interactive UI, Testing for accessibility, Avoiding common mistakes.(8)

APIs and Storage: API Responsibilities, Designing REST API, Securing API, Event Based APIs, Discovering APIs, Using APIs, Jenkins Pipeline flow, Types of Databases, SQL or NoSQL, Store data, Access data from App, Manage the data, Protect the Data. (10)

Security and Deployment: Trust and secrets, Responding to incidents, The Golden Rule, Threats, Security Checklists: Injection- Broken Authentication and Session Management- Cross-Site Scripting(XSS) -Insecure Misconfiguration-Sensitive Data Exposure- Missing Functional Level Access Control, Cross-site Request Forgery(CSRF), Two Factor App ,Gitlab. (11)

Total L: 45

Text Book:

1. Chris Northwood, "The Full Stack Developer – Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer", APress, United States, 2018.
2. Frank Zammetti , "Modern Full-Stack Development: Using TypeScript, React, Node.js, Webpack, and Docker , Apress, United States, 2020 .

Reference Book:

1. Steve Fulton and Jeff Fulton, " HTML5 Canvas", O'Reilly, United States ,2013
2. Marijin Haverbeke, " Eloquent JavaScript – A Modern Introduction to Programming", No scratch Press, United States, 2018
3. Addy Osamani, " Learning JavaScript Design Patterns", O'Reilly, United States, 2012

LANGUAGE ELECTIVES

19G001 COMMUNICATION SKILLS FOR ENGINEERS

0 0 4 2

COMMUNICATION CONCEPTS :

Process of Communication
Inter and Intrapersonal Communication
Inter and Intrapersonal CommunicationActivities

(9)

FOCUS ON SOFT SKILLS :

Etiquette — Work Place etiquette — Telephone etiquette
Body Language
Persuasive Communication
Public Speaking
Critical Reasoning and Conflict Management based on Case Studies
Group Communication
Meetings
Interview Techniques

(14)

TECHNICAL WRITING :

Technical Writing Principles
Style and Mechanics
Technical Definitions – Physical, Functional and Process Descriptions
Technical Report Writing
Preparing Instructions and Manuals
Interpretation of Technical Data

(15)

BUSINESS CORRESPONDENCE :

Writing Emails
Preparing Resumes
Memos
Technical and Business Proposals

(7)

TECHNICAL COMMUNICATION :

Seminars
Process Description and Group Discussions
Use of Visual Aids

(15)

Total P: 60

TEXT BOOKS:

1. Faculty Incharge "Course Material on "Communication Skills for Engineers"", PSG College of Technology., Coimbatore, 2019

REFERENCES:

1. Jeff Butterfield "Soft Skills for Everyone", Cengage Learning., New Delhi, 2013
2. Jean Naterop B and Rod Revell "Telephoning in English", Cambridge University Press., Cambridge, 2011
3. David A Mc Murrey and Joanne Buckley "Handbook for Technical Writing", Cengage Learning., New Delhi, 2011
4. Simon Sweeney "English for Business Communication", Cambridge University Press., New Delhi, 2012

19G002 GERMAN- LEVEL A1.1**0 0 4 2****GUTEN TAG! :**

1. To greet, learn numbers till 20, practice telephone numbers & e mail address, learn alphabet, speak about countries & languages
2. Vocabulary: related to the topic
3. Grammar: W – Questions, Verbs & Personal pronouns I.

(10)

FREUNDE, KOLLEGEN UND ICH :

1. To speak about hobbies, jobs, learn numbers from 20; build dialogues and frame simple questions & answers
2. Vocabulary: related to the topic
3. Grammar: Articles, Verbs & Personal pronouns II, sein & haben verbs, ja/nein Frage, singular/plural

(10)

IN DER STADT :

1. To know places, buildings, question, know transport systems, understand international words; build dialogues and write short sentences
2. Vocabulary: related to the topic
3. Grammar: Definite & indefinite articles, Negotiation, Imperative with Sien verbs

(12)

GUTEN APPETIT! :

1. To speak about food, shop, converse; Vocabulary: related to the topic; build dialogues and write short sentences
2. Grammar: Sentence position, Accusative, Accusative with verbs, personal pronouns & prepositions, Past tense of haben & sein verbs

(13)

TAG FÜR TAG/ZEIT MIT FREUNDEN :

