SEMESTER I

15L101 CALCULUS AND ITS APPLICATIONS

DIFFERENTIAL CALCULUS: Basic concepts - Limits, continuity, differentiation, functions of several variables, partial derivatives.

INTEGRAL CALCULUS: Double integrals - double integrals over rectangles, double integrals as volumes, Fubini's theorem (concept and statement only) double integrals in polar form, changing the order of integration, triple integrals in rectangular co-ordinates, triple integrals in spherical and cylindrical co-ordinates.

ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER: Basic concepts, separable differential equations, exact differential equations, integrating factors, linear differential equations, Bernoulli equation, modelling of electric circuits.

LINEAR DIFFERENTIAL EQUATIONS OF SECOND ORDER: Homogeneous linear equations of second order, linearity principle, initial value problem, general solution, second order homogeneous equations with constant coefficients, Euler – Cauchy equation, solution by variation of parameters, modelling of electric circuits.

VECTOR CALCULUS: Gradient of a scalar field, directional derivative, divergence of a vector field, curl of a vector field. Integration in vector field – line integrals, work, circulation and flux, path independence, conservative fields, surface integrals. Green’s, Gauss divergence and Stoke’s theorems (concepts and statements only), evaluation of line, surface and volume integrals.

TEXT BOOKS:

REFERENCES:

15B102/15D102 /15I102 /15L102 /15Z102 PHYSICS


Total L: 45
TEXT BOOKS:

REFERENCES:

15E/I/L/R/U/Z103 CHEMISTRY


ADVANCED MATERIALS: Carbon nanotubes and carbon fibres, graphene and polymer nano-composites-properties and applications – morphological studies by SEM and TEM. Solid oxide materials and polymer electrolytes –energy storing applications. Polymer blends and alloys, photo and electroluminescence materials, insulating materials, photopolymers and photoresists for electronics, polymer photovoltaics.


Total L: 45

TEXT BOOKS:

REFERENCES:

15L104 PROBLEM SOLVING AND C PROGRAMMING

INTRODUCTION TO PROBLEM SOLVING: Program development - Analyzing and Defining the Problem - Algorithm - Flow Chart.

PROGRAMMING LANGUAGES: Definition - Types of programming language – Modular Programming - Program Development Environment.


CONTROL STATEMENTS: If else - Switch Case - While - Do While - For - Nested loops - break – continue – goto statements.

2203

25
**FUNCTIONS:** Function prototype - Defining a function – function call - Passing arguments to a function - Storage classes - auto - static - extern and register variables.

**ARRAYS:** Defining an array - Processing an array - Passing array to a function - Multi dimensional array - Arrays & strings.

**POINTERs:** Definition - Pointer Arithmetic - Pointer and arrays – Dynamic memory allocation.

**STRUCTURES AND UNIONS:** Definitions - Processing a structure – Array and structures – Nested structures - Structures and pointers - Structures and functions.

**FILES:** Need for files – Operations on files - Sequential and Random access file functions - File Handling Functions - Error handling functions.

Preprocessor Directives - Command Line Arguments.

**TEXT BOOKS:**

**REFERENCES:**

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**15L105 PRINCIPLES OF ELECTRICAL ENGINEERING**


**NETWORK THEOREMS:** Superposition theorem - Thevenin’s theorem - Norton’s theorem - Maximum power transfer theorem - Reciprocity theorem – Introduction to dependent sources.

**SINGLE PHASE AC CIRCUITS:** Introduction to alternating quantities, average and RMS values, Circuit elements, Series and Parallel combination of circuit elements - Use of complex notation and exponential notation - Phasor representation of variables - Steady state solution using phasor algebra - Analysis of Series, Parallel and Series – Parallel circuits – Power triangle and average power


**TRANSFORMER:** Theory of Operation, Equivalent Circuit, Efficiency and Voltage Regulation Introduction to AC machines

**TEXT BOOKS:**

**REFERENCES:**
15M104 ENGLISH LANGUAGE PROFICIENCY

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)


GUIDELINES FOR WRITTEN COMMUNICATION: Principles of Clear Writing - Paragraph Writing – Essay Writing – Emphasis Techniques – Summarizing and Paraphrasing – Analytical Writing – Letter Writing (4)

WRITING PRACTICE (8)

FOCUS ON SPOKEN ENGLISH: Task – based activities with 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 (14)

LISTENING ACTIVITY: Task- based Activities using Language Lab (8)

TEXTBOOK:
Monograph prepared by the Faculty, Department of English, 2015.

REFERENCES:

Total L: 30+T: 30 =60

15L111 PHYSICS LABAROTORY I

LIST OF EXPERIMENTS:
1. Determination of wavelength of Mercury spectrum using diffraction grating
2. Determination of frequency of electrically maintained tuning fork - Melde’s Apparatus
3. Measurement of Temperature using IC temperature sensor LM35
4. Determination of thickness of a thin wire– Air Wedge method
5. Study of reverse bias characteristics of Germanium diode and determination of band gap of Ge

DEMONSTRATION:
1. Optical phenomena using He – Ne Laser.
2. Ultrasonic cleaning.
3. Thin film deposition using DC/RF sputtering technique.
4. Hall effect

REFERENCES:
1. Physics Practicals, Department of Physics, PSG College of Technology 2015

Total P: 30
15E/I/L/R/U/Z112 CHEMISTRY LABORATORY I

1. Estimation of strength of an acid by pH -metry.
2. Estimation of acids in a mixture by conductometry.
3. Anodizing of aluminium, determination of thickness of anodic film, sealing and dyeing of anodic film.
4. Determination of total, permanent, temporary, calcium and magnesium hardness of water by EDTA method.

REFERENCE:
1. Laboratory Manual Prepared by the Department.

Total P: 30

15L113 ENGINEERING PRACTICES

MODULE - I

1. Study of passive and active components and equipments (CRO, DSO, Function generator and DC power supply).
2. Construction of series and parallel circuits using resistors
3. Preparation of PCB layout and simulation of PCB (Printed circuit board)
4. Soldering of components on the PCB and testing of PCB (regulated power supply).
5. Study of types of lamps (CFL lighting, LED lighting, filament lamps) – Measurement of power.

MODULE – II

1. Welding - Metal arc welding tools and equipment, exercises by Arc welding and TIG welding Processes.
4. Plumbing-exercises-external thread cutting and joining
5. Sheet metal work & Soldering - Tools, operations, exercises Make a Rectangular Tray in Galvanized Iron sheet

REFERENCES:
1. Laboratory Manual prepared by ECE Department.
2. Laboratory manual prepared by Mechanical department, 2010.

Total P: 30

SEMESTER II

15L201 COMPLEX VARIABLES AND TRANSFORMS

COMPLEX VARIABLES: Complex differentiation-Analytic function, Cauchy Riemann equations, harmonic functions. (6+4)

COMPLEX INTEGRATION: Cauchy’s integral theorem, Cauchy’s integral formula, Laurent series (concept and statement only), singularities and zeros, residue integration method (Residue integration of complex integrals only), conformal mapping - $e^z$, $\sin z$, $\cos z$, $z+1/z$. (8+5)

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, convolution, differentiation and integration of transforms, Method of solving differential equations and integral equations by using Laplace transform technique. (12+9)

Z-TRANSFORMS: Introduction of Z-transform, Inverse transform, difference equation, application of Z-transform to solve difference equations. 

TEXT BOOKS:

REFERENCES:

15L202 MATERIALS SCIENCE


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


15L203 APPLIED ELECTROCHEMISTRY


METAL FINISHING IN ELECTRONIC INDUSTRY: Production of Plated through hole PCB’s, electroforming - fabrication of CD stampers and wave guides. Electropolishing, electrochemical machining, electrochemical etching of Cu from PCBs, Electrophoretic painting, Electrochemical etching of semiconductors.

BATTERIES AND FUEL CELLS: Batteries- types - battery characteristics-fabrication and working of dry cell, lithium primary battery, lead- acid battery, Ni – Cd, Ni-metal-hydride and lithium ion batteries. Advanced batteries and supercapacitors.
Fuel cells: Classification, working principle, components, applications of hydrogen-oxygen, solid oxide, molten carbonate, direct methanol and proton exchange membrane fuel cells. Hydrogen as a fuel-production and storage. (9)


REFERENCES:

REFERENCES:

15L204 ELECTRON DEVICES

PROPERTIES OF SEMICONDUCTOR MATERIALS: Mobility and Conductivity - Charge Densities in a Semiconductor - Generation and Recombination of Charges - Drift and Diffusion current - Continuity Equation - Injected Minority Carrier Concentration - Potential Variation within a Graded Semiconductor. (5)


FIELD EFFECT TRANSISTOR: Types - Comparison of FET and BJT - Characteristics and principle of operation of JFET - JFET parameters - JFET as an amplifier, switch, and variable resistor. CS, CD, CG Configurations - Methods of FET biasing. MOSFET - principle of operation - Depletion and Enhancement type of MOSFET - Output and Transfer Characteristics - Introduction to CMOS devices. (9)


TEXT BOOKS:

REFERENCES:

15L205 NETWORK THEORY


COUPLED CIRCUITS: Self Inductance - Co-efficient of Coupling - Dot Convention Analysis of Coupled Circuits - Ideal Transformer - Analysis of Single Tuned and Double Tuned Circuits (8)


FILTERS AND ATTENUATORS: Passive Filters - Low Pass, High Pass, Band Pass and Band Stop filters – Constant K and m-derived filter – Attenuators – T type, PI type, Lattice Attenuator

REFERENCES:

REFERENCES:

15L210 ENGINEERING GRAPHICS

INTRODUCTION: Introduction to Engineering Drawing. BIS. Principles of dimensioning.


SECTION OF SOLIDS: 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.

DEVELOPMENT OF SURFACES: Development of lateral surfaces of regular solids and truncated solids. Preparing parts like tray, funnel, CPU housing using cardboard material. Introduction to CAD Drawing.

REFERENCES:

REFERENCES:

15L211 PHYSICS LABORATORY II

List of Experiments:
1. Study of I-V characteristics of a solar cell and determination of its efficiency
2. Determination of hysteresis loss of a ferromagnetic material
3. Determination of electrical resistivity of metal and alloy using Carey Foster Bridge
4. Determination of Temperature Coefficient of Resistance of metallic wire using post office box
5. Study the characteristics of a photo diode.

Demonstration:
1. Laser micromachining.
2. Determination of Crystal structure by powder photograph method.
3. Thin film deposition using electron beam and thermal evaporation.
4. Crystal Growth System
REFERENCES:
1. Physics Practicals, Department of Physics, PSG College of Technology 2015

15L212 CHEMISTRY LABORATORY II

1. Potentiometric determination of ferrous iron.
2. Electroplating of nickel & copper and determination of cathode efficiency.
3. a. Determination of alkalinity and TDS of water.
   b. Photocolorimetric estimation of iron.
   b. Estimation of dichromate in corrosion inhibitor solution by iodometry.

REFERENCE:
1. Laboratory Manual Prepared by the Department.

15L213 CIRCUITS AND DEVICES LABORATORY

1. Verification of Kirchhoff's Voltage and Current laws.
2. Verification of Superposition theorem.
3. Verification of Thevenin's theorem and Maximum Power Transfer Theorem.
4. Verification of Reciprocity theorem.
5. PN Diode Characteristics of Silicon and Germanium Diode.
6. Waveshaping circuits: Clippers and clampsers.
8. Transistor Characteristics and h-parameter evaluation (CE, CB and CC) Configurations.
10. BJT as an Amplifier and Switch.

REFERENCE:
1. Laboratory Manual Prepared by ECE Department.

SUMMER TERM COURSES

15L215 PROFESSIONAL SKILLS

SIMULATION OF CIRCUITS USING PSpICE: DC Circuits – Bias Point Analysis, Transient Analysis, AC Analysis, AC Analysis- Proof of Theorems – Analysis and Application Development. AC Circuits – Q point Analysis. (6+9)

COMPUTATIONAL TOOLS: Basic commands – Plotting commands – Script / Function Development- Control Flow command – I/O Functions. (4+6)

PRINCIPLES OF OBJECT ORIENTED PROGRAMMING: Object Oriented Programming paradigm - Basic concepts and benefits of OOP - Object Oriented Language - Application of OOP - Structure of C++ - Applications of C++ - Operators in C++ - Manipulators. (2+2)

FUNCTIONS IN C++: Call by Reference - Return by reference - Inline functions - Default, Const Arguments - Function Overloading - Friend Functions - Classes and Objects - Member functions - Nesting of Member functions - Private member functions - Memory allocation for Objects - Static data members - Static Member Functions - Arrays of Objects - Objects as Function Arguments - Friend Functions. (3+7)

CONSTRUCTORS: Parameterized Constructors - Multiple Constructors in a Class – Destructors. (2+2)

OPERATOR OVERLOADING: Operator function – Overloading unary and binary operators – Overloading operators using friend function – Overloading extraction and insertion operators. (4+4)

INHERITANCE AND POLYMORPHISM: Defining Derived Classes – Types of inheritance – Constructors in derived and base classes – Abstract classes – Virtual functions – Dynamic polymorphism. (3+6)

Total L : 24+ P:36 = 60
REFERENCES:

15L216 IN-PLANT TRAINING & TECHNICAL SEMINAR

IN-PLANT TRAINING: Industrial Visits will be arranged for the students to be trained in the state of the art technologies. Reports and Presentations are to be done by the students after the visit.

TECHNICAL SEMINAR: Expert talks will be arranged by the faculty preferably from industries to highlight the recent trends and technologies.

Total L: 24+ P: 36 = 60

SEMESTER III

15L301 LINEAR ALGEBRA AND NUMERICAL ANALYSIS

VECTOR SPACE: General vector spaces, real vector spaces, Euclidean n-space, subspaces, linear independence, basis and dimension. (9+3)

ERRORS: Approximations and round-off errors – truncation errors. (2+1)


NONLINEAR EQUATIONS: Bisection method, False position method, Newton’s method, convergence criteria, Bairstow’s method, Graeffe’s root squaring method. (6+5)

INTERPOLATION AND CURVE FITTING: Lagrange’s polynomial, Newton’s divided differences, evenly spaced data, Chebyshev interpolation. Curve fitting - using principle of least squares approximation. (4+4)

DIFFERENTIATION AND INTEGRATION: Numerical differentiation, numerical integration - Newton-Cotes formulae, Trapezoidal rule, Simpson’s 1/3 rule, Simpson’s 3/8 rule, 2-point and 3-point Gaussian quadratures. (6+4)


Total L: 45+ P: 30 = 75

TEXT BOOKS:

REFERENCES:

15L302 ANALOG ELECTRONICS


AMPLIFIERS: BJT and FET amplifiers - equivalent circuit - calculation of input and output impedance of various configurations, cascaded BJT amplifiers - RC coupled amplifiers- Analysis at low, medium and high frequencies. DC amplifiers - Differential and common mode gain CMRR - Use of current source in emitter terminal - Cascode and Darlington amplifiers. (14)
POWER AMPLIFIERS AND FEEDBACK AMPLIFIERS: Classification - Class A/B/AB/C - single ended and Push-pull configuration - Power dissipation, output power and conversion efficiencies - Complementary-symmetry power amplifiers - Basic concepts of feedback - effect of negative feedback on input and output resistances, gain, gain stability, distortion and bandwidth - voltage and current feedback circuits.


TUNED AMPLIFIERS: Coil losses, unloaded and loaded Q of tank circuits, Analysis of single tuned amplifier, double tuned, stagger tuned amplifiers, instability of tuned amplifiers, stabilization techniques, Narrow band neutralization using coil, Broad banding using Hazeltine neutralization, Class C tuned amplifiers and their applications. Efficiency of Class C tuned Amplifier.

REFERENCES:
1. Hazeltine neutralization, Class C tuned amplifiers and their applications. Efficiency of Class C tuned Amplifier. (10)
2. Total L: 60

TEXT BOOKS:

REFERENCES:

15L303 DIGITAL ELECTRONICS

NUMBER SYSTEMS AND BOOLEAN ALGEBRA: Review of binary, octal and hexadecimal number systems - number representations - signed, unsigned, fixed point, floating point numbers - computer codes - BCD, Gray code - error detection and correction codes - parity codes - Hamming code - basic postulates, theorems - switching functions, canonical forms - logic gates - introduction to HDL.

COMBINATIONAL LOGIC DESIGN: Standard representation of logic functions - incompletely specified functions - simplification of logic functions through K-maps and Quine McClusky method - implementation using logic gates - Decoders, encoders, multiplexers and demultiplexers - implementation of combinational circuits using multiplexers - Binary/BCD adders, subtractors - Carry look ahead adder - magnitude comparator - ALU

DIGITAL LOGIC FAMILIES: Characteristics of digital ICs - voltage and current ratings - Noise margin - propagation delay - power dissipation - TTL logic family - totem pole, open collector and tristate outputs - wired output operations, MOS transistor switches - nMOS, CMOS inverters - logic gates - multiplexers, ECL logic families - comparison of performance of various logic families - interfacing TTL and CMOS devices.


MEMORY AND PROGRAMMABLE LOGIC DEVICES: Classification of memories, Read write operations - timing waveforms - Memory decoding - memory expansion, Types of ROM-PROM, EPROM, EEPROM, RAM - static RAM, Dynamic RAM - Introduction to PLDs-ROM-PAL-PLA - architecture of PLDs - implementation of digital functions using PLDs.

REFERENCES:

TEXT BOOKS:

REFERENCES:

Total L: 60
15L304  ELECTROMAGNETIC FIELDS

VECTOR ANALYSIS: Nature of scalars and vectors - Vector algebra - Vector differential operator - Gradient, Divergence and Curl operators - Line, surface and volume integrals - Cartesian cylindrical and spherical co-ordinate systems. (5+4)

STATIC ELECTRIC FIELDS: Coulomb’s law - Electric field intensity - Calculation of electric field intensity due to different charge configurations: Point charge, line charge, surface charge and volume charge - Electric flux density - Gauss law - application of Gauss law - Gauss divergence theorem. (5+4)

ELECTRIC POTENTIAL: Absolute potential - Potential difference - Calculation of potential for different configurations - Potential gradient - Electric dipole - Energy density in the electrostatic field. (5+2)


BOUNDARY VALUE PROBLEMS: Poisson's equation – Laplace's equation – Solution of Laplace equation in one variable - Solution of Laplace equation in two variables using variable separable method - Applications for Laplace’s equation - Capacitance - Parallel plate, coaxial and spherical capacitors. (5+4)

STEADY MAGNETIC FIELDS: Biot savart's Law - Magnetic field intensity - Amperes circuitual law - Curl and Stoke’s theorem - Magnetic flux density - Magnetic scalar and vector potentials. (5+4)


MAGNETIC CIRCUITS: Basic expressions for self and mutual inductances - Inductance evaluation for solenoid, toroid, coaxial cables and transmission lines - Energy stored in magnetic fields - Force on a magnetic material - Lifting power of a magnet. (5+4)


Total L: 45+T:30=75

TEXT BOOKS:

REFERENCES:

15L305  MEASUREMENTS AND INSTRUMENTATION


INDICATING INSTRUMENTS: D’ARSONAL Galvanometer- PMMC Mechanism- DC Ammeters and voltmeters- AC current and voltage measurements - RLC measurements - Using ac and dc bridges - measurement of incremental inductance and low capacitances - AC voltmeters using rectifiers - digital voltmeters - Q meters-RF power and voltage measurement-high frequency measurement of inductances and capacitances. (7+7)

INSTRUMENTS FOR SIGNAL GENERATION AND ANALYSIS: Introduction- Sine wave generator- frequency synthesized signal generator-pulse and square wave generator-Wave analyzers-harmonic distortion analyzer-spectrum analyzer- heterodyne wave analyzer-frequency counter and time interval measurement- Block diagram of General Purpose Oscilloscope Measurement of voltage, current, phase and frequency using CRO. (6+6)

ANALOG AND DIGITAL DATA ACQUISITION SYSTEMS: Components of analog and digital data acquisition systems Instrumentation Systems-Interfacing transducers to Electronic control and measuring instruments-Multiplexing-Types of multiplexing systems-Uses of data acquisition systems -Use of recorders in digital systems-Digital recording systems-Input conditioning systems-digital data acquisition systems digital display units-segmental display-liquid crystal displays. (5+5)

TRANSUCERS: Classification of transducers-Selecting a transducer- strain gauges - Temperature Transducers - Linear Variable Differential Transformer(LVDT), Advantages and Disadvantages –Capacitive Transducers – Piezo-electric Transducers and Optoelectronic Transducers. (5+5)

Total L:30+T:30=60

TEXT BOOKS:

REFERENCES:

15M070 ECONOMICS FOR ENGINEERS

INTRODUCTION: Definition – Nature – Scope and Significance of Economics for Engineers. (3)


MONEY AND BANKING: Money – Functions – Quantity Theory of Money - Banking - Commercial Banks – Functions – Central Bank (RBI) – Functions – Case Study in Recent Development in Banking. (6)


Total L: 45

TEXT BOOKS:

REFERENCES:

15L311 ANALOG ELECTRONICS LABORATORY

1. Design and testing of rectifiers with and without filters.
2. Design and testing of Series voltage regulators.
3. Design and testing of BJT amplifiers.
4. Design and testing of FET amplifiers.
5. Design and testing of RC phase shift and Colpitt’s oscillators.
6. Design and testing of Class AB and Class B amplifiers.
7. Design of Class C power amplifier.
9. Design of Monostable and Bistable multivibrators.
11. Mini project.

REFERENCES:

15L312 DIGITAL ELECTRONICS LABORATORY

0 0 2 1

Design and testing of combinational and sequential circuits using digital IC’s and HDL program

Combinational Circuits
1. Design and testing of Half adder and Full adder using basic gates.
2. Design and testing of Adder / Subtractor Circuits using 7483.
3. Design and testing of Code Converters for BCD to Gray conversion and BCD to Seven segment code conversion.
4. Design and testing of Magnitude Comparator.
5. Design and testing of Multiplexers/Demultiplexers using gates.

Sequential circuits
6. Design and testing of Shift Registers using D flip-flops.
7. Design and testing of Ring Counter and Johnson Counter.
8. Design and testing of Asynchronous Counters.
9. Design and testing of Synchronous Counter.
10. Design and testing of Sequence Detector.