1. To learn time related expressions, speak about family, about birthdays, understand & write invitations, converse in the restaurant; ask excuse, fix appointments on phone
2. Vocabulary: related to the topic
3. Grammar: Time related prepositions, Possessive articles, Modalverbs

(15)

Total P: 60**TEXT BOOKS:**

1. Dengler Stefanie "Netzwerk A1.1", Klett-Langenscheidt GmbH., München, 2013
2. Sandra Evans, Angela Pude "Menschen A1", Hueber Verlag., Germany, 2012

REFERENCES:

1. Stefanie Dengler "Netzwerk A1", Klett-Langenscheidt GmbH., München, 2013
2. Hermann Funk, Christina Kuhn "Studio d A1", Goyal Publishers & Distributors Pvt. Ltd., New Delhi, 2009
3. Rosa-Maria Dallapiazza "Tangram Aktuell 1 (Deutsch als Fremdsprache)", Max Hueber Verlag., Munchen, 2004
4. Christiane Lemcke und Lutz Rohrmann "'Grammatik Intensivtrainer A 1", Goyal Publishers & Distributors Pvt. Ltd., New Delhi, 2012

19G003 FRENCH LANGUAGE LEVEL 1**0 0 4 2****PARTS OF SPEECH :**

1. inviter et répondre à une invitation, Pronoms sujets
2. L'article définis, l'article indéfinis
3. Conjugation : présent, adjectifs possessifs
4. interrogation, décrire les personnes
5. La vie de quatre parisiens de professions différentes

(12)

ELEMENTS OF GRAMMAR :

1. Exprimer l'ordre et l'obligation demander et commander
2. l'adjectif possessifs, l'article partitif, l'article démonstratif, négation ne
3. pas, l'article contracté
4. verbe pronominaux
5. prepositions

(12)

SENTENCE STRUCTURE :

1. Raconter et reporter-donner son avis
2. Futur simple, pronom complètement d'objet direct, passé composé
3. plusieurs région de France, imparfait, pronom y/en, imparfait

(12)

TENSES AND NUMBERS :

1. Demander l'autorisation-passé récent, futur proche
2. La vie administrative et régionale, Pluriel des noms, moyens de transport

(12)

DISCOURSE :

1. le discours rapporté, décrire un lieu, exprimer ses préférences
2. décrire la carrière, discuter d'système éducation de France
3. parler de la technologie de l'information

(12)

Total P: 60**TEXT BOOKS:**

1. Christine Andant étal "À propos (livre de l'élève", LANGER., NEW DELHI, 2012
2. Myrna Bell Rochester "Easy French Step By Step", MCGrawhill Companies., USA, 2008

REFERENCES:

1. Michael D. Oates "Entre Amis: An Interactive Approach", Houghton Mifflin., 2005 , 5th
2. Bette Hirsch, Chantal Thompson "Moments Literaries : An Anthology for intermediate French", ..
3. Simone Renaud, Dominique van Hooff "En bonne forme", ..

19G004 BASIC JAPANESE**0 0 4 2****JAPANESE PEOPLE AND CULTURE :**

1. Basic greetings and responses
2. Basic script — Method of writing hiragana and katakana — Combination sounds and simple words
3. Selfintroductions: "Hajimemashite" -Demonstratives "Kore", "Sore", "Are" — Demonstrative "Kono", "Sono", "Ano"
4. Possessive noun particle "no" — Japanese apartments: Greeting your neighbor

(12)

PATICLE "NI (AT)" FOR TIME :

1. kara (from) ~ made(until) — Particle "to (and)"
2. Time periods: Days of the week, months, time of day —Verbs (Present / future and pasttense)
3. Telephone enquiry: Asking for a phone no. And business hours- Destination particle "e".

(12)

LIKES AND DISLIKES :

1. Potential verbs (wakarimasu and dekimasu) — "Kara (~ because)"
2. Adverbs — Asking some one out over the phone-Verbs denoting presence
3. Introduction to Adjectives (na and ii type) -Verb groups — I, II and III — Exercises to group verbs- Please do (te kudasai)
4. Present continuous tenses (te imasu) — Shall I? (~ mashou ka) — Describing a natural phenomenon (It is raining)

(12)

DIFFERENT USAGES OF ADJECTIVES :

1. Comparison — Likes and dislikes — Going to a trip- Need and desire (ga hoshii) — Wanting to . . . (Tabeti desu)- Going for a certain purpose (mi -ni ikimasu)
2. Choosing from a menu-Adjectives ("i" and "na" type) — Adjectives (Positive and negative useage)

(12)

ROLE PLAYS IN JAPANESE :

1. Framing simple questions & answers
2. Writing Short paragraphs & Dialogues
3. A demonstration on usage of chopsticks and Japanese tea party

(12)

Total P: 60

TEXT BOOKS:

1. Minna no Nihongo, Honsatsu Roma "ji ban (Main Textbook Romanized Version)", . International publisher — 3A Corporation., Tokyo,2012

REFERENCES:

1. Eri Banno et.al "Genki I: An Integrated Course in Elementary Japanese I -Workbook", ., 1999
2. Tae Kim "A Guide to Japanese Grammar: A Japanese Approach to Learning Japanese Grammar", ., 2014
3. Minna Minna No Nihongo "Translation & Grammatical Notes In English Elementary", .,

ONE-CREDIT COURSES**19IF01 AUGMENTED REALITY****1 0 0 1**

INTRODUCTION: Definition, Components, History, Augmented Reality Vs Virtual Reality, AR Vs QR Codes, Challenges, Opportunities. (2)

AUGMENTED REALITY TYPES: Working principles of Augmented Reality, Augmented Reality Methods, Display Technology, Interaction in AR Applications, Value of Augmented Reality, Next User Interface, Uses of Augmented Reality. (4)

APPLICATION DEVELOPMENT: Mobile Application Development,Vuforia, ARlab, DroidDR, Installing tools, Building application and deploying, Experience the application. (9)

Total L: 15**REFERENCES:**

1. Greg Kipper and Joseph Rampolla, "Augmented Reality - An Emerging Technologies Guide to AR", Elsevier, USA, 2013.
2. Steve Aukstakalis, "Practical Augmented Reality: A Guide to the Technologies, Applications, and Human factors for AR and VR", Pearson Education, USA, 2017.

19IF02 BLOCK CHAIN TECHNOLOGY**1 0 0 1**

INTRODUCTION: Blockchain Data structure - Hash chain, Distributed database, Index structure. (2)

BLOCKCHAIN ARCHITECTURE: Hashes, Transactions, Asymmetric-Key Cryptography, Addresses and Address Derivation, Private Key Storage, Ledgers, Blocks, Chaining Blocks. (3)

BLOCKCHAIN IMPLEMENTATION: Forking - Soft Forks, Hard Forks, Cryptographic Changes and Forks, Smart contract programming. (4)

BLOCKCHAIN PLATFORMS: Cryptocurrencies - Bitcoin - Litecoin - Ethereum - Ripple, Hyperledger, Ethereum.(6)

Total L: 15**REFERENCES:**

1. Melanie Swan, "Blockchain - Blueprint for a New Economy", O'Reilly Media, New Delhi, 2015.
2. Narayanan, J. Bonneau, E. Felten, A. Miller and S. Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", Princeton University Press, USA, 2016.

19IF03 CYBER FORENSICS**1 0 0 1**

COMPUTER FORENSICS: Fundamentals of Computer Forensics, Computer Forensics Technology, Live data collection from Windows systems, Live data Collection from Unix systems, Data Acquisition of digital evidence from electronic media, Evidence collection and preservation, Network Forensics, Email Investigations, Mobile device forensics, Computer Forensics Analysis and Validation, Macro Threats, Information Warfare. (8)

DATA ANALYSIS: Data analysis Techniques: Preparation for Forensic Analysis, Restoring a Forensics Duplicate, Recovering deleted files on Windows systems, Recovering files from Unallocated space, Free space and Slack space, Writing Forensic Reports, Report Writing Guidelines. (7)

Total L: 15**REFERENCES:**

1. John R. Vacca , "Computer Forensics: Computer Crime Scene Investigation", 3rd Edition, Jones & Bartlett Learning, LLC, USA, 2010.
2. Chad Steel , "Windows Forensics", Wiley Publishing Inc, Indiana, 2006.