REFERENCES:

SEMESTER IV

15L401 PROBABILITY AND RANDOM PROCESSES

3 2 0 4

PROBABILITY: Probability axioms, conditional probability, law of total probability, Baye’s theorem, independence. (4+4)

RANDOM VARIABLES: Discrete random variables – probability mass function, Bernoulli, Binomial, Poisson and Geometric random variables, cumulative distribution function, expectations. Continuous random variables – probability density function, uniform, exponential, Gaussian and Gamma random variables, expectations. (8+8)

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 and linear regression. (8+5)

SUMS OF RANDOM VARIABLES: Expected values of sums, probability density function of the sum of two random variables, moment generating functions. (7+4)

STOCHASTIC PROCESSES: Types of stochastic processes – Poisson process, Brownian motion process, expected value and correlation, stationary processes, wide sense stationary stochastic processes, cross- correlation, Gaussian processes. (10+6)

RANDOM SIGNAL PROCESSING: Linear filtering of a continuous-time stochastic process, Linear filtering of a random sequence, power spectral density of a continuous-time process, power spectral density of a random sequence. (8+3)

Total L: 45 + T: 30 = 75

TEXT BOOK

REFERENCES
15L402  LINEAR INTEGRATED CIRCUITS


APPLICATION OF OPERATIONAL AMPLIFIERS: Inverting and Non inverting amplifiers - Voltage Follower - Summing amplifier - Differential amplifier - Log and antilog amplifier - Instrumentation amplifier - Integrator and Differentiator - Voltage to Current converter - Phase changers - Sinusoidal Oscillators - Active filters - Low pass, high pass, band pass and band stop Butterworth filters - Sample and Hold circuit - Precision diode Half - Wave and Full wave rectifiers - Comparator - Zero crossing detector - Active peak detector, Clipper and Clamper - Square and Triangular waveform generators.


A-D AND D-A CONVERTERS: Digital to Analog converters - Binary weighed and R-2R Ladder types - Analog to digital converters - Continuous - Counter ramp, successive approximation, single, dual slope and parallel types - DAC/ADC performance characteristics and comparison.

VOLTAGE REGULATORS: Regulation - Need for voltage regulators - Series and Shunt regulators - Comparison - Current limiting and protection circuits - Switched mode power supplies - IC Voltage regulators.

TEXT BOOKS:

REFERENCES:

Total L: 45

15L403  SIGNALS AND SYSTEMS

INTRODUCTION TO SIGNALS AND SYSTEMS: Continuous-time (CT) & Discrete-Time (DT) signals - Signal Operations - Basic CT and DT signals - Representation of signals in terms of impulse function – Classification of CT & DT Signals — Properties of CT & DT systems.

LINEAR TIME INVARIANT (LTI) SYSTEMS: Discrete time LTI systems: Convolution Sum – Continuous time LTI systems: Convolution Integral – Properties of LTI systems – Unit step response and unit impulse response of LTI systems – LTI systems represented by Linear Constant Coefficient differential and difference equations.

FOURIER ANALYSIS OF CONTINUOUS TIME SIGNALS AND SYSTEMS: Representation of CT periodic signals by Continuous Time Fourier Series (CTFS) - Convergence of CTFS - Properties of CTFS - Representation of CT aperiodic signals by Continuous Time Fourier Transform (CTFT) – CTFT of CT periodic signals - Convergence of CTFT - Properties of CTFT - Response of CT LTI systems to complex exponentials - Frequency response of systems characterized by differential equations.


SAMPLING: Representation of CT signals by samples – Impulse train sampling – Reconstruction of CT signal from samples using interpolation - Effects of under sampling - Aliasing error.


Total L: 60
15L404 TRANSMISSION LINES AND WAVE GUIDES

3 2 0 4

TIME VARYING FIELDS AND MAXWELL’S EQUATIONS: Review of vector analysis and coordinate systems. Faraday’s law for electric and magnetic fields - Ampere’s law – Maxwell’s Equation in differential form and integral form for sinusoidal time variations. (5+5)

PROPAGATION OF UNIFORM PLANE WAVES: The wave equation- uniform plane waves - Propagation in lossless and lossy media - Power flow and Poynting Vector - Propagation in good conductors - Skin effect – Reflection and refraction of plane waves at plane boundaries- surface of perfect dielectric –perfect conductor. (8+5)

TRANSMISSION LINES: Introduction –The lumped –element circuit model for a transmission line – Derivation of transmission line equations-propagation constant, characteristic impedance - Smith Chart – Quarter-wave Transformer – Generator and load mismatches-Lossy transmission lines. (8+5)

IMPEDANCE MATCHING AND TUNING: Matching with Lumped Elements- quarter wave transformer-Single-stubTuning,Double-stubTuning. (8+5)

GUIDED WAVES: Separability of wave equation in spatial variables – existence of modes- the parallel plane waveguide, TM waves - TE waves Waveguide losses - Phase and Group velocities. (8+5)

WAVEGUIDES AND CAVITY RESONATORS: Rectangular Waveguides – Modes - TM and TE waves - Waveguide losses-Fields in a Rectangular cavity for TEM_{mnp} mode - Q factor for TE_{10p} mode. (8+5)

Total L: 45+T:30=75

TEXT BOOKS: 

REFERENCES: 

15L405 COMPUTER ARCHITECTURE

3 2 0 4

INTRODUCTION: Computing and Computers, evolution of computers, VLSI era, system design- register level, processor level, CPU organization, Data representation, fixed – point numbers, floating point numbers, instruction formats, instruction types. (9+6)

DATA PATH DESIGN: Fixed point arithmetic, addition, subtraction, multiplication and division, combinational and sequential ALUs, carry look ahead adder, Robertson algorithm, booth’s algorithm, non-restoring division algorithm, floating point arithmetic, coprocessor, pipeline processing, pipeline design, modified booth’s algorithm (9+6)

CONTROL DESIGN: Hardwired Control, Micro programmed control, Multiplier control unit, CPU control unit, Pipeline control, instruction pipelines and pipeline performance. (9+6)
MEMORY AND INPUT/OUTPUT ORGANIZATION: Basic Concepts – Memory Hierarchy – Main Memory – Auxiliary Memory – 
Associative Memory – Cache and Virtual Memory Concepts – Input / Output Interface – Asynchronous Data Transfer – Modes of 
Transfer – Direct Memory Access – I/O Processor. (9+6)

SYSTEM ORGANIZATION: Communication methods, buses, bus control, bus interfacing, bus arbitration, IO and system control, IO 
interface circuits, DMA and interrupts, vectored interrupts, PCI interrupts, pipeline interrupts, IOP organization, operation systems, 
multiprocessors and fault tolerance. (9+6)

TEXT BOOKS:

REFERENCES:

15L411 LINEAR INTEGRATED CIRCUITS LABORATORY

Experiments to be designed using discrete components and ASLK PRO Lab Kit

1. Design and testing of Inverting, Non-Inverting Amplifiers, Summer, Subtractor, Differentiator and Integrator using op-amps.
2. Design and testing of Precision half wave and Full wave rectifiers using op-amps.
3. Design and testing of Logarithmic amplifier, Anti Logarithmic amplifier using op-amps.
5. Design of Astable and Monostable Multivibrator using IC 555 / 7555.
6. Design and testing of Active Analog Filters.
7. Design and testing of Voltage Controlled Oscillator
9. Design of Phase Locked Loop (PLL)
10. Design of Low Dropout (LDO) regulator

Total P: 30

REFERENCES:

15L412 SIGNALS AND SYSTEMS LABORATORY

LIST OF EXPERIMENTS

1. Generation of basic continuous-time (CT) signals i) unit impulse ii) unit step iii) ramp iv) exponential v) sinusoid vi) sinc vii) 
square viii) signum ix) triangle
2. Generation of basic-discrete time (DT) signals i) unit impulse ii) unit step iii) ramp iv) exponential v) sinusoid vi) sinc vii) square 
vi) signum ix) triangle
3. Basic operation on CT and DT signals i) time reversal ii) time shifting iii) time scaling iv) signal addition v) signal multiplication 
vi) combination of various operations
4. Verification of system properties i) Memory ii) Causality iii) Linearity iv) Time Invariance
5. Computation of linear convolution of given signals
6. Computation of impulse response and step response of LTI systems
7. Study of Gibbs Phenomenon
8. Computation of CTFT of a continuous-time signal
9. Computation of DTFT of a discrete-time signal
10. Study of sampling and reconstruction

Total L: 30

REFERENCES:
1. “Signals and Systems Lab Manual”, Department of ECE, PSG CT.
SEMESTER V

15L501 ANTENNAS AND WAVE PROPAGATION 3 2 0 4

BASIC ANTENNA CONCEPTS: Types of antennas - Radiation mechanism - current distribution on a thin wire antenna - Antenna parameters - Radiation Pattern, Beam solid angle, Radiation intensity, Radiation Power density, Directivity, Gain, Effective aperture, Polarization, Bandwidth, Beam width, antenna impedance, Poynting vector-Fris Transmission formula, Duality of Antennas, Antenna and Transmission lines, Radiation from a dipole antenna. (7+4)

SMALL ANTENNAS: Radiation fields of point source, infinitesimal dipole, and half-wave dipole, Radiation resistance, Directivity and Design procedure. (7+4)

ANTENNA ARRAYS: Definition, Power patterns, Array of two point sources – Pattern multiplication, Broad side array, End fire array, N-element linear array, Evaluation of null directions and maxima, amplitude distributions, Binomial arrays, Dolph-Chebychev arrays. (8+6)


ANTENNA MEASUREMENTS: Antenna ranges- Measurement of radiation pattern - Gain, directivity and impedance measurements- Polarization measurements- scale model measurements. (7+4)

WAVE PROPAGATION: Propagation in free space - propagation around the earth - Surface wave propagation - structure of the ionosphere - propagation of plane waves in ionized medium - determination of critical frequencies - maximum usable frequency - effect of the earth’s magnetic field – ionospheric variations – fading - tropospheric propagation - space wave propagation- super refraction - refractive index of troposphere-scatter propagation. (6+6)

Total L: 45+T:30=75

TEXT BOOKS:

REFERENCES:

15L502 ANALOG COMMUNICATION 3 0 0 3


TRANSMITTERS: Classification of transmitters - Block diagram of AM broadcasting transmitters- Low Level and High Level transmitters - Pilot carrier technique - FM transmitters- Armstrong FM systems - Radio telemetry. (7)

RECEIVERS: Classifications of receivers - Block diagram – Receiver characteristics - Tuned radio frequency receiver - Super heterodyne receiver - Merits and demerits of different receivers. Block diagram of FM receiver -Automatic frequency control - Limiters - Diversity reception techniques - TDM and FDM. (7)

PULSE ANALOG MODULATION SCHEMES: Sampling process – Pulse-amplitude modulation – Pulse-Time modulation – Bandwidth-noise trade off. (7)

TEXT BOOKS:

REFERENCES:

15L503 MICROPROCESSORS AND MICROCONTROLLERS 3 0 0 3

MICROCONTROLLER ARCHITECTURE AND INSTRUCTION SET: Functional block diagram and pin diagram of 8051- Power supply, clock and reset circuit- Program Counter and ROM space in 8051-Program and Data Memory organization-addressing modes. Instruction Set: data transfer, arithmetic and logical, program branching instructions and Boolean variable manipulation. (9)


OFF-CHIP PERIPHERAL INTERFACING AND PROGRAMMING: LED, 7-segment and LCD Interfacing, Push-to-On switch and Matrix Keyboard Interfacing, ADC and Sensor Interfacing, Relay Interfacing, DC Motor and Stepper Motor Interfacing Techniques. (9)

ARM ARCHITECTURE: ARM Cortex Fundamentals, Registers, Operation Modes, MPU, Memory Map, Instruction Set, Interrupts and Exceptions, Vector Tables, NVIC Interrupt Controllers, General Purpose Registers, Stack Pointer, Special Registers, Cortex M Implementation Overview, Pipelines, Detailed Block Diagram (9)

ARM ASSEMBLY LANGUAGE PROGRAMMING:Assembly basics, Instruction set development, Thumb-2 Technology, Unified Assembler, Instruction Set Architecture Instruction list and descriptions, Processing data, Bit Fields, Useful and new instructions (9)

TEXT BOOKS:

REFERENCES:

15L504 CONTROL SYSTEMS 3 2 0 4

INTRODUCTION : Open loop and closed loop systems - Modelling of physical systems – Mechanical systems-Translational and Rotational systems - Electrical networks - Block diagram – Signal flow graph - Mason's gain formula- Transfer function-example. (8+4)

TIME DOMAIN ANALYSIS: Standard Test signals – Time response of second order system - Time domain specifications - Types of systems - Steady state error - error constants - Generalized error series - Feedback characteristics of control systems- Introduction to PID Controllers. (8+4)
FREQUENCY RESPONSE OF SYSTEMS: Frequency domain specifications - Estimation for second order systems - correlation between time and frequency response for second order systems. (3+2)

SYSTEM STABILITY: Characteristic equation - Routh Hurwitz criterion of stability - Absolute and Relative stability - Root Locus - stability analysis. (8+4)


STATE SPACE ANALYSIS: Introduction to state space analysis - Phase variable and canonical forms - State transition matrix - Solutions to state space equation - Controllability and Observability (Kalman’s test) of systems. State space representation of discrete time systems- controllability and observability. (9+8)

Total L: 45+T: 30=75

TEXT BOOKS:

REFERENCES:

15L511 ANALOG COMMUNICATION LABORATORY

1. Design and testing of Amplitude Modulation and Demodulation.
2. Study of DSB-SC Modulation and Demodulation.
3. Design and testing of Pre emphasis and De emphasis circuits.
4. Design and testing of Frequency Modulation and Demodulation.
5. Implementation and testing of Automatic Gain Control circuits.
6. Design and Testing of Single tuned amplifier
7. Frequency Response of Mixer Circuit.
10. Study of TDM and FDM systems.
11. Simulation of Amplitude modulation and Demodulation.
12. Performance analysis of AM and FM systems in presence of noise

Total P: 30

REFERENCES:

15L512 MICROPROCESSORS AND MICROCONTROLLERS LABORATORY

Assembly Language Programming
1. Addition and Subtraction of single and multi byte data
2. Multiplication and Division of single and multi byte data
3. Searching the given number using Linear / Binary Search Algorithms
4. Sorting the given numbers using Bubble/Insertion Algorithms
5. Code Conversion Techniques

Interfacing Experiments
6. Interfacing Display Unit
7. Interfacing Keyboard Unit
8. Timer/Counter Interfacing Techniques
9. Software and Hardware Interrupts
10. UART Programming Techniques
11. Sensor Interfacing Techniques
12. Motor Interfacing Techniques

Total P: 30

REFERENCES:
Preparing a project – brief proposal including
- Problem Identification
- A Statement of system / process specifications proposed to be developed (Block diagram / concept tree)
- List of possible solutions including alternatives and constraints
- Cost benefit analysis
- Time line of activities

A report highlighting the design finalization (based on functional requirements & standards ( if any )

A Presentation including the following
- Implementation Phase ( Hardware / Software / both )
- Testing and validation of the developed system
- Learning in the project

Consolidated report preparation

SEMESTER VI

15L601 DIGITAL SIGNAL PROCESSING


REALIZATION OF DIGITAL FILTERS: Direct, Cascade, Parallel and ladder realizations of IIR filters - Realization of FIR filters - Realization of Linear phase FIR filters. (8)

EFFECTS OF FINITE REGISTER LENGTH: Input Quantization – Coefficient Quantization – Product Quantization – Signal Scaling – Finite register length effects in realization of IIR digital filters - Finite register length effects in realization of FIR digital filters - Finite register length effects in DFT and FFT computations. (10)


TEXT BOOKS:

REFERENCES:
3. Texas Instruments Manuals for TMS 320C54X Volumes 1 to 5.

15L602 STATISTICAL THEORY OF COMMUNICATION

RANDOM PROCESS: Review of probability Theory - Random variables - Operations on single and multiple random variables- random process concept- stationarity - Ergodicity - First order markov process - Correlation - Auto and Cross Correlation functions - Power spectral density (6+6)
OPTIMUM LINEAR SYSTEMS: I/O Relations of linear systems subjected to random inputs - Transmission of Gaussian process through linear system - Linear Mean Square filtering - Physically realizable optimum system - Matched filtering.

CONCEPT OF INFORMATION THEORY: Memoryless Finite Schemes - Self information measure - Entropy function - Conditional Entropies - Characteristics of Entropy function - Derivation of the noise characteristics of a channel - Mutual information - Redundancy - Efficiency and channel capacity - capacities of channels with symmetric noise structure.


CONTINUOUS CHANNELS: Definitions of different entropies - Mutual information - Maximization of the entropy of a continuous random variable - Entropy maximization problems - Channel capacity under the influence of additive white Gaussian Noise - Hartley Shannon's Law - Trade - off between Bandwidth and SNR - Comparison of different modulation methods.

REFERENCES:

REFERENCES:

15L603 VLSI DESIGN

OVERVIEW OF VLSI DESIGN METHODOLOGY: VLSI design process - Architectural design - Logical design - Physical design - Layout styles - Full custom - Semi custom approaches.

BASIC ELECTRICAL PROPERTIES OF MOSFET: nMOS and PMOS transistors - Threshold voltage - Threshold voltage equations - MOS device equations - Basic DC equations - Second order effects - MOS modules - Small signal AC characteristics

VLSI FABRICATION TECHNIQUES: An overview of wafer fabrication - Wafer processing - Oxidation - Patterning - Diffusion - Ion implantation - Deposition - Silicon gate nMOS process - CMOS processes - nWell - PWell - Twin tub - Silicon on insulator - CMOS process enhancements - Interconnect - Circuit elements

LAYOUT DESIGN RULES: Need for design rules - Mead Conway design rules for the silicon gate nMOS process - CMOS nWell/PWell design rules - Simple layout examples – NAND, NOR, CMOS inverter

INVERTERS: nMOS inverter - Depletion mode and enhancement mode pull ups – Pseudo nMOS Inverter - CMOS inverter – Transfer Characteristics – Noise Margins - Sheet resistance - Area Capacitance - Inverter delay – Power Dissipation - Need For Low Power

LOGIC DESIGN: Static CMOS logic - Pass transistor- transmission gate logic - NAND gate - NOR gate - Other forms of CMOS logic - Dynamic CMOS logic - Clocking CMOS logic - Precharged domino CMOS logic - Structured design - Simple combinational logic design examples - Parity generator – Multiplexers - Clocked sequential circuits - Two phase clocking - Charge storage - Dynamic register element – D-Flipflop - Semistatic register - JK flip flop - Dynamic shift register


TEXT BOOKS:

REFERENCES:

15L604  COMPUTER NETWORKS


Total L: 45+T: 30=75

TEXT BOOKS:

REFERENCES:

15L611  DIGITAL SIGNAL PROCESSING LABORATORY

LIST OF EXPERIMENTS
1. Overlap add and overlap save method for performing Convolution.
2. Implementation of FFT algorithm.
3. Implementation of amplitude modulation schemes using Simulink.
4. IIR Filter Design using bilinear transformation and impulse invariant technique.
5. FIR Filter design using windows.

Total P: 30

REFERENCES:
3. Texas Instruments Manuals for TMS 320C54X Volumes 1 to 5.

15L612  VLSI DESIGN LABORATORY

1. Study of the characteristics of NMOS and PMOS transistors.
2. Design and Simulation of nMOS inverter, CMOS inverter and obtaining its transfer characteristics and Noise Margin.
3. Logic design using pass transistors, transmission gates and static CMOS logic.
4. Design and Simulation of dynamic CMOS circuits.
5. Design and Simulation of simple combinational circuits (encoder, multiplexer, code converters)
6. Design and Simulation of ALU subsystem-Adders, Multipliers.
7. Design and Simulation of sequential circuits (counters, shift registers)
8. Layout design of Digital logic circuits.
9. Design and Simulation of Memory cell.

Total P: 30

REFERENCES:

15L613 EMBEDDED COMPUTING LABORATORY

1. Serial Communication Protocols
   a. I2C
   b. CAN
   c. Ethernet
2. Wireless Communication Protocols
   a. Bluetooth
   b. WiFi
3. Interface to External Memory Devices
   a. SD Card (SPI)
   b. Pen Drive (USB)
4. Porting Embedded Linux
5. Applications using IoT

Total P: 60

REFERENCES:
2. TIVA Series ARM Cortex M DataSheet

SEMESTER VII

15L701 MICROWAVE ENGINEERING

INTRODUCTION: Microwave frequencies, Microwave systems, High frequency limitations of conventional tubes-Two cavity Klystron and Reflex klystron – Magnetron oscillator- Microwave solid devices: Microwave Transistors – Gunn diode oscillators-microwave network analysis-Scattering matrix.

(8)

THEORY AND DESIGN OF FERROMAGNETIC COMPONENTS: Basic properties of ferrite material,plane wave propagation in Ferrite medium, Ferrite Isolators, Ferrite Phase Shifters, Ferrite Circulators, Active Microwave Circuits: Detectors and Mixers.

(6)

MICROWAVE RESONATORS: Series and Parallel Resonant Circuits, Transmission Line Resonators

(6)

POWER DIVIDERS AND DIRECTIONAL COUPLERS: Basic Properties of Dividers and Couplers, T-Junction Power Divider, Quadrature Hybrid Couplers.

(6)

MICROWAVE FILTERS: Filter Design by the Insertion Loss Methods, Filter Transforms, Filter Implementation.

(6)


(8)
MICROWAVE COMMUNICATION SYSTEMS: Simplified microwave system – need for diversity-frequency and space diversity-Microwave radio stations - system gain.

Total L: 45

TEXT BOOKS:

REFERENCES:

15L702 DIGITAL COMMUNICATION


QUANTIZATION AND ENCODING: Signal sampling, PCM generation and recovery using match filter - Analysis of uniform and non uniform quantizers - Delta modulation - Analysis of delta modulators - Delta sigma and adaptive delta modulators - Linear predictive coding - DPCM - Comparison of PCM and DM on the basis of speech signal

ERROR CONTROL CODING: Parity check codes - Linear block codes - systematic codes - Polynomial representation of code structures - cyclic codes - convolution codes - Decoding algorithms, turbo codes

BASEBAND SIGNALLING TECHNIQUES: Need for line shaping of signals, Signaling formats - RZ/NRZ, Duo binary, Split phase (Manchester) and High density bipolar coding - Scrambling and unscrambling - channel equalization, tapped delay line and Transversal filters.

DIGITAL DATA TRANSMISSION: Concept of base band signaling - Detection using matched filters for signals via AWGN channels - Analysis of coherent and non coherent detection Schemes for ASK, FSK, PSK, DPSK - M-arysignaling - Quadrature system.

SYNCHRONISATION: Need for synchronization - Synchronization methods - Bit, word and frame synchronization - Introduction to Spread Spectrum Techniques - Synchronization using PN Sequences.

Total L: 45

TEXT BOOKS:

REFERENCES:

15L703 WIRELESS COMMUNICATION


WIRELESS CHANNEL MODELING: Small-scale multipath propagation, Parameters of mobile multipath channels, Types of small scale fading, Rayleigh and Ricean distribution, Physical modeling for wireless channels - Input/output model of the wireless channel - Time and frequency coherence - Statistical channel models.

Total L: 45

CAPACITY OF WIRELESS CHANNELS: AWGN channel capacity – capacity of flat fading channels , Frequency-selective fading channels,Downlink channel capacity, Uplink channel capacity, MIMO multuser system

TEXT BOOKS:

REFERENCES:

15L704 ENVIRONMENTAL SCIENCE AND ENGINEERING


RADIATION HAZARDS - Basic definition of RF and microwave radiation hazards: Occupational exposure- public exposure-precautions- Non ionizing radiation- Biological effects: - safe levels for exposure-Guidelines- SAR- emission due to transmission towers- EMC and EMI—causes—methods of reducing interference—shielding—grounding.

TEXT BOOKS:

REFERENCES:
15L711 MICROWAVE ENGINEERING LABORATORY

1. Study of Klystron oscillator characteristics.
2. Study of GUNN diode characteristics
3. Study of Directional Coupler characteristics
4. Determination of VSWR and reflection coefficient.
5. Study of radiation pattern of horn antenna
6. Determination of radiation pattern and return loss of planar antenna.
7. Study of measurement of S-parameters of micro strip components using vector network analyzer
8. Study of Signal generator and analyzer.
10. Design and simulation of RF planar filter.
11. Design and simulation of RF amplifier
12. Mini project.

REFERENCES:
2. Laboratory Manual Prepared by the Department of ECE, 2012

Total P: 30

15L712 DIGITAL COMMUNICATION LABORATORY

1. Design and Implementation of PCM and DPCM
2. Design and Implementation of Delta modulator, Adaptive Delta Modulator for speech signals
3. Determination of Power spectral density of different type of Line codes
4. Design of Scramblers and descramblers
5. Design and Implementation of Tapped-Delay equalizer
6. Design and implementation of Linear Block Coder and decoder
7. Design and implementation of Cyclic Coder and decoder
8. Design and implementation of Convolution Coder and decoder
10. Study of Spread Spectrum Systems using DSSS , FHSS

REFERENCES:

Total P: 30

15L720 PROJECT WORK I

- Identification of a real time problem in thrust areas
- Developing a mathematical model for solving the above problem
- Finalization of system requirements and specification
- Proposing different solutions for the problem based on literature survey
- Future trends in providing alternate solutions
- Consolidated report preparation of the above

SEMESTER VIII

15L820 PROJECT WORK II

- Identification of a real time problem in thrust areas
- Developing a mathematical model for solving the above problem
- Finalization of system requirements and specification
- Proposing different solutions for the problem based on literature survey
- Future trends in providing alternate solutions
- Consolidated report preparation of the above
**LANGUAGE ELECTIVES**

**15M080 COMMUNICATION SKILLS FOR ENGINEERS**

**COMMUNICATION CONCEPTS:** Process of Communication – Inter and Intrapersonal Communication – Essentials for effectiveness


**BUSINESS CORRESPONDENCE:** Writing Emails, Preparing Resumes, Memos, Technical and Business Proposals

**TECHNICAL COMMUNICATION:** Seminars, Process Description and Group Discussions, Use of Visual Aids.

Total L: 45

**TEXTBOOK:**
1. Monograph prepared by the Faculty, Department of English, 2015.

**REFERENCES:**

**15M081 BASIC GERMAN**

**INTRODUCTION:** German Culture, Tradition, Universities and Companies , Alphabets, Greetings, Countries, Nationalities and Languages.

**VOCABULARY:** Context related to School, University, Professions, Family, Supermarket, Food and Beverages, Entertainment, Celebrations, Weather.

**GRAMMAR:** Noun forms – Singular , Plural; Gender Introduction, Articles, Personal Pronouns and Possessive Pronouns in Nominative , Accusative and Dativ cases, Usage of Adjectives, Time related forms - Formal & informal expressions, Usage of adverbs, daily routines, related verbs and question words. Related vocabulary and grammar. Simple dialogues and exercises. Verbs –Verb conjugation, Helping verbs , subject – verb agreement ,Regular and Irregular verbs, Modal verbs.and their related grammatical structure.

**GENERAL USAGE:** Number system, Question words, Statements and Questions, Negation: nicht/kein. Imperatives Simple dialogues, Exercises.

**SYNTAX:** Word order and sentence formation. Practice with mini –dialogues.

**COMMUNICATION SKILLS:** Conversing in formal and informal situations, Dialogue writing, Letter writing, Email writing, Invitations and Telephone conversations.

**PRACTICALS:** Listening, Speaking, Reading and Writing.

Total L: 45

**TEXT BOOK:**
1. Monograph prepared by the Faculty, Department of English, 2015.

**REFERENCES:**
15M082 BASIC FRENCH

INTRODUCTION


Total L: 45

TEXT BOOK:

REFERENCES:

15M083 BASIC JAPANESE

Orientation Session, Geographic & Socio, economic perspective to Japan, Japanese people and culture and Basic greetings and responses.

Basic script, Method of writing hiragana and katakana, and Combination sounds and simple words.

Topic marker – wa, Desu / dewa arimasu cupolas, Interrogative particle – ka, Grammar particles – mo, – no, –'.

Introducing some one: – Kochira wa – and Self introductions: Hajimemashite]

Demonstratives – Kore, – Sore, – Are, Demonstrative – Kono, – Sono, – Ano, Possessive noun particle – no and Japanese apartments: Greeting your neighbour

Place markers – Kokoo, – Sokoo, – Asoko, Direction markers – Kochira, – Sochira, – Achira] and Japanese department stores: Asking for and buying something

Asking for and telling the time, Participant – ni (at)] for time, kara (from) – made (until), Participant – to (and)]. Time periods:

Days of the week, months, time of day, Verbs (Present / future and past tense) and Telephone enquiry: Asking for a phone no. and Business hours

Destination particle – e, Particles – de (mode of transportation)] and –to (with) and Japanese train station: Asking for Fare and track no. / types of trains

Direct object particle – oj, Particle – de (place of action)] , Verbs (– masen ka, – mashou] and - Ohanami] Cherry blossom viewing

Particle – de (by means of)]] , Particle – ni (to)], Aaemasu (give) and Moraimasu (receive) and Visiting a Japanese House

Adjectives (– i] and – na] type), Adjectives (Positive and negative usage), Particle – ga (however, but), – Dore which?]] and Leaving a room, thanking some one for hospitality

Likes and dislikes, Potential verbs (wakarimasu and dekimasu), – Kara ( ~ because)]] , Adverbs and Asking some one out over the Phone

Verbs denoting presence: – Imasu] and – arimasu], Particle – ni (in)]] , – Dare (who?)]] , Adverbs (– Chikaku ni ~) , Particle – dare mo (negative ~ no one)] , Dare ka (anyone), dare ga (who) , Nani ka (anything) , nani ga (what) - ya
(and) ~ nado (etc.) and Asking for directions

Counters and Counting suffixes

Introduction to Adjectives (na and ii type), Different usages of adjectives, Comparison, Likes and dislikes and Going to a trip

Need and desire (ga hoshii), Wanting to … (Tabeti desu), Going for a certain purpose (mi –ni ikimasu) and Choosing from a menu

Verb groups, I, II and III and Exercises to group verbs

Please do (te kudasai), Present continuous tenses (te imasu), Shall I? (~ mashou ka) and Describing a natural phenomenon (It is raining)

To grant permission (~te mo ii desu), Asking for permission (~ te mo ii desu ka) and Should not do (~ te wa ikemasen)

Describing a continuing state and Describing a habitual action

Roleplays in Japanese

A demonstration on usage of chopsticks and Japanese tea party

Total L: 45

TEXT BOOK:

REFERENCE:

OPEN ELECTIVES

MATHEMATICS

15OH01 ADVANCED LINEAR ALGEBRA

VECTOR SPACES: General vector spaces, real vector spaces, Euclidean n-space, subspaces, linear independence, basis and dimension, row space, column space and null space.

INNER PRODUCT SPACES: Inner products, length and angle in inner product spaces, orthonormal bases, Gram- Schmidt process, orthogonal matrices, QR decomposition, best approximation- least square.

LINEAR TRANSFORMATIONS: General linear transformation - kernel and range, matrices of linear transformations, change of basis, rank and nullity.

EIGENVALUES AND EIGENVECTORS: Eigenvalues and eigenvectors, diagonalization, orthogonal diagonalization, quadratic forms, application of conic sections, quadratic surfaces - discrete dynamical systems.

Total L: 45

TEXT BOOKS:

REFERENCES:

15OH02 ALGEBRAIC STRUCTURES

GROUPS: Groups, subgroups, permutation groups, cosets and Lagranges's theorem, normal subgroups and quotient groups, homomorphisms, isomorphisms, Cayley’s theorem.

Total L: 45
CODING THEORY: Group codes, the communication model and basic notions of error correction, generation of codes by using parity checks - error recovery in group codes. (5)

RINGS: Rings, sub-rings, properties of rings, integral domain, ideals and quotient rings, polynomial rings. (12)

FIELDS: Fields, roots of polynomials, construction of straightedge and compass. (13)

TEXT BOOKS:

REFERENCES:

15OH03 CALCULUS OF VARIATIONS AND TENSOR ANALYSIS

CALCULUS OF VARIATIONS: Basic concepts, method of variations in problems with fixed boundaries - variation and its properties, Euler equation. (12)

FUNCTIONALS: Functional involving first and higher order derivatives, functionals dependent on the functions of several independent variables, variational problems in parametric form – applications: vibrating string and membrane. (12)

VECTOR ANALYSIS: Basic concepts – gradient, directional derivative, divergence, curl, potential vector field. solenoidal vector field, Laplacian vector field. Green’s theorem, Stoke’s theorem and Gauss divergence theorem (statement and concepts only) (7)

TENSOR ANALYSIS: Concepts of a tensor field – Ostrogradski’s theorem, field of tensor of rank 2 - flux, divergence and derivative in a direction of tensor field. Integral theorems - theorems related to Ostrogradski’s theorem – applications: equation of motion of a liquid, Archimedes’ law. (14)

TEXT BOOKS:

REFERENCES:

15OH04 GRAPH THEORY AND ITS APPLICATIONS

GRAPHS AND DIGRAPHS: Common families of graphs, degree sequence, handshaking lemma, Havel-Hakimi theorem (statement and concepts). Walk, trail and path, connected graph, distance, radius and diameter. Graph isomorphism. Representations of graphs – adjacency and incidence lists – adjacency and incidence matrices. (10)

SPANNING TREES: Cayley’s formula: Prfer encoding-decoding algorithm. Matrix tree theorem (statement and problems only). Depth-first and breadth-first search algorithms, minimum spanning tree – Prim’s and Kruskal’s algorithms, shortest-path problem – Dijkstra’s algorithm. (9)

EULERIAN AND HAMILTONIAN GRAPHS: Eulerian graphs – Konigsberg bridge problem; Eulerian tour algorithm, characterization of Eulerian graph, optimal postman tour. Hamiltonian graphs - non Hamiltonian graphs, sufficient conditions for Hamiltonian graphs (only statements and concepts).Travelling salesman problem - nearest neighbour algorithm. (10)

VERTEX-COLORING: Vertex-coloring - chromatic number of a graph, vertex coloring algorithms – sequential vertex coloring, largest degree first algorithm, applications - scheduling problem, assignment of radio frequencies, fast register allocation for computer programming. (8)


Total L: 45
**TEXTBOOKS:**


**REFERENCES:**

2. Narsingh Deo, Graph Theory with Applications to Engineering And Computer Science, Prentice Hall, New Delhi, 2010.

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**15OH05 MATHEMATICAL FINANCE**  
3 0 0 3

**FINANCIAL MATHEMATICS:** Basic terminology, assumptions, derivative securities.  

**FORWARD AND FUTURES CONTRACTS:** Forward contract, forward price formula, value of a forward contract, futures contract, futures pricing.  

**OPTION PRICING:** Definition and preliminaries, behavior of option prices with respect to variables, pay-off curves, single period and multi period binomial lattice models for option pricing, pricing American options: a binomial lattice model, Black-Scholes formula.  

**RISK FREE ASSETS:** Time value of money, Simple interest, periodic compounding, streams of payments, continuous compounding. Money market: zero coupon bonds, coupon bonds, money market account.  

**PORTFOLIO MANAGEMENT:** Risk and return, expected return standard deviation as risk measure, two securities, risk and expected return on a portfolio.  

**TEXT BOOKS:**


**REFERENCES:**


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**15OH06 MATHEMATICAL MODELING AND SIMULATION**  
3 0 0 3

**SYSTEM MODELS AND STUDIES:** System- continuous and discrete system, system modeling, types of models - static physical, dynamic physical, static mathematical, dynamic mathematical models, principles in modeling, corporate model, environment, production, management segment, system analysis – corporate model, system design – message processing in a computer, system postulation – function of liver in the human body.  

**SYSTEM SIMULATION:** Technique of simulation, Monte Carlo Method – area under a curve, estimate of π, comparison of simulation and analytical methods, distributed lag models – national economy, cobweb Models – supply and demand, exponential growth and decay models, logistic curves, simple system dynamics diagrams – population, multi-segment models – product sales, representation of time delays, feedback in socio-economic systems, host and parasite fluctuation.  

**STATIC SIMULATION:** Basics and components of the simulation study, simulation as an analysis tool, static simulations - model for profit on a sale promotion, a financial model for an office building. Random number generation - linear congruential generator, Blum-Blum generator, random variates generation - Bemuoulli, uniform, triangular, normal, exponential random variates, a model for loss ratio for an insurance agency.  

**DYNAMIC SYSTEMS SIMULATION:** Financial models and @risk - a model for the price of a stock, dynamic financial models of stock prices, correlated asset values, fitting a distribution to date.  

**TEXT BOOKS:**

REFERENCES:
1. Brian Albright, Mathematical Modeling with Excel, JonesBartlett publishers, Singapore 2010

**15OH07 NUMBER THEORY FOR COMPUTING**

DIVISIBILITY AND DIOPHANTINE EQUATIONS: Theory of divisibility - Basic concepts and properties of divisibility, fundamental theorem of arithmetic, Euclid’s algorithm, continued fractions. Diophantine equations - Linear Diophantine equations

ARITHMETICAL FUNCTIONS AND DISTRIBUTION OF PRIME NUMBERS: Multiplicative functions – functions \( \tau(n) \), \( \sigma(n) \) and \( s(n) \) - functions \( \phi(n) \), and \( \mu(n) \). Prime distribution function \( \pi(x) \), prime number theorem, the \( n^{th} \) prime.

THEORY OF CONGRUENCES: Basic concepts and properties of congruences — linear congruences — Fermat’s Little theorem, Euler’s theorem, Chinese remainder theorem, Legendre and Jacobi symbols, primitive roots.

COMPUTATIONAL NUMBER THEORY: Primality testing: Fermat’s pseudoprimality test, strong pseudoprimality test, integer factorization: trial division and Fermat method, quadratic and number field sieves.

CRYPTOGRAPHY: Random number generation - linear congruential generator, public key cryptography: discrete logarithm based cryptosystems - RSA public-key cryptosystem.

**TEXT BOOKS:**

REFERENCES:

**15OH08 OPERATIONS RESEARCH**


GAME THEORY: Two person zero sum game, pure and mixed strategies, dominance principle, graphical solution, linear programming solution.

NON-LINEAR PROGRAMMING: Constrained NLPP - Lagrange’s multipliers method, convex NLPP - Kuhn-Tucker conditions, Quadratic programming-Wolfe’s method.

QUEUING THEORY: Elements of queueing model, relationship between exponential and Poisson queueing models, (M/M/1), (M/M/1/N), (M/M/c), (M/M/c/N) and self-service model.

REPLACEMENT THEORY: Replacement of items that deteriorate, replacement of items that fail, group replacement.

**TEXT BOOKS:**

REFERENCES:
15OH09 RELIABILITY AND QUALITY CONTROL 3 0 0 3

STATISTICAL PROCESS CONTROL: Chance and assignable causes of quality variation, statistical basis of the control charts - basic principles, choice of control limits, analysis of patterns on control charts. (7)

CONTROL CHARTS FOR VARIABLES AND ATTRIBUTES: \( \bar{x} \) chart, R chart, \( s^2 \) chart, p chart, np chart, c chart, and u chart. (10)

ACCEPTANCE SAMPLING: Types of sampling plans, lot formation, single sampling plans for attributes, double, multiple and sequential sampling plans, acceptance sampling by variables, chain sampling, continuous sampling, skip lot sampling plans. (10)

BASIC RELIABILITY MODELS: The failure distribution, the reliability function, mean time to failure, Hazard rate function, bathtub curve, conditional reliability. Constant failure rate model: Exponential reliability function. Time - dependent Weibull failure model, Time - dependent normal failure model. (10)

RELIABILITY OF SYSTEMS: Serial configuration, parallel configuration, combined series, parallel systems - k out of n: system - system structure function, minimal cuts, minimal paths, common mode failures, three state devices. (8)

Total L: 45

TEXT BOOKS:

REFERENCES:

15OH10 SOFT COMPUTING 3 0 0 3

FUZZY SETS: Basic concepts, membership functions, basic operations on fuzzy sets, properties of fuzzy sets, fuzzy relations. Propositional logic and predicate logic, fuzzy If-then rules, fuzzy mapping rules and fuzzy implication functions. (15)

NEURAL NETWORKS: Basic concepts, neural network architectures - single layer, multilayer, recurrent networks, learning methods, back propagation network. (15)

GENETIC ALGORITHMS: Basic concepts, encoding, fitness function, reproduction, inheritance operators, cross over, inversion and deletion, mutation operator, bit-wise operators, generational cycle. (10)

HYBRID SYSTEMS: Genetic algorithm based backpropagation networks, fuzzy backpropagation networks. (5)

Total L: 45

TEXT BOOKS:

REFERENCES:

15OH11 STOCHASTIC MODELS 3 0 0 3

STOCHASTIC PROCESSES: Definition, Markov chains: Classifications of states, absorption probability, period, Chapman-Kolmogorov equations, steady state probabilities. (12)

CONTINUOUS TIME MARKOV CHAINS: Definition, Chapman-Kolmogorov equations, Kolmogorov forward and backward equations, steady-state probabilities, birth - death processes. (9)

BROWNIAN MOTION: First passage time distribution, maximum of a Brownian motion, zeros of Brownian motion, Brownian motion with drift, Geometric Brownian motion, applications to finance. (10)
**QUEUEING MODELS:** Basic definitions, steady-state solution: M/M/1, M/M/1/K, M/M/c, M/M/c/c, M/M/c/k Models, queues with unlimited service.

**TEXT BOOKS:**

**REFERENCES:**

**PHYSICS**

**15OH20 ANALYTICAL TECHNIQUES FOR MATERIALS CHARACTERIZATION 3 0 0 3**

**X-RAY DIFFRACTION ANALYSIS:** Crystal systems - Symmetry elements in crystals - combination of symmetry elements - Rotation-inversion axis - translation symmetry elements - space groups - Stereographic projection - Wulff net - Measurement of angle between poles - determination of Miller indices of an unknown pole. X-ray diffraction analysis

**ELECTRON AND ION SPECTROSCOPIC TECHNIQUES:** Mass spectroscopy and X-ray emission spectroscopy (Principle and limitations) - Quadrupole mass spectrometer. Special surface techniques: X-ray photoelectron spectroscopy (XPS or ESCA) - photoelectron process of spectrum - elemental analysis - Instrumentation and applications, Auger electron spectroscopy (AES)-Basic principles-information in Auger spectra-methods for surface and thin film characterization, Secondary ion mass spectrometry (SIMS) - Dynamic and static SIMS-common modes of analysis, Rutherford Backscattering Spectrometry (RBS), Field Ion Microscopy (FIM)

**SURFACE STRUCTURE ANALYSIS:** The need for surface study. Surface chemical composition: The extension of bulk techniques to surface studies - Unit meshes of five types of surface nets - diffraction from diperiodic structures. Surface methods using electron, low energy electron diffraction (LEED), reflection high energy electron diffraction (RHEED),

**IMAGING TECHNIQUES:** Scanning electron microscope (SEM) - physical basis of operation - sample requirements - applications, Transmission electron Microscopy (TEM) - resolution - sensitivity - TEM operation - diffraction mode - specimen preparation, Scanning Transmission Electron Microscopy (STEM). – imaging – common analysis modes – sample requirements

**SCANNING PROBE MICROSCOPY:** Instrumentation, Scanning Tunnelling Microscopy, Tunneling current, probe tips and working environments, operational modes, typical applications, atomic force microscopy, near field forces, force sensors, operational modes, applications, image artifacts

**TEXTBOOKS:**

**REFERENCES:**

**15OH21 LASER TECHNOLOGY 3 0 0 3**

**LASER CHARACTERISTICS:** Einstein coefficients - negative absorption, shape and width of spectral lines, spontaneous and stimulated emission. Laser resonators, types of resonators, stability diagram. Spatial and temporal coherence.