3. Dejey and Murugan , "Cyber Forensics", Oxford University Press, UK, 2018.

19IF04 EDGE/FOG COMPUTING

1 0 0 1

INTRODUCTION: IoT and New Computing Paradigms - Advantages - Hierarchy of Edge Computing - Opportunities and Challenges - Federating Edge Resources - Integration of IoT, Edge and Cloud Infrastructure - Network Slicing Management in Edge and Cloud - Optimization Problems in Edge Computing. (5)

MIDDLEWARES: Need for Middlewares, Design Goals - System Model - Actuators - Personal Devices - Fog Servers - Cloud Servers - Device Discovery - Edge Cloud Architecture - Lightweight Cluster Formation – Storage and Orchestration - Security Management for Edge Cloud Architecture. (5)

DATA MANAGEMENT AND APPLICATIONS: Edge Data Management - Life Cycle - Characteristics - Predictive Analysis with Fog Torch - Comparing iFogSim and FogTorch - Data Analytics in Edge/Fog - Prototypes and Evaluation - Applications - Exploiting Edge Computing in Health Monitoring - Smart Homes - Smart Transportation. (5)

Total L: 15

REFERENCES:

1. Rajkumar Buyya, Sathish N Srirama, "Fog and Edge Computing: Principles and Paradigms", John Wiley and Sons, USA, 2019.
2. Jie Cao, Quan Zhang, Weisong Shi, "Edge Computing: A Primer", Springer, Switzerland, 2018.

19IF05 INDUSTRIAL AUTOMATION

1 0 0 1

INTRODUCTION: Automation overview, Requirement of automation systems, Architecture of Industrial Automation system, Introduction of PLC and supervisory control and data acquisition (SCADA), Industrial bus systems: modbus & profibus. (4)

AUTOMATION COMPONENTS: Sensors for temperature, pressure, force, displacement, speed, flow, level, humidity and pH measurement, Actuators, process control valves, power electronics devices DIAC, TRIAC, power MOSFET and IGBT, DC and AC servo drives for motion control. (4)

COMPUTER AIDED MEASUREMENT AND CONTROL SYSTEMS: Role of computers in measurement and control, Elements of computer aided measurement and control, man-machine interface, computer aided process control hardware, process related interfaces, Industrial communication systems, Data transfer techniques, Internet of things (IoT) for plant automation. (4)

AUTOMATION USING ROBOTS: Basic construction and configuration of robot, Pick and place robot, Welding robot. (3)

Total L: 15

REFERENCES:

1. Frank Lamp, "Industrial Automation Hands-On", McGraw Hill, USA, 2013.
2. S.K. Singh, "Industrial Instrumentation and Control", The McGraw Hill Companies, New Delhi, 2010.
3. Thomas R.Kurfess, "Robotics and Automation Handbook", CRC Press, USA, 2005.

19IF06 MACHINE TO MACHINE COMMUNICATION

1 0 0 1

INTRODUCTION: Machine to Machine communication, Machine to Machine Market, Machine to Machine History, Early Machine to Machine, Machine to Machine Requirement. (3)

ARCHITECTURE: High-Level Architectural Principles, ETSI Machine to Machine Service Architecture, Machine to Machine Optimizations, Public Mobile Networks, Role of IP in Machine to Machine. (6)

DESIGN AND APPLICATION: Machine to Machine Security Issues, Designing Internet of Things, Building Machine to Machine - Internet of Things systems, M2M Application: Smart Cards. (6)

Total L: 15

REFERENCES:

1. David B, Omar E and Olivier H, "M2M Communications- A System Approach", John Wiley and Sons, New Delhi, 2012.
2. Vojislav B. Mistic and Jelena Mistic , "Machine to Machine Communications: Architectures, Technology, Standards and Applications", CRC Press, New Delhi, 2014.
3. Adrian McEwen and Hakim Cassimally, "Designing the Internet of Things", John Wiley and Sons, New Delhi, 2013.