DYE LASERS: Liquid lasers, dye lasers, fabrication and excitation mechanisms. Concept of Q-switching and mode-locking, second harmonic generation, theory and experiment, materials for optical SHG. (9)

INDUSTRIAL APPLICATIONS: Laser cutting, drilling & Piercing. Laser welding, operating characteristics and applications. medical. Spectroscopic (qualitative), laser Raman effect, stimulated Raman effect - Brillouin scattering. (9)


15OH22 MICRO ELECTROMECHANICAL SYSTEMS


SCALING LAWS AND MINIATURIZATION: Introduction. Scaling in geometry. Scaling in rigid body dynamics. The trimmer force scaling vector – scaling in electrostatic forces, electromagnetic forces, scaling in electricity and fluid dynamics, scaling in heat conducting and heat convection. (9)


MICROMACHINING METHODS Bulk micromachining. Isotropic and anisotropic etching. Wet etchants, etch stops, dry etching comparison of wet and dry etching. Dry etching – physical etching – reactive ion etching, comparison of wet and dry etching. Surface micromachining – process in general, problems in surface micromachining. The LIGA process – description, materials for substrates and photoresists, electroplating, the SLIGA process. (9)


15OH23 NANOMATERIALS AND APPLICATIONS

INTRODUCTION AND CLASSIFICATION: Atoms, Clusters and Nanomaterials-Classification of nanostructures, nanoscale architecture – Effects of the nanometre length scale – Changes to the system total energy, changes to the system structures, vacancies in nanocrystals, dislocations in nanocrystals – Effect of nanoscale dimensions on various properties – Structural, thermal, chemical, mechanical, magnetic, optical and electronic properties. (11)

NANOMATERIALS SYNTHESIS AND PROCESSING: Top-down processes: Ball Milling, lithography, machining process; Bottom-up processes: i) Wet chemical synthesis of nanomaterials- sol-gel, liquid solid reactions; ii) Gas phase synthesis of nanomaterials-Furnace, Flame assisted ultrasonic spray pyrolysis; iii) Gas condensation processing; iv) Chemical vapour deposition (CVD)-plasma-assisted deposition process, MBE and MOVPE-Preparation, safety and storage issues -STM and AFM Techniques. (11)

SEMICONDUCTOR NANOSTRUCTURES: Quantum confinement in semiconductor nanostructures - Quantum wells, quantum wires, quantum dots, superlattices, band offsets and electronic density of states – Fabrication techniques – Requirements, epitaxial
growth, cleared edge overgrowth – Growth on vicinal substrates, strain-induced dots and wires, electrostatically induced dots and wires, quantum well width fluctuations, thermally annealed quantum wells and self-assembly techniques.


TEXTBOOKS:

REFERENCES:

15OH24 PHYSICS FOR SOLAR PV SYSTEMS AND SOLID-STATE LIGHTING SYSTEMS


PHYSICS OF SEMICONDUCTOR JUNCTIONS: Elemental and compound semiconductors. Band structure of silicon p-n junctions and III-V compound semiconductor junctions. light emission and absorption. Creation and recombination of electron hole pairs. Lattice mediated recombination conservation of momentum. Direct and indirect band gap semiconductors. Structure of Solar PV devices and solid state lighting devices- LEDs. Factors limiting efficiency of conversion of light energy to electrical energy (PV) and vice versa (Lighting) High power LEDs


TEXT BOOKS:

REFERENCES:

15OH25 SENSORS FOR ENGINEERING APPLICATIONS

STRAIN AND PRESSURE MEASUREMENT: Resistance strain guage, piezoelectric pressure gauge, characteristics. Electronic circuits for strain gauge, load cells. Interferometer, Fibre-optic methods. Pressure gauges Anorid capacitance pressure gauge, ionization gauge. Using the transducers for applications

MOTION SENSORS: Capacitor plate sensor, Inductive sensors, LVDT Accelerometer systems, rotation sensors drag cup devices, piezoelectric devices. Rotary encoders.
LIGHT RADIATION: Color temperature, light flux, photo sensors, photomultiplier, photo resistor and photoconductors, photodiodes, phototransistors, photovoltaic devices, fiber-optic applications, light transducer, solid-state, transducers, liquid crystal devices.

HEAT AND TEMPERATURE: Bimetallic strip, Bourdon temperature gauge, thermocouples, Resistance thermometers, thermistors, PTC thermistors, bolometer, Pyroelectric detector.

ELECTRONIC SENSORS: Proximity detectors – Inductive and capacitive, ultrasonic, photo beam detectors, Reed switch, magnet and Hall-effect units, Doppler detectors, liquid level detectors, flow sensors, smoke sensors.

TEXTBOOKS:

REFERENCES:

15OH26 THIN FILM TECHNOLOGY


DEPOSITION MONITORING AND CONTROL: Microbalance, Crystal oscillator thickness monitor, optical monitor, Resistance Monitor. Thickness measurement: Multiple Beam Interferometer, Fizeau (Tolansky) technique - Fringes of equal chromatic order (FECO) method - Ellipsometry (qualitative only).


DIELECTRIC PROPERTIES: DC conduction mechanism - Low field and high field conduction. Breakdown mechanism in dielectric films - AC conduction mechanism. Temperature dependence of conductivity.


TEXTBOOKS:

REFERENCES:

15OH27 NONLINEAR SCIENCE AND ENGINEERING APPLICATIONS

INTRODUCTION: Dynamical systems: Linear and Nonlinear Forces, Mathematical Implications of Nonlinearity- Linear waves-ordinary differential equations (ODEs)- Partial differential equations (PDEs)- Methods to solve ODEs and PDEs- Numerical methods – Linear and Nonlinear oscillations- Nonlinear waves- Quantitative features


REFERENCES:

TEXT BOOKS:


OPTICAL SOLITONS AND DISPERSION MANAGEMENT: Soliton Characteristics - Soliton Stability - Bright and Dark Solitons – Other kinds of Solitons - Effect of Birefringence in Solitons - Solitons based Fiber Optic Communication System (Qualitative treatment) – Dements - Dispersion Managed Solitons (DMS). (9)


APPLICATIONS OF SOLITONS: DMS for single channel transmission – WDM transmission - Fiber Gratings- Fiber Couplers – Fiber Interferometers – Pulse Compression – Soliton Switching – Soliton light wave systems. (9)

REFERENCES:

15OH29 CHAOTRONICS 3 0 0 3

LINEAR AND NONLINEAR CIRCUITS: Linear circuit elements – nonlinear circuit elements – switches, reactive nonlinear energy storage devises-inductance and capacitance -circuits with linear elements – circuits with nonlinear elements – LC, RLC and forced
CHEMISTRY

15OH33 CHEMICAL SENSORS AND BIOSENSORS

3 0 0 3


**FLUOROPHORE AND CHROMOPHORES BASED FIBEROPTIC BIOSENSORS:** Enzyme based nonmediated fiberoptic biosensors – chromophores and fluorophore detection. Bioluminescence and chemiluminescence based fiberoptic sensors – bioluminescence and chemiluminescent reactions – analytical potential of luminescent reactions – applications

**DETERMINATION OF METAL IONS BY FLUORESCENCE ANISOTROPY:** Theory of anisotropy based determination of metal ions – fluorescent aryl sulfonamides for zinc determination- removal of zinc from carbonic anhydrase – determination of zinc using reagent approach – determination of copper and other ions by using reagentless approach.

**TEXT BOOKS:**

**REFERENCES:**

15OH37 ENERGY STORING DEVICES AND FUEL CELLS

BATTERIES: Types-battery characteristics - voltage, current, capacity, electricity storage density, power, discharge rate, cycle life, energy efficiency, shelf life. Primary cells: Fabrication, performance aspects, packing and rating of zinc-carbon, alkaline-manganese, silver oxide cells. Lithium primary batteries.

SECONDARY BATTERIES: Fabrication, performance aspects and rating of lead acid and sealed lead acid battery, nickel-cadmium, Ni-metal-hydride lithium ion batteries, Rechargeable Zinc alkaline batteries and thermal batteries.

ADVANCED BATTERIES: Metal / air, zinc-bromine, sodium-beta alumina and lithium / iron sulphide batteries. Photogalvanic cells. Battery specifications for cars, heart pacemakers, torpedo batteries, satellite batteries.

FUEL CELLS: Classification, working principle, components, applications and environmental aspects of alkaline, phosphoric acid, solid oxide, molten carbonate, direct methanol and proton exchange membrane fuel cells.


REFERENCES:

Total L: 45

TEXT BOOKS:


REFERENCES:

Total L: 45

TEXT BOOKS:


REFERENCES:

15OH46 COMPUTER GRAPHICS AND VIRTUAL REALITY

BASICS OF COMPUTER GRAPHICS: Display Devices - Bitmap and Vector based graphics - Overview of Coordinate system - Scan Conversion of: point - line using Digital differential analyzer & Bresenham’ s algorithm - circle using midpoint approach ; Curve Generation : Bezier and B-Spline curves. Introduction to fractals: generation procedure - classification dimension and Koch Curve. (11)

AREA FILLING, TRANSFORMATIONS AND VIEWING: Area filling: Inside/outside Test - scan line polygon fill algorithm - Boundary fill and flood fill algorithm. Basic geometrical 2D and 3D transformation. Viewing pipeline - view coordinate reference frame - window to viewport transformation. (9)

BASICS OF ANIMATION: Key frame animation - sequence - motion control methods - morphing - warping. (8)

VIRTUAL REALITY: Components of VR system - types of VR - position trackers - navigation - gesture interface - displays - Open GL rendering pipeline. (9)

VR PROGRAMMING: VRML, defining and using nodes and shapes - VRML browsers - Java 3D – visual object definition by shape 3D instances - ColorCube class - Geometric utility classes. (8)

Text Books:

References:

15OH47 DATA AND FILE STRUCTURES

INTRODUCTION: Data structures - Abstract data Types - Primitive data structures - Algorithms: Structure, properties – analysis of time complexities. (4)

ARRAYS: Representation of linear and multi dimensional arrays – Operations - Applications. (5)

STACKS : Representation - Operations - implementation - Applications: Recursion handling; Evaluation of expressions. (5)

QUEUES: Representation - Operations - sequential implementation – Circular Queues-Priority Queues - Deque – Applications: Job Scheduling systems. (7)

LISTS: Singly linked lists, Doubly linked lists, Circular lists, Multiply linked lists – Operations - Linked stacks - Linked queues-Applications: Addition of Polynomials; Sparse Matrix representation. (9)

FILES: File Types – Basic file operations – Heap Organization- Sequential file organization – Indexed Sequential File – Direct file organization (8)

SORTING: Insertion Sort - Shell Sort - Bubble Sort - Quick Sort - Merge Sort – Algorithms - Analysis. (7)

Text Books:

References:
15OH48 DATABASE MANAGEMENT SYSTEM


DATAMODELING: Introduction to Hierarchical data model - Network data model- ER model: Entities, Attributes, relationships – Weak and strong entity types – Design of Entity Relationship data models.

RELATIONAL MODEL: Relational data model basics - properties of Relations- Domains and Key concept – Enforcing data integrity constraints - Relational algebra operations.

RELATIONAL DATABASE MANIPULATION: Introduction to Structured Query Language(SQL) – SQL commands for defining database – Manipulations on database – Basic data retrieval operations - aggregate function- order by/group by clause- sub queries-in-any-all- views in SQL.

DATA BASE DESIGN THEORY: Functional dependencies - Normal forms – Normalization: 1NF to 5NF- Domain Key Normal Form – losses join and dependency preserving decomposition.

DATABASE TRANSACTION & SECURITY: - Transaction processing – properties - Concurrency control mechanism - security and integrity threats - Defense Mechanism.

TEXT BOOKS:

REFERENCES:

15OH49 HIGH PERFORMANCE COMPUTING


PARALLEL COMPUTERS: Parallel architectures -Trends in architectures, CMPs, GPUs, and Grids, Multiprocessors, Multicore processors, Multithreading, Pipelining- Data access optimization - Balance analysis and lightspeed estimates - Storage order - Taxonomy of parallel computing paradigms - Shared memory computers - Distributed memory computers - Hierarchical systems – Networks - Basics of parallelization- Parallelism – Parallel scalability.


PRINCIPLES OF PARALLEL ALGORITHM DESIGN: Preliminaries - Decomposition techniques - Characteristics of tasks and interactions - Mapping techniques for load balancing - Methods for containing interaction overheads - Parallel algorithm models – Basic communication operations.


TEXT BOOKS:

REFERENCES:

Total L: 45
15OH50 MAINFRAME SYSTEMS

EVOLUTION OF MAINFRAME: Overview of Computer Architecture - Classification of Computers - micro, mini, mainframes and super computer - key features – benefits.

MAINFRAME SYSTEM: Attributes of Mainframes - Reasons for opting Mainframes - Users of Mainframes - Difference between Centralized and Distributed computing - Batch processing - Online/Interactive transactions.

MAINFRAME WORKLOADS: Concept - strategy and benefits of the z/OS environment - Application enablement in z/OS - Overview of e-business support in z/OS - Connectivity to the z/OS environment - Security support provided by z/OS

SYSTEM MANAGEMENT: Scalability – availability - backup and recovery features in z/OS - z/OS system services - zSeries processor configurations.

COBOL: Introduction to COBOL - Program Structure - Procedure Division - Table Handling - File Handling.

CASE STUDY: z/VM – Linux – zVSE – zTPF.


15OH51 MOBILE APPLICATION DEVELOPMENT


BUILDING MENUS: Menus and types – Creating menus through XML – Creating menus through coding – Using the ActionBar – Drop-down List ActionBar.


PUBLISHING ANDROID APPLICATIONS: Setting versioning information – Signing and publishing the applications – Distributing applications - Monetizing the applications.


15OH52 MULTICORE PROGRAMMING

BASICS OF MULTICORE: Definition - hybrid architectures - The software developer's viewpoint - single core - multicore – Types: multicore designs.
CHALLENGES: Sequential model – Concurrency – software development - Processor architecture - Operating systems role.


COMMUNICATION AND SYNCHRONIZATION: Thread strategy approaches - Decomposition and encapsulation of work - Approaches to application design - PADL and PBS.

UML: Modelling the structure of a system - UML and concurrent behavior - Basic testing types - Defect removal for parallel programs - Standard software engineering tests.

TEXT BOOK:

REFERENCES:

15OH53 OBJECT ORIENTED PROGRAMMING 3 0 0 3


FUNCTIONS IN C++: Function Prototyping - Call by Reference - Return by reference - Inline functions – Default - Const Arguments

CLASSES AND OBJECTS: Data members - Member functions - Nesting of Member functions - Private member functions - Memory allocation for Objects - Static data members - Static Member Functions - Arrays of Objects - Objects as Function Arguments - Friend Functions - Returning Objects.


POLYMORPHISM: Compile and Run Time Polymorphism – Operators Overloading - Unary and Binary Operators Overloading - Function Overloading.

TEXT BOOKS:


15OH54 PROGRAMMING IN PYTHON 3 0 0 3

BASICS: Python - Variables - Executing Python from the Command Line - Editing Python Files - Python Reserved Words - Basic Syntax-Comments - Strings and Numeric Data Types - Simple Input and Output.


ERROR HANDLING: Run Time Errors - Exception Model - Exception Hierarchy - Handling Multiple Exceptions - Data Streams - Access Modes Writing - Data to a File Reading - Data From a File - Additional File Methods - Using Pipes as Data Streams - Handling IO Exceptions - Working with Directories.

OBJECT ORIENTED FEATURES: Classes Principles of Object Orientation - Creating Classes - Instance Methods - File
REFERENCES:

15OH55 RESPONSIVE WEB DESIGN

INTRODUCTION TO HTML AND XHTML:
Origins and evolution of HTML - Basic Syntax - Standard HTML Document Structure -

CASCADING STYLE SHEETS:
Introduction - Levels of Style Sheets - Style Specification Formats – Style Classes - Properties and Property Values - Color - The span and div Tags.

HTML5:
Media Queries supporting different viewport – Syntax - Fluid Layouts - Fluid Images - Serving Different Images for different screen sizes - HTML 5 for responsive designs - semantic media in HTML5 – Embedding Media in HTML5.

CSS3:
Selectors - Typography and Color Modes – Aesthetics with CSS3 - Text shadows - Box shadows - Background Gradients - patterns - Multiple Background images Transitions - Transformations and Animations Forms with HTML5 and CSS3.

BASICS OF JAVASCRIPT:

TEXT BOOKS:

REFERENCES:

15OH56 SOCIAL WEB MINING

INTRODUCTION:

SOCIAL NETWORK DATA AND REPRESENTATION:
Structural – composition-affiliation variables-modes-boundary specification and sampling- type of networks- measurement and collection - Review of graph theory- Data set- Tools-Pajek, Netdraw, UClnet

STRUCTURAL PROPERTIES OF SOCIAL NETWORKS:
Notions of centrality - cohesiveness of subgroups - roles and positions - structural equivalence - equitable partitions.

WEB CONTENT MINING:
Boolean model - vector space model - web search – feature enrichment of short texts- - automatic topic extraction from web document – opinion search and opinion spam.

WEB LINKAGE MINING:
Hyperlinks- co-citation and bibliographic coupling- page rank and HITS algorithm – web community discovery – web graph measurement and modelling - using link information for webpage classification.

TEXT BOOKS:

REFERENCES:
INTRODUCTION: Software Characteristics-Comparison with other Engineering disciplines-Software Crisis and Myths-Software life cycle models-Selection of process models for projects- Agile methods- Software Engineering paradigms. (8)

REQUIREMENTS GATHERING: Requirements gathering tasks – Requirements Engineering Process - Qualities of good requirements-Types of Requirements-Requirements elicitation- Requirements documentation- Analysis Documentation. (7)


PROGRAMMING STANDARDS: Structured programming coding standards-Maintainability of code. (5)

SOFTWARE TESTING FUNDAMENTALS – Black-Box and White-Box testing – Basis Path testing – Requirements phase testing - Design phase testing - Program phase testing - Desk debugging and program peer view test tools - Evaluating test results - Installation phase testing - Acceptance testing – Testing GUI – Testing Web Applications (8)


TEXT BOOKS:  

REFERENCES:  

INTRODUCTION: Features of Java – Java Development Environment – Java Virtual Machine- byte codes in java - Naming conventions and Data Types - Operators - Control Structures - Arrays and Strings. (3+3)

OBJECT ORIENTED CONCEPTS: Classes and objects- creation- access specifiers- constructors – Methods - static- Inheritance - Composition-polymorphism -nested classes–wrapper classes- Abstract classes. (5+6)

PACKAGES AND INTERFACES: - Packages - Access protection - Importing packages - Interface - Defining and Implementing Interface. (3+3)

EXCEPTION HANDLING: Exception types - Uncaught Exception - Using Try and Catch - Multiple catch clauses - Nested try statements - throw - throws - Java Built-in Exception - Creating user defined exceptions- Assertions. (4+4)

INPUT/OUTPUT: Files – Stream classes – Byte Streams – Character Streams – Serialization. (3+3)

MULTI THREADED PROGRAMMING: Java thread model - Priorities - Synchronization - Messaging - Thread class and runnable Interface - Synchronization - Interthread Communication. (4+4)

GUI PROGRAMMING: AWT-Swing classes - Components - Labels, Buttons, Check Boxes, combo box- Controls Menus – Frames Event delegation model –listener and listener methods –Event classes- Applets. (5+4)

DATABASE CONNECTIVITY: Architecture – connect RDBMS – Exploring java.sql package. (3+3)

REFERENCES:  
15OH59 GEOGRAPHIC INFORMATION SYSTEM


DATA MANAGEMENT AND OUTPUT: Import / Export – Data Management functions - Raster to Vector - Vector to Raster Conversion - Data Output - MapCompilation – Chart/Graphs – Multimedia – Enterprise Vs Desktop GIS - Distributed GIS. (5+5)


Total L: 30 + T: 30 = 60

TEXT BOOKS:

REFERENCES:

15OH60 PROGRAMMING FOR ROBOTICS

BASICS OF ROBOTICS: History – Definition – Components – Building a robot – The Robot drive mechanism. (3+2)

ROBOT SIMULATION: Mathematical modeling of the robot - Robot kinematics – Concepts of ROS and Gazebo. (4+4)

DESIGNING CHEFBOT HARDWARE: Specifications - Block diagram - Working with Robotic Actuators and Wheel Encoders - Interfacing DC geared motor with Tiva C LaunchPad - Interfacing quadrature encoder with Tiva C Launchpad - Working with Dynamixel actuators. (5+5)

WORKING WITH ROBOTIC SENSORS: Working with ultrasonic distance sensors - Working with the IR proximity sensor - Working with Inertial Measurement Unit. (4+4)

PYTHON AND ROS: Introduction to OpenCV, OpenNI, and PCL - Programming Kinect with Python using ROS, OpenCV, and OpenNI - Working with Point Clouds using Kinect, ROS, OpenNI, and PCL. (6+6)


Total L: 30 + T: 30 = 60

71
TEXT BOOKS:

REFERENCES:

HUMANITIES

15OH61 AN INTRODUCTION TO INDIAN CONSTITUTION

3 0 0 3

PREAMBLE AND ITS PHILOSOPHY: Introduction and Evolution of Indian Constitution preamble and its Philosophy. (4)

CENTRE-STATE RELATIONS: Directive Principles of State Policy, Fundamental Rights and Duties, Centre-State Relations. (6)

UNION GOVERNMENT: Powers, Functions and Position of President, Vice-President and Council of Ministers. (6)


JUDICIARY: The Union Judiciary - Supreme Court and High Court. (6)

PUBLIC SERVICES: All India Services, Central Civil Services, State Services, Local Services and Training of Civil Services. (5)

INTERNATIONAL POLITICS: Foreign Policy of India, Foreign Policy of USA, International Institutions like UNO, WTO, SAARC and Environmentalism. (5)

TEXT BOOKS:

REFERENCES:

15OH62 ENTREPRENEURSHIP

3 0 0 3

INTRODUCTION TO ENTREPRENEURSHIP: Definition – Characteristics and Functions of an Entrepreneur – Common myths about entrepreneurs – Importance or Entrepreneurship. Seminar in R5 & R6. (5)


DEVELOPING AN EFFECTIVE BUSINESS MODEL: The Importance of a Business Model – Starting a small scale industry - Components of an Effective Business Model. (5)

APPRAISAL OF PROJECTS: Importance of Evaluating Various options and future investments- Entrepreneurship incentives and subsidies – Appraisal Techniques. (8)

FORMS OF BUSINESS ORGANIZATION: Sole Proprietorship – Partnership – Limited liability partnership - Joint Stock Companies and Cooperatives. (4)


THE MARKETING FUNCTION: Industry Analysis – Competitor Analysis – Marketing Research for the New Venture – Defining the Purpose or Objectives – Gathering Data from Secondary Sources – Gathering Information from Primary Sources – Analyzing and Interpreting the Results – The Marketing Process. (5)
INTELLECTUAL PROPERTY PROTECTION AND ETHICS: Patents – Copyright – Trademark – Geographical indications – Ethical and social responsibility and challenges.

TEXT BOOKS:

REFERENCES:

15OH63 HUMAN RESOURCE MANAGEMENT


TRAINING AND DEVELOPMENT: Principles of Learning, Objectives, Types and Training Methods, Management Development: Its Meaning, Scope and Objectives.


INTERNATIONAL HRM: Model, Variables that outline difference between local and International HRM approaches to IHRM, Linking HRM to International Expansion Strategies.


15OH64 INDUSTRIAL PSYCHOLOGY

INDUSTRIAL PSYCHOLOGY: Introduction – Concept and Meaning – Characteristics and Scope.


ORGANISATION CULTURE: Meaning – Types – Importance – Changing Organizational Culture and Matching People with Organizational Culture – Working Environment. (5)

INDUSTRIAL FATIGUE BOREDOM: Types of Industrial Fatigue – Symptoms – Causes and Remedies of Industrial Fatigue Industrial Boredom – Causes – Effective Ways to Reduce Boredom. (6)

JOB SATISFACTION: Job Satisfaction – Consequences – Tips for Reducing Job Dissatisfaction. (3)

PERFORMANCE MANAGEMENT: Concept – Objectives – Process – Methods of Performance Evaluation. (3)

TEXT BOOKS:

REFERENCES:

15OH65 PRINCIPLES OF MANAGEMENT

PRINCIPLES OF MANAGEMENT: Meaning, Definition and Significance of Management, Basic Functions of Management – Planning, Organizing, Staffing, Directing and Controlling. (5)

ENGINEERS AND ORGANIZATIONAL ENVIRONMENT: Social, Economic, Technological and Political. Social Responsibility of Engineers. (3)

MANAGEMENT CONCEPTS: MBO, Theory Z, Kaizen, Six Sigma, Quality Circles and TQM. (Case Study) (5)

BUSINESS PROCESS REENGINEERING: Need for BPR, Various phases of BPR, Production and Productivity in six sigma and TQM – Factors Influencing Productivity. (7)

ORGANISATIONAL BEHAVIOUR: Significance of OB, Role of Leadership, Personality and Motivation, Stress, Attitudes, Values and Perceptions at work. (7)

INDUSTRIAL AND BUSINESS ORGANIZATION: Growth of Industries (Small Scale, Medium Scale and Large Scale Industries). Forms of Business Organizations. Resource Management – Internal and External Sources. (6)

MANAGING INFORMATION: Why Information Matters – Strategic Importance of Information – Cost of Useful Information – Getting and Sharing Information. (6)


Total L: 45

TEXT BOOKS:

REFERENCES:

15OH66 BUSINESS STATISTICS

STATISTICS INTRODUCTION: Definition, Types of Statistics, Types of Variables, Descriptive Measures, Basic Definition and Rules of Probability, Independence of Events. (9)

DESCRIPTIVES MEASURES: Measures of central tendency, dispersion, Probability Distributions. (6)

SAMPLING: Definition, Selection of Statistical tools, Sampling Methods, Sampling Frame determining the sample size. (6)

HYPOTHESIS TESTING: ANOVA- Independent sample t test, Paired t test. (4)

PARAMETRIC TEST: Concept, Chi square tests for Association and homogeneity, One sample t test. (4)
CORRELATION AND REGRESSION: Karl Pearson Correlation, Linear regression (Both manual and software applications), Components, Trend - Method of least squares and moving averages, seasonal variation - Simple average method only. (10)

STATISTICAL DECISION THEORY: Uncertainty and risk and Decision tree analysis (6)

TEXT BOOKS:

REFERENCES:

15OH67 DISASTER MANAGEMENT

INTRODUCTION: Disaster – Definition, Factors and Significance, Difference between Hazard and Disaster, History of Disasters and Types, Disaster Aids. (4)

NATURAL DISASTERS: Cyclones, Floods, Drought and Desertification - Earthquake, Tsunami, Landslides and Avalanche. (5)

MAN MADE DISASTERS: Chemical industrial hazards, major power breakdowns, traffic accidents, Fire, War, Atom bombs, Nuclear disaster. - Forest Fire-Oil -accident in Mines. (8)

GEOSPATIAL TECHNOLOGY: Remote sensing, GIS and GPS applications in real time disaster monitoring, prevention and rehabilitation- disaster mapping. (8)

RISK ASSESSMENT AND MITIGATION: Hazards, Risks and Vulnerabilities. -Disasters in and India, Assessment of Disaster Vulnerability of a location and vulnerable groups- Preparedness and Mitigation measures for various Disasters- Mitigation through capacity building -Preparation of Disaster Management Plans. (8)

DISASTER MANAGEMENT: Legislative responsibilities of disaster management- Disaster management act 2005- post disaster recovery & rehabilitation, Relief & Logistics Management; disaster related infrastructure development- Post Disaster, Emergency Support Functions and their coordination mechanism. (8)

GLOBAL PERSPECTIVE: Study of Environmental Impacts Induced by Human Activity, Industrial Accidents, Outbreaks of Disease and Epidemics, War and Conflicts. (4)

TEXT BOOKS:

REFERENCES:

15OH68 FINANCIAL AND MANAGERIAL ACCOUNTING

INTRODUCTION TO ACCOUNTING: Meaning, Definition and significance of Accounting, Accounting Principles, Concepts and Conventions, Classifications of Accounts. (9)

BASIC ACCOUNTING: Journal Entry, Ledger, and Trial Balance Sheet, preparation of final accounts: Trading, Profit & Loss Account, Balance sheet. (9)

BASIC FINANCIAL STATEMENTS: Meaning – Types of Financial Analysis Income Statement, common analysis, trend analysis, ratio analysis, corporate cash flow, DuPont Model. (9)

COST ACCOUNTING: Accounting for overheads, Cost sheet, Marginal and Absorption costing, Break even analysis, Effect on profits, Activity Based Costing system. (6)
ACCOUNTING FOR DECISION MAKING: CVP Analysis - Relevant Costs and Revenue for Decision Making, Pricing Decisions, Operational Decisions, Exploring New markets, Make or buy decisions. (6)

ACCOUNTING FOR PLANNING AND CONTROLLING: Budgets, Budgetary Control - Variance Analysis - Cost and Financial Variances. (6)

TEXT BOOKS:

REFERENCES:

15OH69 MARKETING MANAGEMENT

3 0 0 3


MARKETING STRATEGY: Formulating Marketing Strategy, Key Drivers of Marketing Strategy, Marketing Strategies- Marketing Mix Components. (7)

COMPETITOR ANALYSIS: Analysis of Consumer & Industrial Markets, Building Competitive Advantage. (6)


MARKETING RESEARCH & TRENDS IN MARKETING: Marketing Information System, Marketing Research Process & Purpose, Ethics in Marketing, Online Marketing Trends. (7)

TEXT BOOKS:

REFERENCES:

15OH70 DEFENCE PRACTICES AND DISASTER MANAGEMENT

3 0 0 3

HISTORY & ENVIRONMENTAL AWARENESS: NCC- Army, Navy, Air force; Aim and Motto; Ranks and Equivalent Ranks; Honors and Awards; Organization; Training – Nation Building; Civil affairs; Social Service & Needs; Environment & Ecology; Pollution; Rain Water Harvesting; Law and Order; Corruption. (7)

WEAPONS: Introduction; Types of Weapons; Armed Forces Fighting Arms; Service Corps; Section Formation & Types; Firing Order; Judging Distance; Types of Land; Working Principle of Rifle, Tank, Missiles; Characteristics of supporting Rifle and its ammunitions; Field Craft and Battle Craft; Fighting - Role of Fighting Arms and map reading. (7)

DISASTER MANAGEMENT: Definition; Types of Disaster; Elements of Disaster Management, Foundations of Disaster Studies- Review of Concepts, Organizations – NDMA, NIDM, NDMRT, NEC, Disaster Mitigation, Disaster Preparedness, Disaster Relief, Reconstruction Planning, Economic and Social Rehabilitation, Globalization and Disaster Studies, Social Science and Domains Approach. (7)

LIFE SKILL MANAGEMENT: Introduction; Concept of Life Skills; Internalizing of Life Skills; Self awareness and Empathy; Knowing Myself; Self care; Empathizing with others; Creative Thinking & Critical Thinking; Practicing Decision making & Problem Solving;
Effective Communication – Inter Personal Relationship; Coping with Emotions & Stress; Facilitation skills – Verbal & Non verbal; Training Methodologies. (7)

HEALTH AND HYGIENE: Anatomy, Physiology, Microbiology – Personal and Mental Health; Infectious and Contagious Diseases, Its prevention; First Aid in common Medical Emergencies; Basics of Home Nursing; Treatment and care of Wounds and Fractures. (7)

FIELD TRAINING: Foot Drill; Handling-Inspection Training; MapReading; Physical Proficiency Training; Introduction to Yoga. (10)

Total L: 45

TEXT BOOKS:

REFERENCES:

ENGLISH

15OH75 ENGLISH AND SOFT SKILLS FOR EMPLOYABILITY

SELF MANAGEMENT AND ATTITUDES: Self Concept, Stress management, Positive attitude, Influential Skills, Initiative, Empathy, Social Etiquette (5)

COMMUNICATION STYLES : Presentation Skills, Interpersonal Communication Skills, Interviewing Skills, Verbal and Nonverbal (body language) skills, Active Listening, Professional Writing, Effective email writing (16)

TEAM WORK: Inter team cooperation, Intra team cooperation, Diversity, Productivity, Goal Setting and action (4)

LEADERSHIP SKILLS: Empowerment, Planning, Establishing Credibility, Vision & direction, Supervision, Mentoring, Decision-making, Creativity, Flexibility, Team problem solving (5)

MANAGING TIME AND PRESSURES: Managing Change, Time management, Effective meetings (5)

EFFECTIVE AND EXCELLENT CUSTOMER SERVICE: Communication with the customer- telephonic and online services, Managing conflicts or Challenging communication, Setting and resetting customer expectations, Building customer confidence, Growing customer relationship, Opportunity management, Developing team approach to meet customer needs. (10)

Total L: 45

TEXTBOOK:
Monograph prepared by the Faculty, Department of English, 2015.

REFERENCES:

15OH76 ENGLISH FOR COMPETITIVE EXAMINATIONS

READING COMPREHENSION: Focus on different levels of Comprehension- Literal, Inferential, Analytical and Critical reasoning (7)
Identifying key words and signal words, decoding the building blocks of a passage, understanding jargons and double distractors (2)

LISTENING COMPREHENSION: Micro skills and Macro skills of Listening (4)
Identifying tone and purpose, eliminating distractors in objective type questions (2)

SPEAKING : Sub skills of speaking- Genre-specific oral communication (4)

VERBAL ABILITY: Word formation and expansion, Selecting and ordering words - Identifying and correlating synonyms
and antonyms - Collocations (5)
Sentence Completion (5)
Verbal analogies (3)
Spotting and correcting errors (4)

WRITING: Mapping ideas, developing points and employing Variety in sentence types (3)
Referencing, Ellipsis and substitution in writing – Skillful paragraphing (unity, coherence and cohesion) (3)
Register and Tone in Critical, Analytical writing - Useful Language for describing graphs - Expressing strong opinions (3)

Total L: 45

TEXTBOOK:
Monograph prepared by the Faculty, Department of English, 2015

REFERENCES:

15OH77 GERMAN LANGUAGE – INTERNATIONAL LEVEL A1.1

3 0 0 3

GUTEN TAG! - LEARNING: To greet, learn numbers till 20, practice telephone numbers & e mail address, learn alphabet, speak about countries & languages; Vocabulary: related to the topic; Grammar: W – Questions, Verbs & Personal nouns I. (7.5)

FREUNDE, KOLLEGEN UND ICH - LEARNING: To speak about hobbies, jobs, learn numbers from 20; Vocabulary: related to the topic; Grammar: Articles, Verbs & Personal pronouns II, sein & haben verbs, ja/nein Frage, singular/plural. (7.5)

IN DER STADT – LEARNING: To know places, buildings, question, know transport systems, understand international words; Vocabulary: related to the topic; Grammar: Definite & indefinite articles, Negotiation, Imperative with Sie. (7.5)

GUTEN APPETIT! – LEARNING: To speak about food, shop, converse; Vocabulary: related to the topic; Grammar: Sentence position, Accusative, Accusative with verbs. (7.5)

TAG FÜR TAG – LEARNING: To learn time related expressions, speak about family, ask excuse, fix appointments on phone; Vocabulary: related to the topic; Grammar: Preposition – am, im, um, von...bis, Possessive articles, Modalverbs. (7.5)

ZEIT MIT FREUNDEN – LEARNING: To speak about birthdays, understand & write invitations, converse in the restaurant; Vocabulary: related to the topic; Grammar: Accusative personal pronouns and prepositions. (7.5)

Total L: 45

TEXTBOOK:

REFERENCES:

15OH78 GERMAN LANGUAGE – INTERNATIONAL LEVEL A1.2

3 0 0 3

KONTAKTE - LEARNING: To arrange appointments, understand and give instructions, understand and reply letters, find information in the text, identify the situations and understand the conversation; Vocabulary: related to the topic; Grammar: Dative Preposition & Article, Accusative Possessive Article. (7.5)
MEINE WOHNUNG - LEARNING: To understand the advertisements related to flats/houses, describe a flat, write a text about a flat; **Vocabulary**: related to the topic; **Grammar**: Adjective with sein (sehr/zu), wechselpreposition with Dat. (7.5)

ALLES ARBEIT? – LEARNING: To describe daily routine, talk about the past, speak about jobs, position, advertisements, prepare telephone conversation; **Vocabulary**: related to the topic; **Grammar**: Conjunctions, Perfect tense (regular & irregular verbs). (7.5)

KLEIDUNG UND MODE – LEARNING: To speak about clothes, understand the conversation at shopping centers, about Berlin. **Vocabulary**: related to the topic; **Grammar**: Perfect tense (trennbare & nicht trennbare verbs), personal pronomen & verbs with Dat. (7.5)

GESUND UND MUNTER – LEARNING: To make personal statements, name body parts, understand sport activities, conversation with the doctor, get & give tips to healthy life, e-mail writing; **Vocabulary**: related to the topic; **Grammar**: Imperative, Modalverbs. (7.5)

AB IN DEN URLAUB! – LEARNING: To suggest a city tour, describe the directions, write a postcard, describe the weather, make a complain in the hotel, speak about the trips, letter writing; **Vocabulary**: related to the topic; **Grammar**: Adverbs (time). (7.5)


APPLIED MATHEMATICS AND COMPUTATIONAL SCIENCES

15OH81 DATA STRUCTURES AND ALGORITHMS

**INTRODUCTION:** Data structures - Abstract Data Types - Basic data structures – Arrays, stacks, queues and linked lists-Operations and applications (5)

**ALGORITHMS:** Introduction-Analysis of algorithms - Best, worst and average case time complexities - notations. (2)

**TREES:** Terminologies – Binary tree- Sequential and linked representation -operations - Traversals - Expression trees - Infix, Postfix and Prefix expressions – Heaps- Max heap-Min heap. (4)

**SORTING AND SEARCHING:** Insertion sort, selection sort, heap sort, count sort and radix sort - searching , Linear Search. (4)

**BINARY SEARCH TREES:** Searching – Insertion and deletion of elements-Balanced BST- AVL trees-Definition – searching – insertion and deletion of elements. AVL rotations (4)

**MULTIWAY SEARCH TREES:** Indexed Sequential Access – m-way search trees – B-Tree – searching, insertion and deletion . (3)

**GRAPHS:** Definition – representations (Adjacency matrix, packed adjacency list and linked adjacency list) – Graph search methods (Breadth first and depth first traversals) . (2)

**DIVIDE AND CONQUER:** Method – Merge sort, Quick sort, Binary Search. (3)

**GREEDY METHOD:** Optimization problems – method – examples – Minimum cost spanning tree (Kruskal’s and prim’s algorithms), Knapsack problem (3)

**TUTORIAL PRACTICE:**
Implementation of the following problems:
1. Sparse and dense Matrix operations using arrays.
2. Linked Lists: Singly linked, Doubly linked and Circular lists.
4. Problems using Queues.
5. Binary trees
6. Problems related to sorting and searching algorithms.
7. Binary search tree
8. Minimum cost spanning tree

Total L: 30+T:30 = 60
15OH82 OPTIMIZATION TECHNIQUES

LINEAR PROGRAMMING: Graphical method for two dimensional problems – Central problems of Linear Programming – Definitions – Simplex Algorithm – Phase I and Phase II of Simplex Method. (8)

CONVEX OPTIMIZATION: Convex sets and cones- Convex functions- Convex optimization problems- linear and quadratic programs; second-order cone and semi-definite programs; quasi-convex optimization problems; vector and multi-criterion optimization. (5)


INTEGER PROGRAMMING: Gomory cutting plane methods for all integer and mixed integer programming problems - Branch and Bound method (Land – Dolg and Dakin algorithms) – Zero-One Implicit enumeration Algorithm. (5)


TUTORIAL PRACTICE:
1. Solving inequalities using Simplex, Two-phase, Dual simplex methods, Revised simplex method.
2. Finding initial basic feasible solution using (i) North-West corner rule(ii) Matrix minimum and (iii) Vogel’s approximation method and also perform optimality test using MODI method.
4. Gomory’s cutting plane methods for all IPP and mixed IPP.
6. Critical path for the given PERT and CPM networks.

Total L: 30+T:30 = 60

TEXT BOOK:

REFERENCES:

15OH83 DATA SCIENCE

INTRODUCTION TO DATA SCIENCE : Data wrangling, cleaning, and sampling to get a suitable data set - Mathematics for understanding the data – Descriptive statistics : Visualizing Data - Central Tendency –Variability –Standardizing -Normal Distribution -Sampling Distributions. (6)

DATA MANIPULATION AT SCALE : Parallel databases, parallel query processing, in-database analytics, MapReduce, Hadoop, Key-value stores and NoSQL; tradeoffs of SQL and NoSQL. (5)

COMMUNICATING RESULTS: Visualization - descriptive statistics and visualization, privacy, ethics – multivariate visualization. (3)

SPECIAL TOPICS: Graph Analytics: structure, traversals, analytics, PageRank, community detection, recursive queries, Semantic web. (3)

CASE STUDY: Community Detection – Collaborative Network – Opinion mining – Co-citation network (2)

TUTORIAL PRACTICE:
1. Introduction to R and problems using R.
2. Collect datasets from Kaggle and Data Analysis.
3. Implementation of various predictive models.
4. Generate the results using Confidence levels.
5. Implementation of SVD.

TEXT BOOK:

REFERENCES:
5. Matthew A. Russell,'Mining the Social Web: Analyzing Data from Facebook, Twitter, LinkedIn, and Other Social Media Sites", O'Reilly Media, 2013.

15OH84 DATA VISUALIZATION


STATIC DATA VISUALIZATION – tools – working with various data formats (3)


MAPS – Introduction to building choropleth maps (3)

TREES – Network visualizations – Displaying behavior through network graphs (6)

BIG DATA VISUALIZATION – Visualizations to present and explore big data – visualization of text data and Protein sequences (7)

TUTORIAL PRACTICE:
Note: Explore software like R, Python, Google Vision, Google Refine, and ManyEyes; Data sets are available on Gap minder, Flowing data
1. Visualization of static data.
2. Visualization of web data.
3. Visualization of sensor data.
4. Visualization of protein data.

Total L: 30 + T: 30 = 60

TEXT BOOK:

REFERENCES:

15OH85 ARTIFICIAL INTELLIGENCE

INTRODUCTION: The foundations of AI - The History of AI- Intelligent agents- Agent based system. (2)

KNOWLEDGE REPRESENTATION AND REASONING: Knowledge representation - Logics – First order logic- Inference in first order logic – Higher order logic - Markov logic. (5)


DECISION-MAKING: basics of utility theory, sequential decision problems - decision network- policy -Decision process in infinite horizon: Optimal policy, Value iteration - policy iteration- Partially observable decision process – Decisions in Multi agent system: elementary game theory, (6)

LEARNING: Learning from observation - Knowledge in learning – Supervised Learning - Unsupervised and Reinforcement learning. (2)

ROBOTICS: Introduction. (2)

TUTORIAL PRACTICE:
Lab assignments will be provided for all the topics given below.
2. Hill climbing and genetic algorithm
3. Constraint satisfaction techniques,
4. Simple games — minimax and expectimax
5. Logic based exercises.
6. Implementing HMM models
7. Applications of sequential decision making and multi agent decision making
8. Implementing decision network and dynamic networks.

Total L: 30+T:30 = 60

TEXT BOOKS:

REFERENCES:

15OH86 PERVASIVE COMPUTING

INTRODUCTION: Past, present, future: the pervasive computing market, m-Business, challenges and future of pervasive computing - modelling key for pervasive computing - pervasive system environment interaction - architectural design for pervasive system, application examples of pervasive computing: Healthcare, Tracking, emergency information systems, home networking appliances and entertainment. (4)

DEVICE TECHNOLOGY FOR PERVASIVE COMPUTING: Hardware, computing devices and their characteristics - pervasive information access devices-smart identification, smart card, labels, tokens - embedded controls, smart sensors, actuators -Human-machine interfaces, Biometrics - Various operating systems for pervasive devices. (4)


APPROACHES FOR DEVELOPING PERVASIVE APPLICATIONS: Categorization - smart services for pervasive application development - developing mobile applications – presentation transcoding – device independent view component – heterogeneity of device platforms - Context Awareness and Mobility to build pervasive applications. (6)

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CONTEXT AWARE SYSTEMS: Modelling - mobility awareness - spatial awareness - temporal awareness - ICT system awareness - Intelligent Systems - basic concepts- autonomous systems - reflective and self-aware systems - self management and autonomic computing - complex systems.


TUTORIAL PRACTICE:
1. Create application with onClick, onKeyDown, onFocusChanged Event Handlers.
2. Create application with Toast Notifications.
3. Create application with Android's Advanced User Interface Functions.
5. Create application to Create, Modify and Query an SQLite Database.
6. Create application that Works with an Android Content Provider.
7. Create application that performs Data Storage and Retrieval from Android External Storage.
8. Create Location-Aware application that uses Proximity Alerts and Google Maps API.
9. Implementation of small packages to demonstrate all APIs.