19IF07 TILED-CHIP MULTI-CORE PROCESSORS

1 0 0 1

INTRODUCTION: Concept of instruction pipelining, RISC 5 stage pipeline, pipeline hazards, operand forwarding, branch prediction techniques. (2)

SCHEDULING: MIPS pipeline for handling multi-cycle operations, static and dynamic scheduling of instructions. (2)

THREADING: Multithreading - fine grained and coarse grained, super pipelining, hyper threading, superscalar processors. (2)

CACHE MEMORY: Introduction to cache memory hierarchy in multicore processors, mapping, write strategy and basic optimizations. (3)

DRAM CONTROLLERS: DRAM controllers - organization and scheduling techniques. (1)

TILED CHIP MULTICORE PROCESSORS: Tiled Chip Multicore Processors (TCMP), Network on Chip interconnection systems, basic routing and flow control techniques, Application to Core mapping techniques in TCMP. (5)

Total L: 15

REFERENCES:

1. Hennessey and Patterson, "Computer Architecture A Quantitative Approach", 5th Edition, Elsevier, USA, 2012.
2. Bruce Jacob, Spencer W. Ng and David T. Wang, "Memory System-Cache, DRAM and Disk", Elsevier, USA, 2008.
3. William James Dally, Brian Towles, "Principles and Practices of Interconnection Networks", Elsevier, USA, 2004.

19IF08 UNIFIED COMMUNICATION SERVICES

1 0 0 1

TECHNOLOGY OF UNIFIED COMMUNICATION: Unified communication (UC) and unified messaging, Components, User, Business, Basics of a switching system, Data transmission in PSTNs, Switching techniques for data transmission. (4)

CELLULAR WIRELESS NETWORKS: Principles of cellular networks, Frequency reuse, Channel assignment strategies, Handoff strategies, SNR, SIR, TDMA, FDMA and CDMA systems, OFDM Principles, Issues in rate adaptation and interference management, Applications of mobile devices: PDAs – EDAs – Smart phones. (7)

IP TELEPHONY AND VOIP: Voice digitization, Data under voice, IP telephony, IPTV, US Wireless Cable Television, VoIP, VoIP protocols - H.323, MGCP, SIP, SCCP and video conferencing. (4)

Total L: 15

REFERENCES:

1. Viswanathan T, "Telecommunication Switching Systems and Networks", PHI Learning, New Delhi, 2014.
2. Theodore S Rappaport, "Wireless Communications: Principles and Practice", Pearson Education, New Delhi, 2013.
3. Marion Cole, "Introduction to Telecommunications Voice, Data and the Internet", Pearson Education, New Delhi, 2002.
4. William Stallings, "Wireless Communication and Networks", Pearson Education, New Delhi, 2004.

19IF09 VIRTUAL REALITY

1 0 0 1

INTRODUCTION: Overview of Virtual Reality, Virtual Reality Hardware: Oculus Rift, Other High - End Head - Mounted Displays, Samsung Gear VR: Deluxe, Portable Virtual Reality, Google Cardboard: Low Cost VR for Smartphone, VR Input Devices, VR usage. (5)

VR-GOOGLE CARDBOARD FOR LOW-COST MOBILE VIRTUAL REALITY: Cardboard Basics, Cardboard Stereo Rendering and Head Tracking, Developing with the Cardboard SDK for Android and Unity, Cardboard Applications Using HTML5 and a Mobile Browser, First VR Application: About 360-Degree Panoramas, Setting Up the Project, Adding Cardboard VR Support, creating a Gaze-and-Tap User Interface. (10)

Total L: 15

REFERENCES:

1. Tony Parisi, "Learning Virtual Reality - Developing Immersive Experiences and Applications for Desktop, Web and Mobile", O'Reilly, USA, 2016.
2. Srushtika Neelakantam and Tanay Pant, "Learning Web-based Virtual Reality: Build and Deploy Web-based Virtual Reality", Apress, New Delhi, 2017.

19IF10 5G NETWORKS

1 0 0 1

5G FUNDAMENTALS AND ARCHITECTURE: Evolution of 5G, Need for 5G-5G RAN (Radio Access Network), Key features of 5G, Architecture: Key elements of 5G-3GPP standards for 5G radio and core. (7)

5G KEY TECHNOLOGIES AND WIRELESS NETWORK DEPLOYMENT: Cloud computing and NFV (Network Function Virtualization), NOMA (Non Orthogonal Multiple Access), Massive MIMO, Wireless Network Deployment: Challenges in 5G rollout - SA (Stand Alone) and NSA (Non Stand Alone) deployment. (8)

Total L: 15

REFERENCES:

1. Anwer Al-Dulaimi, Xianbin Wang and Chih-Lin I, "5G Networks: Fundamental Requirements, Enabling Technologies, and Operations Management", Wiley-IEEE Press, USA, 2018.
2. Hrishikesh Venkataraman and Ramona Trestian, "5g Radio Access Networks: Centralized Ran, Cloud Ran, And Virtualization of Small Cells", CRC PRESS, India, 2017.