Note: All implementations using android.

Total L:30+T:30=60

TEXT BOOKS:

REFERENCES:

15OEH87 PARALLEL AND DISTRIBUTED COMPUTING


PARALLEL COMPUTER MEMORY ARCHITECTURES: Shared Memory - Distributed Memory - Hybrid Distributed-Shared Memory Multiprocessors: Communication and Memory issues - Message Passing Architectures - Vector Processing and SIMD Architectures.

PARALLEL PROGRAMMING MODELS: Overview -Shared Memory Model - Threads Model - Message Passing Model - Data Parallel Model - Other Models.


PRAM ALGORITHMS & BSP: PRAM model of computation- Work-Time formalism and Brent’s Theorem; algorithm design techniques-parallel prefix, pointer jumping.

HIGH PERFORMANCE COMPUTING ARCHITECTURES - Latency Hiding Architectures -Multithreading Architectures -Dataflow Architectures.


TUTORIAL PRACTICE:
1. Basic Master – Worker program and send messages.
2. Write a program to find the summation of largest number in a very larger array of integers. (The contents of the array should be equally distributed to all processes).
3. Write a parallel program in SPMD to calculate the PI value using integral approximation method.
5. Select your own choice of very dense computational problem having divide and conquer method and implement it in parallel algorithm. And produce the performance chart with 2, 4, 6 and 8 nodes.

**TEXT BOOKS:**

**REFERENCES:**

**15OH88 CYBER SECURITY**

**INTRODUCTION:** Security Goals, Attacks, Services and Mechanisms – Techniques – Understanding Threats. (2)


**PROGRAM SECURITY:** Secure Programs – Buffer overflows – Malware – viruses and other malicious code – Targeted Malicious code –Defense Mechanism. (6)


**WEB SECURITY:** Overview, various types of web application vulnerabilities, Reconnaissance, Authentication, Authorization (Fuzzing and Privilege Escalation), Session Management, Cross Site Scripting (XSS),Cross Site Request Forgery (CSRF), SQL Injection and Blind SQL Injection. (5)

**OS SECURITY:** Memory and Address protection – Access Control –file protection mechanisms –User authentication –models of security –Trusted OS design. (4)

**TUTORIAL PRACTICE:**
1. Design of a Client server application for a basic cryptosystem.
2. Detection of a Buffer overflow attack.
3. Packet Sniffing using Wireshark Tool to perform the traffic analysis attack.
4. Key distribution using RSA(KDC) – Key hacking.
6. Password authentication.
7. Transaction security using SQL Injection attacks.
8. Port scanning tools.
9. Performing attacks and testing with attack tools.
10. Security testing for Web applications.

**TEXT BOOKS:**

**REFERENCES:**

15OH89 RANDOMIZED ALGORITHMS  2 2 0 3

INTRODUCTION: Randomized algorithms, randomized quick sort, Karger’s min-cut algorithm Las Vegas and Monte Carlo algorithms, computational models and complexity classes. (4)

MOMENT, DEVIATION AND TAIL INEQUALITIES: Occupancy problem, Markov and Chebyshev inequalities- randomized selection- coupon collector’s problem, the Chernoff bound- routing in a parallel computer- a wiring problem. (4)

PROBABILISTIC METHODS: Overview of the method – maximum satisfiability - finding a large cut, Expander graphs. (4)

MARKOV CHAINS AND RANDOMWALKS: Markov chains, Random walk on graphs - connectivity in undirected graphs – Expanders and rapidly mixing random walks. (4)

DATA STRUCTURES AND GRAPH ALGORITHMS: Random Treaps, hashing – hash tables – perfect hashing, skip lists - Fast min-cut. (4)

ONLINE ALGORITHMS: Paging problem-adversary models- paging against an oblivious adversary-relating the adversaries-the adaptive online adversary, k-server problem. (4)

PARALLEL AND DISTRIBUTED ALGORITHMS: Sorting on a PRAM – Maximal Independent sets. (3)

DERANDOMIZATION: The method of Conditional Probabilities – Derandomizing max-cut algorithm – Constructing pairwise independent values modulo a prime - Pairwise independent – large cut. (3)

TUTORIAL PRACTICE:
1. Implementation of randomized quick sort and solve real time problems using it.
2. Find solution for s-t min-cut problem adapting min cut algorithm.
3. Implementation of randomized selection and problems related to it.
4. Implementation of treap data structure.
5. Problems using randomized hash table.
6. Implement the shortest path and fast min-cut algorithms.
7. Implementation of randomized primality testing.

Total L: 30+TP:30 = 60

TEXT BOOKS:

REFERENCES:

15OH90 APPROXIMATION ALGORITHMS  2 2 0 3

INTRODUCTION: Definition-performance ratios, vertex-cover problem. (3)

COMBINATORIAL ALGORITHMS: lower bounding techniques and Metric TSP, multiway cut problem, the minimum k-cut problem, FPTAS for knapsack, greedy algorithms for Makespan-PTAS for minimum Makespan, Euclidean TSP. (7)

LINEAR PROGRAMMING RELAXATIONS: LP-duality, min-max relations and LP-duality, rounding applied to vertex cover-simple rounding algorithm-randomized rounding, primal dual method and vertex cover. (5)

CUTS, METRICAL RELAXATIONS AND EMBEDDINGS: multiway cut, sum multi-commodity flow, some applications of multicut, rounding for Sparsest Cut via L1 Embeddings. (5)

SEMIDEFINITE PROGRAMMING: Strict quadratic programs and vector programs, properties of positive semidefinite matrices, the semidefinite programming problem, randomized rounding algorithm, improving the guarantee for MAX-2SAT. (5)

HARDNESS OF APPROXIMATION: reduction, graphs, and hardness factors, the PCP theorem, hardness of MAX-3SAT. (5)
TUTORIAL PRACTICE:
1. Implementation of vertex-cover algorithm.
2. Implementation of Greedy algorithm for makespan.
3. Problems related to Euclidean TSP.
4. Implementation of different algorithms with rounding.
5. Implementation of applications of multicut.

Total  L:30+T:30 = 60

TEXT BOOKS:

REFERENCES:

15OH91 NETWORK SCIENCE

INTRODUCTION: Basics of networks and graphs, random network model - degree distribution, evolution, small world property, six degrees of separation, Watts-Strogatz model, local clustering coefficient, random networks and network science. (6)

BARABÁSI-ALBERT MODEL: Growth and preferential attachment, Barabási-Albert model, degree dynamics, degree distribution, diameter and the clustering coefficient, preferential attachment - absence of growth, measure, non-linearity, the origins. (6)

SCALE-FREE PROPERTY: Power laws and scale-free networks, Hubs, Universality, Ultra-small property, role of the degree exponent, Generating networks with a pre-defined degree distribution. (6)

EVOLVING NETWORKS: Bianconi-Barabási model, measuring fitness, Bose-Einstein condensation, evolving networks. (5)

DEGREE CORRELATIONS: Assortativity and disassortativity, Measuring degree correlations, Structural cutoffs, Degree correlations in real networks, Generating correlated networks, impact of degree correlations. (7)

Total  L:30+T:30 = 60

TUTORIAL PRACTICE:
1. Implementation of Barabási-Albert model.
2. Implementation of Watts-Strogatz model.
3. Implementation of Bianconi-Barabási model.
4. Obtaining Degree correlations in real networks.
5. Case studies of the theory concepts on real networks.

TEXT BOOK:

REFERENCES:

15OH92 APPLIED STOCHASTIC PROCESSES

STOCHASTIC PROCESSES: Introduction – Classification of Stochastic Processes – Markov Chain (2)


RANDOM WALK MODELS: Symmetric random walk – Random walk on graphs – Gambler's Ruin model (3)


GENERAL QUEUEING MODELS: Single and Multi server Poisson Queues - Single Server Queue with Poisson input and general service- General input and exponential service Queueing models.

TUTORIALS PRACTICE:
1. Case Study for Markov Chain: Passport Credit Card Company, Manufacturing, Telecommunication
2. Case Study for generalized Markov Process: Healthy Heart Coronary Care Facility
3. Modeling Network Protocols using Queueing Models
4. Performance Evaluation of Communication Systems
5. Page Ranking Algorithms

TEXT BOOKS:

REFERENCES:

15OH93 MODELLING AND SIMULATION

PRINCIPLE OF COMPUTER MODELLING AND SIMULATION: Monte Carlo simulation. Nature of computer modeling and simulation.Limitations of simulation, areas of application. (3)

SYSTEM AND ENVIRONMENT: Components of a system - discrete and continuous systems. Models of a system - A variety of modelling approaches. (3)


DESIGN AND EVALUATION OF SIMULATION EXPERIMENTS: Input - Output analysis - variance reduction techniques - Antithetic variables - verification and validation of simulation models. (4)

DISCRETE EVENT SIMULATION: Concepts in discrete-event simulation, manual simulation using event scheduling, single channel queue, two server queue, simulation of inventory problem. (5)

SIMULATION LANGUAGES - GPSS - SIMSCRIPT - SIMULA - SIMPLE_1, Programming for Discrete event systems in GPSS, SIMPLE_1 and C. (4)

CASE STUDIES: Simulation of LAN - Manufacturing system - Hospital system. (4)

TUTORIAL PRACTICE:
1. Implement variance reduction.
2. Implement event scheduling.
4. Simulate a manufacturing system.

TEXT BOOKS:

REFERENCES:


MATCHING: Maximum and perfect matchings, augmenting path, Berge’s, König’s and Tutte’s theorems, Hall’s theorem, Hungarian algorithm, Edmond-Blossom algorithm. Kuhn-Munkre’s algorithm for optimal assignment. (4)

NETWORK FLOW: Maximum flow in a network, minimum cut, Ford-Fulkerson algorithm, Max-flow min-cut theorem. Similarity between matching and flow theories. (4)


VERTEX COLORING: Vertex coloring and bounds. Sequential coloring, largest degree first algorithms. Maximum clique and vertex coloring. Mycielski’s construction for large chromatic number. (3)

GRAPH ISOMORPHISM: Isomorphism, subgraph isomorphism, László Babai’s quasi-polynomial time solution for graph isomorphism problem. (4)

PLANAR GRAPHS: Euler’s formula, dual graph, Kuratowski’s theorem, 4-color problem, Wagner’s theorem. Planarity testing – Hopcraft-Tarjan algorithm. (3)

Total L: 30+T: 30=60

TUTORIAL PRACTICE:
1. VLSI Physical design – maximum Independent set, maximum clique and minimum coloring for interval graphs, Steiner minimum tree in routing.
2. Isomorphism/subgraph isomorphism problem in Data mining - common subgraph pattern in networks, chemical compound within a chemical database.
3. Link verification using Eulerian trails.
4. Network flow – finding maximum flow in network
5. Register allocation, frequency assignment using vertex coloring
6. Traveling salesman problem using Hamiltonian concept
7. Planar graph embedding
8. Solving optimal assignment problem

TEXT BOOKS:

REFERENCES:
PROFESSIONAL ELECTIVES
(Six courses to be opted)

ADVANCED COMMUNICATIONS SYSTEMS

15L001 SATELLITE COMMUNICATION

ELEMENTS OF SATELLITE COMMUNICATIONS AND ORBITAL ASPECTS:

Expandable Launch Vehicle (ELV) - Space Transportation System (STS) - The mechanics of Launching a Synchronous satellite - The rocket equation - Powered flight - Injection into final orbit and orbital manoeuvres - Mission possibilities - Low thrust variations.

SPACE CRAFT: Space craft subsystems - Altitude and Orbit Control System - Telemetry, Tracking and Command (TT&C) - Power systems - Description of communication system - Transponder - Implementations - Transmission Impairments - Space Craft Antennas - Equipment reliability.

SATELLITE LINK: Basic Transmission Theory - System noise temperature and G/T ratio - Calculation of system noise temperature - Noise figure - Downlinks and Uplinks - Limits on link performance - Design of Satellite links for specified (C/N) - Rain attenuation model.


SATELLITE SERVICES: MSAT service, BSAT service, RADARSAT service, SAR SAT service, INTELSAT service, INMART SAT service, VSAT service, Satellite Navigation and the Global positioning system.


TEXT BOOKS:

REFERENCES:

Total L: 45

15L002 DIGITAL SWITCHING SYSTEMS


SWITCHING NETWORKS: Single stage networks- cross point switches- gradings- forms of grading- Link systems-2, 3 and 4 stage networks.

TIME DIVISION SWITCHING: Space and Time switching- time division switching networks-PBX switches.

SWITCHING SYSTEMS CONTROL: Introduction-digital switching system fundamentals- and evolution-call processing functions-common control-stored program control- Processor-Distributed processing- software-The 5ESS switching system.

SIGNALLING METHODS: Review of dc signaling over audio frequency lines- FDM carrier systems-Out-band and in-band signaling-PCM signaling-Inter register signaling- common channel signaling- Digital customer line signaling.

TRAFFIC ENGINEERING: Introduction to traffic and queuing Theory, Network Traffic Load and Parameters, Grade of Service Blocking Probability, Incoming traffic and service time characterization.

Total L: 45
**TELEPHONE NETWORK ORGANISATION:** Analog and Digital networks-Subscriber Loop System. Switching Hierarchy and Routing, Transmission Plan and Transmission Systems, Numbering, Charging. (5)

**MOBILE SWITCHING:** The cellular concept- analog and digital- network elements- channels-initialization- signaling- channel assignment- handoff- digital cells-fading and path loss. (5)

**TEXT BOOKS:**

**REFERENCES:**

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**15L003 FIBER OPTIC COMMUNICATION**

**INTRODUCTION:** Optical Spectral bands, Evolution of fiber optical system -Elements of Optical Fiber Systems — Optical Fiber Modes and Configurations- Mode theory of Circular Wave guides — Single Mode Fiber — Graded Index fiber - Fiber Materials- Signal degradation in fibers-Advantages and applications of fiber optic transmission systems. (9)

**OPTICAL TRANSMITTER:** Optical sources- Light-Emitting Diodes (LEDs)- Laser Diodes -Light Source Linearity -Reliability Considerations-Comparison and applications--Transmitter Design. (9)

**OPTICAL RECEIVER:** Photo detectors-Photodiodes, Avalanche photo diodes- Comparisons of photo detector- Receiver Noise andsensitivity-Digital Receiver Performance-BER Diagnosis. (9)

**SYSTEM CONFIGURATIONS:** Optical link design - Optical Power Launching and Coupling -System Design considerations - Optical amplifiers - EDFA, Raman amplifier- Multiplexing strategies —Wavelength division multiplexing. (9)

**ADVANCES IN OPTICAL FIBER SYSTEMS:** DWDM -SONET/SDH—Wavelength Routing Networks - Optical switches -Optical fiber LAN link — Ultra High Capacity Networks - Optical networking technology in enterprise. (9)

**TEXT BOOKS:**

**REFERENCES:**

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**15L004 RADAR COMMUNICATION**

**INTRODUCTION TO RADAR:** Basics of radar, EM Waves & properties- applications of radar, radar frequencies-radar block diagram, Radar Coordinates, Radar equation for hard targets and the SNR-radar cross section of targets, Radar Resolution Elements, Pulse, CW and FMCW Radars—configurations, transmitter power- pulse repetition frequency, Duty Ratio, Pulse Compression, Coding, Detection of signals in noise and Radar signals (12)

**RADAR TRANSMITTER AND RECEIVER** -Introduction- Types of Transmitters - linear-beam power tubes- solid-state RF power sources- magnetron- Klystron, crossed-field amplifier- radar receiver- receiver noise figure- super heterodyne receiver, Digital Receivers, duplexers and receiver protectors- radar displays-Human Machine Interface (HMI). (11)

**RADAR ANTENNA** – Functions of radar antenna- antenna parameters- antenna radiation pattern and aperture illumination - reflector antennas- electronically steered phased array antennas- phase shifters – frequency - scan arrays- architectures for phased arrays , radiators for phased arrays- mechanically steered planar array antennas- radiation pattern synthesis -effect of errors on radiation patterns - low side lobes antennas. (11)

**MTI AND PULSE DOPPLER RADAR**- Introduction to Doppler and MTI radar- delay –line cancellers- staggered pulse repetition frequencies- doppler filter banks- digital MTI processing - Moving target detector- limitations to MTI performance- pulse Doppler

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**Total L: 45**

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**Total L:45**

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**Total L:45**

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90

REFERENCES:

TEXT BOOK:

REFERENCES:

RADIO FREQUENCY SYSTEMS

15L005 RADIO FREQUENCY INTEGRATED CIRCUITS

BASIC OF RF ELECTRONICS AND ISSUES IN RFIC DESIGN: Lumped element concept at RF- lumped and distributed regions lower frequency analog design and microwave design versus radio frequency integrated circuit design - Impedance levels for microwave and low-frequency analog design- noise - linearity and distortion in RF Circuits - dynamic range - filtering issues. (7)

SEMICONDUCTOR DEVICE MODELING OF TECHNOLOGY:Basic operation and characteristic of bipolar junction transistor Small signal model of bipolar transistor - high frequency effects - noise in bipolar transistors - base shot noise-noise sources in the transistor model - bipolar transistor design considerations-CMOS transistor- impedance matching - tapped capacitors and inductors - the concept of mutual inductance - tuning a transformer - bandwidth of an impedance transformation network-quality factor of an LC resonator. (8)

DESIGN OF PASSIVE CIRCUIT ELEMENTS IN IC TECHNOLOGIES: Technology backend and metatilization in IC technologies - sheet resistance and skin effect - parasitic capacitance and inductance - current handling in metal lines-design of inductors and transformers - characterization of inductor-layout of spiral inductors - on-chip transmission lines - high frequency measurements of on-chip passives and common De-Embedding techniques-packaging (8)

LOW NOISE AMPLIFIER: Basic amplifiers - amplifiers with feedback - noise in amplifiers - linearity in amplifiers - differential pair and other differential amplifiers-low-voltage topologies for LNAs and the use of on-chip transformers - DC bias networks - temperature effects broad band LNA design. (11)


TEXT BOOKS:

REFERENCES:

15L006 COMPUTATIONAL ELECTROMAGNETICS


**METHOD OF MOMENTS:** Greens Functions; Surface equivalence principle; Electrostatic formulation; Magnetostatic formulation; Electric Field Integral Equation; Magnetic Field Integral Equation; Direct and Iterative Solvers.

**FINITE DIFFERENCE TIME DOMAIN METHODS:** 1D wave propagation, Yee Algorithm, Numerical dispersion and stability, perfectly matched absorbing boundary conditions, Dispersive materials. Antenna and scattering problems with FDTD, non-uniform grids, conformal grids, periodic structures.

**APPLICATIONS OF CEM:** Antennas, biological electromagnetic effects, electronic packing and high speed circuits, microwave devices and circuits, environmental issues. Surveillance and intelligence gathering, homeland security, signal integrity.

**TEXT BOOKS:**

**REFERENCES:**

**15L007 ADVANCED RADIATING SYSTEM**

**ANTENNA FUNDAMENTALS:** Antenna fundamental parameters. Radiation integrals. Radiation from surface and line current distributions – dipole, monopole, loop antenna; Mobile phone antenna- base station, hand set antenna; Image; Induction, reciprocity theorem, Broadband antennas and matching techniques, Balance to unbalance transformer, Introduction to numerical techniques.

**RADIATION FROM APERTURES:** Field equivalence principle. Radiation from Rectangular and Circular apertures, Uniform aperture distribution on an infinite ground plane; Slot antenna; Horn antenna; Reflector antenna, aperture blockage, and design consideration.

**ARRAY ANTENNA:** Uniform array; Phased array, beam scanning, grating lobe, feed network, Linear array synthesis techniques – Binomial and Chebyshev distributions – Super Directivity – Planar array- Circular array - Design problems.

**MICROSTRIP ANTENNA:** Radiation Mechanism and Excitation techniques: Microstrip dipole; Patch, Rectangular patch, Circular patch, and Ring antenna – radiation analysis from cavity model; Input impedance of rectangular and circular patch antenna; Microstrip array and feed network; Applications of microstrip array antenna.

**EMC ANTENNA AND ANTENNA MEASUREMENTS:** Concept of EMC measuring antenna; Tx and Rx antenna factors; Log periodic dipole, Bi-conical, Ridge guide, Multi turn loop; Antenna measurement and instrumentation – Gain, Impedance and antenna factor measurement; Antenna test range Design.

**TEXT BOOK:**

**REFERENCES:**

**15L008 SMART ANTENNAS**

**INTRODUCTION:** Antenna gain, Phased array antenna, power pattern, beam steering, degree of freedom, optimal antenna, adaptive antennas, smart antenna - key benefits of smart antenna technology, wide band smart antennas, Digital radio receiver techniques and software radio for smart antennas.

**NARROW BAND PROCESSING:** Signal model conventional beamformer, null steering beamformer, optimal beamformer, Optimization using reference signal, beam space processing.

**ADAPTIVE PROCESSING:** Sample matrix inversion algorithm, unconstrained LMS algorithm, normalized LMS algorithm, Constrained LMS algorithm, Perturbation algorithms, Neural network approach, Adaptive beam space processing, Implementation issues.
**BROADBAND PROCESSING:** Tapped delay line structure, Partitioned realization, Derivative constrained processor, Digital beam forming, Broad band processing using DFT method.

**DIRECTION OF ARRIVAL ESTIMATION METHODS:** Spectral estimation methods, linear prediction method, Maximum entropy method, Maximum likelihood method, Eigen structure methods, Music algorithm – root music and cyclic music algorithm, the ESPRIT algorithm. DIVERSITY COMBINING: Spatial diversity selection combiner, switched diversity combiner, equal gain combiner, maximum ratio combiner, optical combiner.

**TEXT BOOKS:**

**REFERENCES:**

**SIGNAL PROCESSING**

**15L009 DIGITAL IMAGE PROCESSING**

**DIGITAL IMAGE FUNDAMENTALS:** Two dimensional signals and systems - Mathematical preliminaries-Elements of Digital Image Processing System - Structure of the human eye - Image formation and contrast sensitivity - Sampling and Quantization - Neighbours of pixel – Distance measures – Image processing applications.

**IMAGE TRANSFORMS:** Introduction to Fourier transform - Discrete Fourier transform - Properties of DFT– Separability, Translation, Periodicity, Rotation, Average Value – Discrete Cosine Transform – Properties - Haar Transform.

**IMAGE ENHANCEMENT:** Point Operations - Histogram Equalization technique - Spatial Filtering – Low pass filtering – Median filtering – Sharpening Filters – Enhancement in the frequency domain - Homomorphic filtering.

**IMAGE RESTORATION:** Degradation model for continuous functions - Discrete formulation - Diagonalization of circulant and Block-circulant matrices - Effects of Diagonalization - Unconstrained and constrained Restorations - Inverse Filtering - Wiener Filter - Constrained least - square Restoration.

**IMAGE COMPRESSION:** Coding, Interpixel and Psychovisual redundancies - Fidelity criteria - Image Compressions models - Elements of Information theory - Variable length coding - Bit plane coding – Constant area coding - Lossless Predictive coding - Lossy predictive coding - Transform coding techniques.

**IMAGE SEGMENTATION AND REPRESENTATION:** The detection of discontinuities - Point, Line and Edge detections - Gradient operators - combined detection - Thresholding – Region-Oriented Segmentation - Representation schemes: chain codes - Polygon approximation - Boundary descriptors: Simple descriptors - Shape numbers Fourier descriptor’s - Introduction to recognition and Interpretation.

**TEXT BOOKS:**

**REFERENCES:**

**15L010 SPEECH SIGNAL PROCESSING**

**SPEECH SIGNAL MODELLING:** Speech signal characteristics and classifications - Speech production mechanism - Acoustic Theory of speech production - Source – Filter model - Lossless Tube Models - Digital Model of speech signals.
SPEECH SIGNAL ANALYSIS: Time domain Analysis for speech processing – Short time energy and magnitude - short time average zero crossing - Speech vs silence discrimination - Pitch period estimation using autocorrelation function - Short time Fourier analysis- Definition and properties - Design of digital filter banks - Pitch detection - Analysis and synthesis.


REFERENCES:

TEXT BOOKS:

15L011 MULTIMEDIA COMPRESSION TECHNIQUES

INTRODUCTION: Overview of information theory, redundancy - Taxonomy of compression techniques -Overview of source coding, source models, Compression Techniques: Loss less compression, Lossy Compression, Measures of performance, scalar quantization, vector quantization, rate distortion theory, structure quantizers - Evaluation techniques-error analysis and methodologies.


AUDIO COMPRESSION: Audio compression techniques-frequency domain and filtering-basic subband coding-application to speech coding-G.722-application to audio coding-MPEG audio, progressive encoding for audio - Silence compression, Speech compression techniques - Vocoders.


VIDEO COMPRESSION: Video signal representation - Video compression techniques-MPEG, Motion estimation techniques-Overview of Wavelet based compression and DVI technology, Motion video compression - PLV performance - DVI real time compression.

REFERENCES:

TEXT BOOKS:

REFERENCES:

15L012 WAVELETS AND ITS APPLICATIONS


CWT AND MRA: Wavelet basis – Continuous time Wavelet Transform (CWT) – need for scaling function – Multi-Resolution Analysis (MRA) – important wavelets: Haar, Mexican hat, Meyer, Shannon, Daubaches.

INTRODUCTION TO MULTIRATE SYSTEMS: Decimation and Interpolation in Time domain - Decimation and Interpolation in Frequency domain – Multi rate systems for a rational factor.
FILTER BANKS AND DWT: Two channel filter bank – Perfect Reconstruction (PR) condition – relationship between filter banks and wavelet basis – DWT – Filter banks for Daubachies wavelet function. (7)

ADVANCED TOPICS: Introduction to Multiwavelets, Multidimensional wavelets – wavelet packet transform. (7)

APPLICATIONS: Feature extraction using wavelet coefficients, Image compression, Wavelet based denoising. (7)

TEXT BOOKS:

REFERENCES:

15L013 ADVANCED DIGITAL SIGNAL PROCESSING


WAVELET TRANSFORMS: Need for Time Frequency Analysis – Short time Fourier transform - short comings of STFT- Need for Wavelets - Continuous time Wavelet Transform – Multi Resolution Analysis – Haar and Daubechies wavelet functions – Introduction to Discrete Wavelet Transform. (9)

Total L: 45

TEXT BOOKS:

REFERENCES:

15L014 PATTERN RECOGNITION

REPRESENTATION: Introduction to pattern recognition, Data sets for pattern recognition, Pattern representation, Cluster representation, Feature extraction, Analysis, Feature selection, Applications of pattern recognition. (7)

NEAREST NEIGHBOUR BASED CLASSIFIERS: Nearest neighbor algorithm, Variants of the NN algorithm, Use of the nearest neighbor algorithm, Branch and bound algorithm, Data reduction, Prototype selection. (8)

BAYES CLASSIFIER: Introduction, Continuous features, Minimum error rate classification, Classifiers, Discriminant functions and decision surfaces, Normal density and its discriminate function, Discrete features, Estimation of probabilities. (8)

Total L: 45
HIDDEN MARKOV MODELS: Markov models for Classification, Hidden Markov models: HMM parameters - Learning HMMs, Classification using HMMs. (8)

DECISION TREES: Introduction, Decision trees for pattern classification, Construction of decision trees, splitting at the nodes, over fitting and pruning. (7)

CLUSTERING: Hierarchical Algorithms - Divisive clustering - Agglomerative clustering, Partitional clustering, Clustering large data sets. (7)

TEXT BOOK:
1. Richard O Duda, Peter E Hart and David G Stork, “Pattern Classification”, Wiley India, New Delhi. 2010,

REFERENCES:

NETWORKS

15L015 WIRELESS SYSTEMS AND STANDARDS

INTRODUCTION TO CELLULAR STANDARDS: 2G GSM, Cell structure, Frequency Bands and Channels- Call processing, Identity numbers, Frame structure, Interfaces, GMSK modulation, Voice and data processing, GPRS, EDGE, EDGE+, CDMA signal processing, IS-2000 system, Frequency bands, Channel allocation, CDMA cell capacity, services provided by IS-2000. 1xEVDO signal processing and data services-3G UMTS signal processing, WCDMA, HSPA, HSPA+, Towards 4G, LTE and LTE advanced. (9)


THE IEEE 802.11 WLAN STANDARD: Introduction to IEEE 802.11 – General Description – Medium Access Control (MAC) – Physical Layer for IEEE 802.11 Wireless LANs; Radio systems – IR Systems Applications. (9)

THE IEEE 802.16 WIMAX STANDARD: Introduction to IEEE 802.16 – General Description – Medium Access Control (MAC) – Radio systems – Physical Layer- Evolution to 802.16m-Bluetooth, Zigbee, (9)


TOTAL L: 45

TEXT BOOKS:

REFERENCES:

15L016 WIRELESS SENSOR NETWORKS

INTRODUCTION: Challenges for wireless sensor networks, Comparison of sensor network with ad hoc network. Sensor Localization, Clock synchronization , power mangament, Speical WSNs ,WSN Applications. (9)

ARCHITECTURE:Single node architecture,Hardware components, Sensor Mote Architecture and design, Mica mote design, Telos Mote, Network architecture, Sensor network scenarios,Design principles,Gateway Concepts. (9)

NETWORKING SENSORS :MAC protocols –MAC low duty cycle protocols and wakeup concepts, contention-based protocols, Schedule-based protocols. (9)
ROUTING IN WIRELESS SENSOR NETWORKS: Energy-efficient unicast, Broadcast and multicast, Data centric Routing protocols in WSNs, Hierarchical Routing protocols, Location based routing protocols and Multipath routing. (9)

SENSOR NETWORK PLATFORMS AND TOOLS: Programming Challenges, Node-level software platforms, Node-level Simulators, Tinyos, Component model, main features, ContikiOs, Proto threads. (9)

TEXT BOOKS:

REFERENCES:

15L017 WIRELESS NETWORKING


ADHOC WIRELESS NETWORKS: Characteristics of Adhoc Networks, Classifications of MAC Protocols - Table driven and Source initiated On Demand routing protocols, DSDV, AODV, DSR, Hybrid Protocols, TCP Over Ad Hoc Wireless Networks. (10)


TEXT BOOK:

REFERENCES:

15L018 LONG TERM EVOLUTION TECHNOLOGIES


TEXT BOOKS:

REFERENCES:

15L019 NETWORK SECURITY

SECURITY IN COMPUTING: Security services-Attacks-Mechanism-Points of security vulnerability-Methods of defense-Controls-Effectiveness of control-Introduction to cryptography and steganography-Plan of attack-attack on encryption-Standards-Standard setting organizations (7)

SYMMETRIC CRYPTOGRAPHY: Encryption and Decryption-substitution-transposition-y-stream and block ciphers-Data Encryption Standard- -advance Encryption Standard-Standard Triple DES-RC5-RC4 ciphers- Differential & Linear Cryptanalysis-Block Cipher modes. (10)

PUBLIC KEY ENCRYPTION: Introduction to Number Theory-Requirements of Public Key cryptography-Rivest-Shamir-Adleman algorithm(RSA)-key management-Diffie-Hellman key exchange-Elliptic Curve cryptography. (10)

MESSAGE AUTHENTICATION: Requirements of authentication-HASH functions -Secure Hash algorithm-Message Digest5-HMAC- Digital signature standards. (9)

NETWORK AND SYSTEM SECURITY: Authentication applications - E-mail Security - IP security - Web security – Intruders- malicious Software - Firewalls. (9)

TEXT BOOKS:

REFERENCES:

VLSI DESIGN TECHNIQUES

15L020 FPGA BASED SYSTEM DESIGN

DESIGN WITH FPGA: Digital IC design flow - The role of FPGAs in digital design – Goals and techniques – Hierarchical design-CAD Tools. (9)

VERILOG HDL: HDL overview - Modules and ports - compiler directives - data types - operands and operators - gate level modeling - data flow modeling - behavioral modeling - structural modeling – primitives-Tasks and functions - Writing test bench. (9)

DIGITAL SYSTEM DESIGN AND TIMING ISSUES: The ASM chart - design from an ASM chart : Boolean implementation for minimal number of Flip-Flops - design from an ASM chart: One-Hot controller implementation : state table entry to a PLD - clock skew in state machines - initialization and lockout in state machines. CLOCKING AND METASTABILITY: Set up time hold time – setup time hold time violations - critical path - calculation of maximum clock frequency – metastability - synchronizers - design examples. (9)

FPGA ARCHITECTURES: FPGA architectures – Configurable logic blocks - configurable I/O blocks – Programmable interconnect – clock circuitry – Xilinx FPGA architecture – Programming Technologies: Antifuse, SRAM, EPROM, EEPROM. (9)
LOGIC IMPLEMENTATION FOR FPGAs: Logic synthesis - logic optimization - simulation – types of simulation – physical design for FPGAs: placement, routing - testing – need for testing, testing methods - Goals and objectives - low power techniques - Design examples: Traffic light controller, score board and controller, keyboard scanner and controller.

Total L: 45

15L021 ANALOG VLSI CIRCUITS

INTEGRATED CIRCUIT DEVICES MODELLING: Semiconductors and pn junctions - MOS transistors - Advanced MOS modeling - bipolar junction transistors.


AMPLIFIERS: MOS and BJT amplifiers – Frequency Response - CMOS and BJT differential amplifiers - Characterization of Op-Amp - Design of two stage op-amp - Op-amps with output stage – Comparators – Two Stage and Latched Comparators, PLL


FILTERS: Active RC Filters - Low pass filters - High pass filters - Bandpass filters - Switched capacitor filters.

Total L: 45

15L022 LOW POWER VLSI DESIGN


POWER ANALYSIS: Simulation power Analysis - Gate-Level Analysis - Architecture level Analysis – Data Correlation Analysis – Monte Carlo Simulation - Probabilistic Power Analysis Techniques.


TEXT BOOKS:

REFERENCES:

15L023 NANO ELECTRONICS


TEXT BOOKS:

REFERENCES:

15L024 DEVICE MODELING

INTRODUCTION TO SEMICONDUCTOR PHYSICS: Review of Quantum Mechanics, Concentration and motion of carriers in Semiconductor, Statics Density of the state Functions Boltzmann transport equation, Continuity equation, Poisson equation.

INTEGRATED DIODES: pn Junction and Schottky Barrier diodes in monolithic technologies - static and dynamic behavior - small and large signal models - SPICE models.

INTEGRATED BIPOLAR TRANSISTOR: Types and structures in monolithic technologies - Basic model (Eber - Moll) - Gummel - poon model - dynamic model, parasitic effects - SPICE model - parameter extraction.
INTEGRATED MOS TRANSISTOR: nMOS and PMOS Transistor - Threshold voltage - Threshold voltage equations - MOS device equations-Basic DC equations Second order effects - MOS models - Small signal AC Characteristics - MOSFET SPICE model. (11)

TEXT BOOKS:

REFERENCES:

15L025 SYSTEM-ON-CHIP DESIGN 3003

INTRODUCTION: Driving Forces for SoC - Components - Generic template- Design flow- Hardware/Software nature- Design Trade-Offs-Major Applications.


CO-DESIGN CONCEPTS: Nature of hardware & software- quest for energy efficiency- driving factors for hardware-software codesign- Codesign space-Dualism of Hardware design and Software design-Modeling Abstraction Level-Concurrency and Parallelism- Hardware Software tradeoffs- Introducing Dataflow modelling

SoC IMPLEMENTATION: Study of Microblaze RISC processor - Real-time operating system (RTOS), peripheral interface and components, High-density FPGAs-Introduction to tools used for SOC design: Xilinx SoC based development kit

SoC TESTING: Manufacturing test of SoC: Core layer, system layer, application layer-P1500 Wrapper Standardization-SoC Test Automation (STAT)

TEXT BOOKS:

REFERENCES:

SYSTEM DESIGN 15L026 EMBEDDED SYSTEM DESIGN 3003

INTRODUCTION: Embedded system overview and applications, features and architecture considerations-ROM, RAM, timers, data and address bus, Memory and I/O interfacing concepts, memory mapped I/O. CISC Vs RISC design philosophy, Von-Neumann Vs Harvard architecture, instruction set, instruction formats, and various addressing modes. Fixed point and floating point arithmetic operations.

BASIC EMBEDDED PROGRAMMING TECHNIQUES: Introduction to TIVA ARM Cortex M4 – Key Features – Functional Block Diagram - Pin Configuration –I/O pin multiplexing, pull up/down registers, GPIO control, Memory Mapped Peripherals, programming
System registers, Watchdog Timer, need of low power for embedded systems, System Clocks and control, Hibernation Module on Tiva, Active vs Standby current consumption. Introduction to Interrupts, Interrupt vector table, interrupt programming. (11)

TIMERS, PWM and Mixed Signal Processing: Timer, Basic Timer, Real Time Clock (RTC), Timing generation and measurements, Analog interfacing and data acquisition: ADC, Analog Comparators, DMA, Motion Control Peripherals: PWM Module & Quadrature Encoder Interface (QEI). (11)

HARDWARE/SOFTWARE INTEGRATION: Host and Target Machines. In-System Programming (ISP)-In-Application Programming (IAP)-Getting Embedded Software into Target System: Programmers. Display, Keyboard, Relay, Stepper and DC Motor Interfacing. (9)

REAL TIME OPERATING SYSTEMS: Survey of Software Architectures, Tasks and Task States, Tasks and Data, Semaphores and Shared Data, Message Queues, Mailboxes and Pipes, Timer functions, Events, Memory Management and Interrupt Routines in RTOS Environment. Study of embedded product design with real time concepts using RTOS (8)

Total L: 45

TEXT BOOKS:

REFERENCES:
3. TIVA Series ARM Cortex M DataSheet
4. www.ti.com/tiva

15L027 DIGITAL SIGNAL PROCESSING SYSTEM DESIGN

COMPUTATIONAL ACCURACY IN DSP IMPLEMENTATIONS: Number Formats for Signals and Coefficients in DSP systems: Fixed Point Format, Double Precision Fixed Point Format, Floating Point Format, Block Floating Point Format. Dynamic Range and Precision - Sources of Error in DSP Implementations - A/D Conversion Errors - DSP Computational Errors - D/A Conversion Errors. (9)


IMPLEMENTATION OF FFT ALGORITHMS: FFT Algorithm for DFT Computation- Butterfly Computation – Overflow & Scaling – Bit Reversed Index Generation-8-point FFT Implementation on the TMS320C54xx processor- Computation of the Signal Spectrum. (9)

INTERFACING SERIAL CONVERTERS TO A PROGRAMMABLE DSP DEVICE: Synchronous Serial Interface- Multichannel Buffered Serial Port (McBSP)-McBSP Programming-CODEC Interface-CODEC Programming- CODEC, DSP Interface. (9)

Total L: 45

TEXT BOOK:

REFERENCES:
2. Texas Instruments Manuals for TMS 320C 54X Volumes 1 to 5.
15L028 VEHICULAR SYSTEMS AND NETWORKS


TEXT BOOKS:

REFERENCES:
4. LPC2129 Microcontroller datasheets.

15L029 ADVANCED PROCESSOR ARCHITECTURES

PARALLEL PROCESSING, MEMORY AND INPUT-OUTPUT SUBSYSTEMS: Trends towards Parallel Processing – Parallel Computer Structures – Architectural Classification Schemes - Parallel Processing Applications. Hierarchical Memory Structure - Virtual Memory System – Cache Memories – Input-Output Subsystems


TEXT BOOKS:

REFERENCES:
2. SPRU197d.pdf (TMS320C6000 Technical Brief), Texas Instruments

15L030 REAL TIME SYSTEMS 3 0 0 3
INTRODUCTION TO REAL TIME SYSTEM: Introduction to Real time Embedded System, need for a real-time system, different kinds (reactive, time driven, deadline driven, etc.) Embedded system Design cycle, Types of Real Time systems, Real Time Applications and features, Issues in real time computing, aspects of real-time systems (timeliness, responsiveness, concurrency, predictability, correctness, robustness, fault tolerance and safety, resource limitations, RTOS necessity) Performance measures of Real Time System, real-time requirement specifications, modeling/verifying design tools (real-time UML, state charts, etc.)

EMBEDDED HARDWARE FOR REAL TIME SYSTEM: Selection criteria for Real time system - Hardware and Software perspective, need for partitioning, criteria for partitioning (performance, criticality, development ease, robustness, fault tolerance and safety, resource limitations, etc.), System Considerations, Basic development environment-host Vs target concept, CPU features – Architecture, on-chip peripherals, Real time implementation considerations, pipeline, bus architecture, Fast Interrupt Response Manager, Introduction to Interrupts, Interrupt vector table, interrupt programming, Pipeline and Parallelism concepts. Case study of real time applications using C2000 microcontroller - Motor Control, Digital Power, Power Line Communication.

EMBEDDED HARDWARE – ON CHIP PERIPHERALS AND COMMUNICATION PROTOCOLS: Role of peripherals for Real time systems, On-Chip peripherals & hardware accelerators, Peripherals [Direct Memory Access, Timers, Analog to Digital Conversion (ADC), DAC, Comparator, Pulse Width Modulation (PWM)], Need of real time Communication, Communication Requirements, Timeliness, Dependability, Design Issues, Overview of Real time communication, Real time Communication Peripherals – I2C, SPI & UART. Case study - Illustration of configuring and interfacing the peripherals and Real time communication protocols for C2000 platforms.


SCHEDULING, SYNCHRONIZATION AND INTER TASK COMMUNICATION IN REAL TIME SYSTEMS: Basic Concepts for Real-Time Task Scheduling, Scheduling: definitions, Overview of Scheduling policies (Rate monotonic Analysis (RMA), Earliest Deadline First (EDF) and etc.) Task Synchronization – Need of synchronization, shared data problems and its ways of handling, Role of Semaphore, types of semaphores, Inter task communication – Need of communication, Message. Mailbox and Message Queues, RTOS problems - Priority inversion phenomenon, Deadlock phenomenon and steps to handle them. Case studies implementation of Semaphore, Mailbox and Message queues using TI RTOS for C2000 platforms. Case Study of RTOS based SW for Real Time Applications using C2000: Motor Control, Digital Power, Power Line Communication.