ENGLISH

19GF01 INTERPERSONAL AND ORGANIZATIONAL COMMUNICATION

1 0 0 1

INTRA ORGANIZATIONAL COMMUNICATION : Communication Networks in an Organization; Intra- organizational communication (2)

INTER ORGANIZATIONAL COMMUNICATION : Flow Nomenclature; Workplace diversity and intercultural aspects of communication (2)

COMMUNICATION FUNCTIONS IN ORGANIZATIONS : Teamwork and team dynamics; Conflict resolution strategies and styles; Leading and influencing others-facilitation skills (3)

WRITTEN COMMUNICATION : Email Writing, Professional Reports, and Memos (4)

INTERPERSONAL SKILLS : Nature and Dimensions of Interpersonal Communication; Personality and Communication styles; Active listening and intentional responding; Working with emotional intelligence (4)

Total L: 15

REFERENCES:

1. Bagchi Subroto , "The Professional", Penguin Publications, UK, 2011.
2. PMBOK guide , "A Guide to the Project Management Body of Knowledge", Project Management Institute Inc, USA, 2013.

19GF02 HUMAN VALUES THROUGH LITERATURE

1 0 0 1

PROSE : Kalam's vision of college education in Wings of fire - Emerson's advocacy of independence of Human will in Self-reliance - Harmony in Education-views of Bertrand Russel (4)

POETRY : Maintaining Human relations in Robert Frost's Mending Wall - Quest for identity and freedom in Kamala Das's An Introduction (2)

DRAMA : Statesmanship and friendship in Girish Karnad's Tughlaq (3)

ONE-ACT PLAY : The theme of love in Chekhov's The Bear (3)

SHORT STORY : Empathy in Somerset maugham's Mr. Know-all - Family bond in Anita Desai's Devoted son (3)

Total L: 15

TEXT BOOKS:

1. Faculty - Department of English , "Course materials", PSG College of Technology, Coimbatore, 2019.

REFERENCES:

1. Abrams M .H, Harpham , "A Glossary of Literary Terms", Cengage, Boston, 2015.
2. Scholes R, et.al , "Elements of Literature", IV, Indian Rpt. OUP, New Delhi, 2013.

HUMANITIES

19OFA1 EXPORT – IMPORT PRACTICES

1 0 0 1

- INTRODUCTION** : Export – Import Business – Preliminaries for starting Export – Import Business Registration. (3)
- EXPORT PROCEDURES** : : Obtaining an Export License – Export Credit Insurance – Procedures and Documentation (4)
- FOREIGN EXCHANGE** : Finance for Exports – Pricing - Understanding Foreign Exchange Rates. (3)
- IMPORT PROCEDURES** : Import Policy – License - Procedure and Documentation. (3)
- EXPORT INCENTIVES** : Incentives - Institutional support (2)

Total L: 15

REFERENCES:

1. Ramagopal C , "Export Import Procedures - Documentation and Logistics", New Age International, 2014.
2. Cherian and Parab , "Export Marketing", Himalaya Publishing House, New Delhi, 2008.
3. Parul Gupta , "Export Import Management", MC-Graw Hill, 2017.
4. Justin Paul, Rajiv Aserkar , "Export Import Management", Oxford, 2013.

19OFA2 INSURANCE - CONCEPTS AND PRACTICES

1 0 0 1

- INTRODUCTION TO INSURANCE AND RISK MANAGEMENT** : Origin, History, Nature and Scope of insurance – Meaning, types and significance of risk. (3)
- INSURANCE LAWS AND REGULATIONS** : Insurance Act, IRDA Act, Consumer Protection Act, Ombudsman Scheme. (2)
- INSURANCE UNDERWRITING AND RISK MANAGEMENT** : Meaning of underwriting and underwriter, guidelines and steps in the process of underwriting – characteristics, significance and principles of risk management. (4)
- FINANCIAL ASPECTS OF INSURANCE MANAGEMENT** : Role and functions of financial institutions, determination of premium for various insurance products. (3)
- SETTLEMENT OF INSURANCE CLAIMS** : Documents needed during various claims, Factors affecting insurance claims (3)

Total L: 15

REFERENCES:

1. Scott Harrington, Gregory Niehaus , "Risk Management and Insurance", McGraw Hill Education, 2017.
2. George E Rejda , "Principles of Risk Management & Insurance", Pearson Education, 2017.
3. John Hull , "Risk Management & Financial Institution", John Wiley and Sons, 2018.
4. Arjun Mittal, D D Chaturvedi , "Insurance and Risk Management", Scholar Tech Press, 2017.

19OFA3 PUBLIC FINANCE

1 0 0 1

- INTRODUCTION**: Nature and Scope of public finance – Principles of taxation. (2)
- PUBLIC REVENUE AND TAXATION**: Sources of Revenue – Tax and non-tax revenue – Classification of Taxes, GST.

(4)

PUBLIC EXPENDITURE: Importance – Types – Causes of increase in public expenditure – Effects of public expenditure in India. (3)

DEFICIT FINANCING AND BUDGET: Sources of public debt – Debt redemption – Budget – Types – Preparation of Budget in India. (3)

FEDERAL FINANCE: Centre-State financial relations – Finance commissions.

(3)

TOTAL: 15

REFERENCE BOOKS:

1. Richard A Musgrave and Peggy B Musgrave, "Public Finance in Theory and Practice" – Tata McGraw Hill Education, New Delhi, 2004.
2. Bhatia H.L, "Public Finance" – Vikas Publishing House, 29th Edition, New Delhi, 2012.
3. David N Hyman, "Public Finance: A contemporary application of theory and policy", Cengage Publication, 11th Edition, Noida, 2014.
4. Santhosh Dalvi and Krishnan Venkatasubramanian, "An introduction to Goods and Service Tax: The biggest tax reform in India", CCH Publisher, New Delhi, 2015.

190FA4 SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

1 0 0 1

INVESTMENT ENVIRONMENT : Financial Markets - Classification - Financial Instruments – Security Trading. (2)

TYPES OF SECURITIES : Trading – Orders, Margin Trading – Clearing and Settlement Procedures. (5)

SECURITY ANALYSIS I : Industry Analysis –Estimation of Rates of Return. (2)

SECURITY ANALYSIS II : Company Analysis — Estimation of Rates of Return. (2)

PORTFOLIO MANAGEMENT : Measuring Risk and Returns and Treatment in Portfolio Management. (4)

Total L: 15

REFERENCES:

1. William F Sharpe, Gordon J. Alexander, Jeffery V Bailey , "Investments", Prentice Hall, 2012.
2. Prasanna Chandra , "Investment Analysis and Portfolio Management", TATA McGraw Hill Publishing, 2011.
3. Ranganathan , "Investment Analysis and Portfolio Management", Pearson, 2004.
4. Bhalla V K , "Investment Management", TATA McGraw Hill Publishing, 2011

190FA5SOCIAL ENTREPRENEURSHIP

1 0 0 1

INTRODUCTION TO SOCIAL ENTREPRENEURSHIP: Social Entrepreneur - Meaning, qualities and skills. Social Entrepreneurship – Characteristics, process and ecosystem – Case Studies. (3)

SOURCES OF FUNDING FOR SOCIAL ENTREPRENEURSHIP: The Social Entrepreneurship Frame work. Start-ups and funding - Internal and External. Schemes for social entrepreneurship. (4)

STRATEGIES IN SOCIAL ENTREPRENEURSHIP:Industry and Market Analysis, Business planning, concepts of value creation,new ideas and risk taking. (4)

PROSPECTS AND PROBLEMSIN SOCIAL ENTREPRENEURSHIP: Opportunities for Social entrepreneurs, an overview of legal structure, tax structure and other liabilities. (4)

TOTAL: 15

REFERENCE BOOKS:

- 1.S.S.Khanka, "Creativity and Innovation in Entrepreneurship", Sultan Chand & Sons, 2021.
- 2.C. Paramasivan, "Social Entrepreneurship", New Century Publications, 2016.
- 3.Robert A. Philips Margret Bonefiel Ritesh Sharma, "Social entrepreneurship, the next big business opportunity", Global Vision Publishing House, 2011.
- 4.Drucker, Peter, "Innovation and Entrepreneurship", Harper Business, 2006.