TEXT BOOKS:

REFERENCES:
3. C2000 Teaching CD ROM from Texas Instruments

COMPUTER SCIENCE ELECTIVES
15L031 ADVANCED COMPUTER ARCHITECTURE AND PARALLEL PROCESSING 3 0 0 3
MEMORY AND I/O SUBSYSTEMS: Hierarchical Memory structure – Virtual memory system – cache memory management 
Memory allocation and management – I/O subsystems. (5)

PIPELINING: Principles - Classification of pipeline processors - Reservation tables – Interleaved memory organization – Design of arithmetic pipeline – Design of instruction pipeline (5)

VECTOR PROCESSING: Need – Basic vector processing architecture - Issues in vector processing – Vectorization and optimization methods. (6)

ARRAY PROCESSING: SIMD Array processors – SIMD interconnection networks – Parallel algorithms for array processors – associative array processing. (7)

MULTIPROCESSOR ARCHITECTURE: Functional structures - Interconnection network – Multi cache problems and solutions – Exploiting concurrency for multiprocessing. (8)

PRINCIPLES OF PARALLEL ALGORITHM DESIGN: Design approaches-Design issues-Performance measures and analysis-Complexities-Anomalies in parallel algorithms - Pseudo code conventions for parallel algorithms-Comparison of SIMD and MIMD algorithms. (8)


13L032 DATA STRUCTURES

INTRODUCTION: Data structures - Abstract Data Types - Primitive data structures - Analysis of algorithms – time and space complexities - notations. (8)

ARRAYS: Operations - Implementation of one, two, three and multi dimensioned arrays – Sparse and dense matrices - Applications. (5)


LISTS: Operations - Singly linked lists, doubly linked lists, Circular lists - Applications – Linked Stacks - Linked queues - Linked Priority queues. (6)


15L033 EMBEDDED LINUX

ARCHITECTURE OF EMBEDDED LINUX: Generic architecture of an Embedded Linux System - System Startup – Types of Boot configuration – Selecting the kernel – Configuring the kernel – Compiling the kernel – Installing the kernel. (9)

DEVELOPMENT TOOLS: GNU Cross-platform development tool chain – debugging, tracing & profiling tools, binary utilities – kernel debugging – debugging in Embedded Linux applications (9)


PORTING APPLICATIONS: Introduction to Beagle bone – Porting of Embedded Linux prebuilt images – Bone script (9)

TEXTBOOKS:

REFERENCES:

15L034 OPERATING SYSTEMS

INTRODUCTION: Operating system – Functions – Evolution of Operating Systems, Structure of operating system – Monolithic and Micro Kernel structures. (4)


Total L: 45

TEXTBOOKS:

REFERENCES:

15L035 RELATIONAL DATABASE MANAGEMENT SYSTEMS

DATA MODELING: Introduction – Data associations – Entities, attributes, relationships – Type role and structural constraints – Weak and Strong entity types – Design of Entity Relationship data models (ERD) – Generalization – Aggregation – Conversion of ERD into tables – Applications – Introduction to Network data model and Hierarchical data model. (6)


RELATIONAL MODEL: Introduction to Relational Data Model – Basic concepts – Enforcing data Integrity constraints – Relational Algebra Operations (3)

RELATIONAL DATABASE MANIPULATION: Introduction to Structured Query Language (SQL) – SQL Commands for defining Database, Constructing database, Manipulations on database – Basic data retrieval operations – Advanced Queries in SQL – Functions in SQL – Aggregation – Categorization – Updates in SQL – Views in SQL. (10)


DATABASE SECURITY, INTEGRITY CONTROL: Security and Integrity threats – Defense mechanisms – Transaction and concurrency control mechanisms. (3)

TEXT BOOKS:

REFERENCES:

15L036  SOFT COMPUTING TECHNIQUES 3003

NEURAL NETWORKS: Basic concepts ,Neural Network Architectures, Characteristics, Learning methods. Back propagation networks - Kohonen's self organizing networks - Radial basis function neural networks - Hopfield network. Applications of neural nets such as pattern recognition, speech and decision. (9)

FUZZY SYSTEMS: Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions - Decomposition – Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making, Industrial Applications. (9)


GENETIC ALGORITHMS :Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction – Selection methods (6)


TEXT BOOKS:

REFERENCES:
15L037 COMPUTER AND MACHINE VISION


SHAPE REPRESENTATION AND DESCRIPTION: Binary shape analysis, connectedness, object labeling and counting, size filtering, distance functions, skeletons and thinning , deformable shape analysis, boundary tracking procedures, active contours, shape models and shape recognition, centroidal profiles, handling occlusion, boundary length measures, boundary descriptors –chain codes –Fourier descriptors –region descriptors –moments. (9)

3D VISION GEOMETRY: 3D vision tasks, Basics of projective geometry, A single perspective camera, Scene reconstruction from multiple views, Two cameras stereo vision, Three cameras and trifocal tensor, Full 3D objects, 3D model-based vision, 2D view-based representations of a 3D scene. (9)


Total :45

TEXT BOOKS:

REFERENCES:
15LF02 RTOS AND ITS APPLICATIONS

**INTRODUCTION:** Real Time System Concepts. Comparison between conventional OS and RTOS. Introduction to MQX RTOS. When to use which OS, RTOS, RTS and Standalone. Different Modules of RTOS. Process management details.

**RTOS Lab#1:** Code Warrior of Freescale, Hardware board environment, BSP, PSP, Application differentiations, host machine setups, project configurations for RTOS. Task creations. Priority settings, working with different scheduler algorithms. To understand different states of a job.

**INTER PROCESS COMMUNICATION BASICS:** Semaphores, Messages.

**RTOS Lab#2:** IPC Basics hands on sessions

**REFERENCES:**
1. "Operating Systems" By Silberschatz, Galvin, Gagne
2. Micro C/OS-II The Real-Time Kernel, By Jean J. Labrosse

**Total L: 15**

15LF03 LTE AND THE EVOLUTION TO 4G WIRELESS COMMUNICATIONS

**LTE:** Motivation to LTE.- Evolution of Architecture –3GPP with Non-3GPP Architecture- EPC - eNB, HeNB and Relay Nodes -LTE- Advanced LTE Protocol Stacks Summary- Protocol architecture - S1 and X2 Interface, Other interfaces- Security Architecture - MBMS Architecture - CS FallBack, SRVCC, VoLTE – Advantages of LTE.

**PHYSICAL LAYER:** Uplink Physical Layer Design – Downlink physical layer design

**CONTROL PLANE AND USER PLANE PROTOCOLS:** MAC architecture- DL-SCH data transfer- HARQ operation- Multiplexing and assembly- Scheduling Request - RLC architecture - PDCP architecture. Radio Resource Controller – PLMN and cell selection, Paging.

**CALL PROCESSING PROCEDURES:** Idle Mode Processing - Cell Reselection- Paging- RRC Connection and Release- SON- Handover - Intra RAT and Inter-RAT

**REFERENCE:**

**Total L: 15**

15LF04 AVIONICS


**Flight Instruments-Air Data Systems Computers (ADS/ADC), Pitot Static Systems-Air Speed Indicator (ASI)-Vertical Speed Indicator (VSI)-Barometric Alltimeters-Radio Altimeters-Artificial Horizon or Attitude Indicator-Flight Directors (FD)

**Total L: 15**

REFERENCES:

15LF05 SYSTEM LEVEL VERIFICATION TECHNIQUES AND METHODOLOGIES

SYSTEM VERILOG FOR VERIFICATION: Data types – Function and task - Basic OOP – Class Methods – Handling objects – Public and local variables.


INTRODUCTION TO OVM: Introduction to OVM - OVM class and its hierarchy – OVM test bench and environment – Basics of Transaction-Level Modeling (TLM) – OVM components – Developing Reusable OVM Components

CASE STUDY: Sample architecture – Creating verification environment – Creating the test plan – Creating test case – Reusable - Transaction Level Models - Managing Simulations - Regression.

REFERENCES:

Total L: 15

15LF06 AUTOMOTIVE ELECTRONIC APPLICATIONS

OVERVIEW OF AUTOMOTIVE MECHANICAL SYSTEMS: Basics of Power Train (Gasoline – Diesel Engine) – transmission – Braking – Steering

OVERVIEW OF VEHICLE ELECTRONIC SYSTEMS: Need for Electronics and Overview of Electronics systems in Automotive

POWER TRAIN ELECTRONICS: - Safety System (ABS, TCS, ESP, Airbags) Electronics – Comfort Electronics (Control System, Hardware & Software)

OVERVIEW OF IN VEHICLE NETWORKING: Introduction to CAN, LIN, FLEXRAY, MOST, KWP2000

REFERENCES:

Total L: 15

15LF07 MACHINE VISION ALGORITHMS AND SYSTEM DESIGN


Total L: 15
CAMERA, LENS AND LIGHTING: Pinhole Camera, Image Formation, Projective Geometry, Lenses and Camera System, Various types of Sensors, Lighting methods, Camera Interfaces, Image transfer to a computer, Representation of an image in a computer.(3)

IMAGE PROCESSING IN MACHINE VISION: Histogram, Thresholding, Otsu’s Method, Adjacency, Morphology, Flood Fill, Connected Component Analysis, Perimeter, Chamfering, Moments, Compactness, Eccentricity, Convolution, Gaussian Pyramid, Edge Detection, Filtering, Segmentation. (3)

BUILDING A MACHINE VISION SYSTEM: System Setup, Pre-processing, Core Algorithm and Post Processing, Ablative Analysis, Cross Validation, ROC Curves, Supervised Learning, Unsupervised Learning, Cutting Edge of Computer Vision. (3)

Case Studies
1. Design of high speed pencil inspection and sorting system (1)
2. Design of automated color registration control system for web offset printing machines (1)
3. Design of high performance counterfeit currency detection system (1)

Total L: 15

REFERENCES:

15LF08 MILLIMETER WAVE COMMUNICATION NETWORKS

INTRODUCTION TO MULTI-GIGABIT: 60-Ghz Millimeter wave radios. Millimeter wave characteristics-Channel performance at 60GHz, Gigabit wireless communication, Standards- Wi -Gig, IEEE 802.11ad, IEEE 802.15.3c,WirelessHD,ECMA-387/ISO/IEC 13156- Millimeter wave applications. (4)

MILLIMETER WAVE ANTENNAS: Path loss and antenna directivity-Antenna beamwidth-Maximum possible gain to Q-Polarization, Beam steering antenna- Millimetre wave design consideration (4)

MILLIMETER WAVE TRANSCEIVERS: Millimeter wave link budget-Transceiver architecture- Receiver without local oscillator, Millimeter wave calibration (4)

MILLIMETER WAVE MIMO: Spatial diversity of antenna arrays-Multiple antennas, Multiple transceivers-Noise coupling in MIMO system. (3)

REFERENCES:

Total L: 15

15LF09 WIRELESS SYSTEM DESIGN


EMERGING TECHNOLOGIES: Protocols - Standard and Proprietary Protocols, Network Topology and Size, Overheads and Throughput. Internet of Things (IoT) and its applications. TI IoT Cloud EcoSystem (5)

Applications of Wireless networks using MSP430 and SimpliciTI Protocol (2)

Peer to Peer Networking with TIVA ARM LaunchPad (1)

Mesh Networking for Smart Sensors Total L: 15

REFERENCE:
15LF10 TELEMATICS

INTRODUCTION: Introduction to 16Bit Ultra Low Power Microcontroller - CPU Architecture, Basic Block Diagram, Clock Module Overview, clock module configuration, various frequency settings, Introduction to IDE, compiler and linker file configuration, Interfacing the IDE and HW development board.

PERIPHERALS INTERFACING: Introduction to digital peripherals - Introduction to Input / Output Ports - Configuration of Digital ports as Input and Output - Introduction to Low Power Modes - Various Low power mode of operations and settings. Communication Peripherals – Universal Asynchronous Serial Transmission (UART) – Baud rate – Register Configuration – Transmission and Reception of Data between MCU and PC


INTERFACING GSM WITH LOW POWER MCU: MCU – Configuration of UART - Hardware Interfacing of GSM with MCU –Send Message using AT commands

INTERFACING GPS WITH LOW POWER MCU: MCU – Configuration of UART – Hardware Interfacing of GPS with MCU – GPS Position Fix with Indication in LED. Send Alert SMS with observed GPS Position Change.

Total L : 15

REFERENCES:
3. Sim900 AT COMMANDS, SIMCOM Ltd.

15LF11 ADVANCED AVIONICS


ADVANCED RADAR SYSTEMS-Helmet Mounted Target Designation System (HMTDS)-Full Authority Digital Engine (or electronics) Control (FADEC)-Avionics of Unmanner Aerial Vehicles (UAV)-All Electric Aircraft-Design of In-flight Entertainment Systems


REFERENCES:
3. Tactical Mission System Manuals as per notes.

15LF12 E-COMMERCE SECURITY


SECURITY MECHANISMS: Legal issues – Cyber Crimes - key management and certificates - payment security services - communication network and network access layer security - Internet layer security and transport layer security - application layer security - hypertext transfer protocol - web server security - web client security, mobile code security - mobile agent security - mobile commerce security, digital signature certificates – eCards Security – mobile payment technology –Payment Card Industry Data Security Standard PCI / DSS.
HANDS-ON TRAINING: Modeling and design of a secure Web/Mobile based e-commerce application, securing internal network, and providing secure employee/user authentication.

REFERENCES:

15LF13 SIMULATION TECHNOLOGIES FOR REAL TIME COMMUNICATION NETWORKS

INTRODUCTION: Communication Network Modeling –simulation technologies,strategies and tools-languages-monte-carlo— Queueing Models –Comparisons – Flexibility


HANDS-ON TRAINING: Modeling and Simulation of Communication Networks: Construction, Parameter Settings, Analysis, Result Interpretation, Failure Analysis-Simulation using OPNET Riverbed Modeler 17.5 & QUALNET.

REFERENCES:

15LF14 INTERNET OF THINGS (IoT)


SIMPLELINK WI-FI CPU: Introduction to CC3200 Simplelink Wi-Fi MCU, hardware Functional Block Diagram, Embedded Software Overview, TI-RTOS support for CC3200 Simplelink, TI-RTOS configuration for CC3200 Simplelink, Simplelink Wi-Fi certification, Power Modes.


HANDS-ON WITH CC3200: Brief introduction to CC3200 Peripherals, OUT OF BOX demo, Home and Industrial automation and control, Creating project, programming with ADC, Programming with GPIO, enabling interrupt, Introduction to serial interface, Overview of sensor interface with CC3200, TI RTOS configuration in CCS workspace, Client severer model basics, Simple Email application, Emailing an sensor (ADC) value.

REFERENCES:
3. Datasheet, Technical Documents and Application Notes
4. www.ti.com/product/CC3200
15LF15 SYSTEMS AND TRANSFORMS

SIGNALS: Definition of signal – Types of signals – Basic Signals.  
TRANSFORMS: Fourier series – Fourier transform.  

REFERENCES:  

Total L: 15

15LF16 NANO TECHNOLOGY

MATERIALS: Free electron and band theory of solids, metals, insulators, semiconductors, semiconductor device concepts.  
NANO DEVICE FABRICATION: Overview of nano devices and materials requirement, Physical Vapour deposition, Chemical Vapour Deposition, solgel process, Photolithography, electron beam lithography, imprint lithography, etching.  
NANO DEVICES: Nano MOSFET performance metrics, transport in nano MOSFET, Nano actuators, Nano Cantilevers.  
NANOCHARACTERIZATION AND SIMULATION TECHNIQUES: Thickness measurement using reflectance and ellipsometry techniques, AFM, FTIR, XRD, SEM, TEM, Simulation techniques and tools.  

REFERENCES:  

Total L: 15

15LF17 ROUTING ARCHITECTURE AND DESIGN

OVERVIEW: OSI and TCP/IP Models, explanation of each layer along with real time example, IP Addressing schemes, IPV4 and IPV6 evolution, LAN, WAN, MAN, Networking devices.  
NETWORKING INFRASTRUCTURES AND DESIGNS: Discovering Network Design Basics, Network design overview, Benefits of hierarchical network design, Network design methodology.  
ROUTING ARCHITECTURE: Cisco Routers and its types, Types of Routing protocols, Static Routing, Dynamic routing, RIP, OSPF, EIGRP, BGP, Routing Technologies– MPLS, L2VPN, L3VPN, IPSEC VPN.  
NETWORKING PHASES: Planning & Design, Testing and Validation, Implementation and Deployment, Maintenance and change.  
DEMO: Quick Demo with simulators on building Simple Network Topology - Vlan configurations, Static Routing, Any one routing protocol implementation.  

REFERENCES:  

Total L:15
15LF18 AUTOMOTIVE CONTROLLER AREA NETWORKS AND SECURITY

1 0 0 1


REFERENCES:

15LF19 OPTICAL FIBER LINK MANAGEMENT

1 0 0 1

FIBER OPTIC LINK AND TRANSMITTER: The Advantages of Optical Fiber over Copper - Optical power and Loss measurement - Optical Windows/Bands – Attenuation, Dispersion, Dispersion Vs Bandwidth, BW of optical communication Semiconductor Light Sources - LED/Laser Sources - Light Source Safety - Safety Handling Precautions Coupling of source to fiber.

OPTICAL FIBER CABLES AND CONNECTORS: Core - Cladding - Coating Standards - Materials - Tensile Strength - Types of fibers, Buffer - Strength Members - Jacket - Cable manufacturers - Cable Types - Colour coding - Ordinary fibers - Pig tail and patch cord - Ribbon Cable - Submarine Cable - Cable Termination Methods - Cable Markings and Codes - External Markings - Bend Radius Specifications - Connectors - Types of Fiber Optic Connectors - Single-Fiber Connectors - Connector Termination, Attenuators.

FIBER SPlicing: Splicing Equipment - Different types of splicing - Fusion Splicers - Splice Requirements - Splicing Procedures - Cable preparation - Fusion Splicing Procedure - Pigtail splicing - Ribbon cable splicing (demo) Thermo shrinking.

REFERENCES:

15LF20 FIBER OPTIC CABLE INSTALLATION AND OTDR TESTING

1 0 0 1

FIBER CABLE CHARACTERISTICS: Structure-OFC Components-Strength Member-Outer and Inner Jacket-Loose Tube- Tight Buffer ADSS- Ariel-Cable-Direct- Burried Cable-Indoor-Outdoor-Cable-Types - Cable marking and packaging requirements.

OPTICAL FIBER CABLE LAYING PROCEDURE: Polyvinyl chloride/ High Density Polyethylene- type of pipes; Horizontal Directional Drilling (HDD), Route Index Diagram; Brick Chamber Type Hand Hole; Technical Specifications. Duct Laying; High Density Poly Ethylene (HDPE) telecom ducts - 140-40-15-Manhole Design Aspects; 190-130-30-RCC-manhole.

REFERENCES:

OFFERED BY THE DEPARTMENT OF HUMANITIES

15OF01 EXPORT - IMPORT MANAGEMENT

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)

REFERENCES:

15OF02 INSURANCE & RISK MANAGEMENT

INTRODUCTION TO RISK MANAGEMENT: Risk in Our Society. (2)

INSURANCE AND RISK: Client Side – Components of the Costs of Risk. (2)


MASS CONTROL: Insurance Intermediaries – Insurance Companies and their Role in Deducting Business / Role Risks. (4)

FINANCIAL RISKS: Shift of Risks – Risk Derivatives. (3)

REFERENCES:

15OF03 VALUES AND ETHICS AT WORK PLACE

HUMAN VALUES AND ETHOS: Meaning and Significance of Values – Sources of Individual Values - Value crisis in the Contemporary Indian Society –Moral and Ethical Values. (4)

APPLICATION OF VALUES: Relevance of Values in Management – Personal Values and Values at Work place – Values for Managers. (2)

WORK ETHICS: Professional Values & Ethics – Need – Issues – Challenges – Ethical Leadership – Ethical dilemma - Case Study. (4)

SHARED VALUES IN THE ORGANIZATION AND ITS IMPACT: Need to identify and share values – the Value Construct and How to Promote Shared Values. (2)
UNIVERSAL VALUES: Cross Cultural Values - Impact of Culture on Organizations and Managing Workforce Diversity. (3)

REFERENCES:

15OF04 DEVELOPMENT OF INDUSTRIALISATION

1001

EVOLUTION OF MODERN ECONOMY: Colonialism, Capitalism and economic development. (2)
AMERICAN HISTORY - Before and After European arrival. (4)
ROLE SLAVERY and trade in America. (4)
INDIAN ECONOMY – Pre and Post Independence, (3)
INDUSTRIALIZATION IN ASIA AND AFRICA – Colonialism – anti-colonialism and Socialism. (2)

REFERENCES:

15OF05 CREATIVITY AND SOCIAL ENTERPRISE

1001

CREATIVITY- Understanding the creative skills (2)
WAYS TO IMPROVE creativity and exercises. (4)
INNOVATION – Process of Innovating new ideas - Importance of Innovation. (4)
ENTREPRENEURIAL skills and development – Intrapreneurship. (3)
SOCIAL ENTREPRENEUR and social enterprise – success stories of entrepreneurs – Leadership styles adopted by successful entrepreneurs. (2)

REFERENCES:

15OF06 SOCIAL AND PSYCHOLOGICAL WELL BEING

1001

DEFINING SOCIAL PSYCHOLOGY and social influences on behavior. (2)
ANALYSIS OF SOCIAL and psychological problems and the solutions to address social problems. (4)
ROLE OF SPORTS AND GAMES, yoga practices, tracking and outdoor activities in addressing social and psychological problems. (4)
ORIGINS OF PSYCHOLOGICAL DISORDER – roots of social anxiety - prevention of psychological disorders. (3)
NATURE OF INTERVENTIONS – Evaluation of Interventions and implementing the interventions. (2)

Total L: 15
REFERENCES:

15OF13 SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT


TYPES OF SECURITY: Trading – Orders, Margin Trading – Clearing and Settlement Procedures.

SECURITY ANALYSIS: Industry Analysis – Company Analysis.

PORTFOLIO: Measuring Risk and Returns and Treatment in Portfolio Management.

REFERENCES:

15OF14 IMPLEMENTATION OF QUALITY MANAGEMENT SYSTEM

INTRODUCTION – Need for Quality – Definitions of Quality – Dimensions of Product and Service Quality – Basic Concept of TQM – Contributions of Deming, Juran and Crosby – Barriers to TQM.


REFERENCES:

15OF15 FINANCIAL MANAGEMENT


OBJECTIVE OF FINANCIAL MANAGEMENT: Profit Maximization and Wealth Maximization.

CAPITAL STRUCTURE: Designing of Capital Structure - Profitability and Liquidity Aspects.

DIVIDEND POLICY: Determinants of Dividends- Bonus share – Tax aspects.

CORPORATE RESTRUCTURING: Merger and Acquisition (M&A) - Case Studies.
15OF16 PERSONALITY DEVELOPMENT THROUGH TRANSACTIONAL ANALYSIS

EXPLORING THE PERSONALITY - Structural Ego states - Functional Ego states. (2)

MOTIVATION – Strokes Maslow’s Hierarchy of Needs. (4)

INTERPERSONAL RELATIONSHIP - Time Management – Transactions - Time Structuring. (4)

STRESS MANAGEMENT - Working Styles – Contamination. (3)

ASSERTIVENESS AND LEADERSHIP SKILLS - Life positions – Competency. (2)

Total L: 15

REFERENCES:
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:

15OF12 – HUMAN VALUES THROUGH LITERATURE 1 0 0 1


DRAMA: Karnad, Girish, Tughlaq – Statesmanship and friendship (3)

ONE-ACT PLAY: Chekhov, Anton. The Bear – Love (1)

SHORT STORY: Maugham, Somerset. “Mr. Know-All” – Empathy, Desai, Anita. “Devoted Son” – Family Bond. (2)

NOVEL: Murthy, Sudha. Gently Falls the Bakula – Gender equality (2)

Total L: 15 hrs

REFERENCES:
3. Additional readings on individual texts

OFFERED BY THE DEPARTMENT OF MATHEMATICS

15OF21 PRINCIPLES OF BUSINESS ANALYTICS 1 0 0 1

PREDICTIVE ANALYTICS: CLASSIFICATION AND DISCRETE CHOICE PROBLEMS: Simple linear regression - multiple linear regression model development and diagnostics - analysis of transactional data using binary logistic and multinomial logistic regression models - discrete choice models, non-linear regression. Classification Trees, Classification and Regression Tree (CART) - forecasting.


Total L: 15

REFERENCES: