Pre-PhD Courses for CIVIL Engineering

Course-I		**Course-II**	
Structural Engineering		**Structural Engineering**	
Sl. No.	**Subject**	**Sl. No.**	**Subject**
1	Theory of Elasticity and Plasticity	1	Pre-Stressed Concrete and steel structures
2	Advanced Structural Analysis	2	Advanced Concrete Technology
3	Earthquake Resistant Design of structures	3	Advanced Reinforced Concrete Design
Geotechnical Engineering		**Geotechnical Engineering**	
Sl. No.	**Subject**	**Sl. No.**	**Subject**
1	Advanced Soil Mechanics	1	Soil Dynamics and Machine Foundations
2	Advanced Foundation Engineering	2	Soil-Structure Interaction
Transportation Engineering		**Transportation Engineering**	
Sl. No.	**Subject**	**Sl. No.**	**Subject**
1	Pavement Analysis and Design	1	Highway Construction, Quality Control And Maintenance
2	Geometric Design of Highways	2	Pavement Materials
Water Resources Engineering		**Water Resources Engineering**	
Sl. No.	**Subject**	**Sl. No.**	**Subject**
1	Advanced Fluid Mechanics	1	Open channel hydraulics and sediment transport
Environmental Engineering		**Environmental Engineering**	
Sl. No.	**Subject**	**Sl. No.**	**Subject**
1	Urban drainage and Wastewater treatment	1	Solid and Hazardous waste Management
2	Industrial wastewater treatment	2	Air pollution and control technology
Remote Sensing & GIS		**Remote Sensing & GIS**	
Sl. No.	**Subject**	**Sl. No.**	**Subject**
1	Digital Image Processing	1	Remote Sensing and GIS for Urban Planning and Management
General Civil Engineering		**General Civil Engineering**	
Sl. No.	**Subject**	**Sl. No.**	**Subject**
1	Probablistic and statistical methods in Civil Engineering	1	Applications of Soft Computing Techniques

STRUCTURAL ENGINEERING

COURSE – I

THEORY OF ELASTICITY AND PLASTICITY

UNIT-I

Introduction: Elasticity – Notation for Forces and Stresses – Components of Stresses – Components of Strain – Hooke's Law. Plane Stress and Plane Strain analysis – Plane Stress – Plane strain – Differential Equations of equilibrium – Boundary conditions – Compatibility equations - Stress function – Boundary Conditions.

UNIT-II

Two Dimensional Problems: in Rectangular Co-Ordinates – Solution by polynomials – Saint – Venant's Principle – Determination of Displacements – Bending of Simple beams – Application of Fourier Series for two dimensional problems for gravity Loading. Two Dimensional problems in Polar Co-ordinates General Equations in polar Co-ordinates –Stress Distribution Symmetrical about an axis – Pure bending of curved bars - Strain Components in Polar Co-ordinates – Displacements for Symmetrical stress Distributions – Circular discs- Stresses on plates with circular holes

UNIT-III

Three Dimensional Problems: Analysis of Stress and Strain in Three Dimension Principal Stress – Stress Ellipsoid and stress director surface – Determination of Principal stresses Maximum shear stresses – Homogeneous Deformation – Principle Axes of Strain. General Theorems: Differential equations of equilibrium – Conditions of Compatibility Determination of Displacement – Equations of Equilibrium in Terms of Displacements – Principle ofSuperposition – Uniqueness of Solution –Reciprocal theorem.

UNIT-IV

Torsion of Prismatic Bars:

Torsion of Prismatic Bars – Bars with Elliptical Cross Section – Other elementary Solution – Membrane Analogy – Torsion of Rectangular Bars – Solution of Torsional Problems by Energy method – use of soap Films in Solving Torsional problems – Hydro dynamical Analogies – Torsion of Bars.

UNIT-V

Theory of Plasticity: Introduction – Concepts and Assumptions – Yield criteria.

References:

1. Theory of Elasticity- Timoshenko & Goodier.
2. Theory of Elasticity – Sadhu Singh

ADVANCED STRUCTURAL ANALYSIS

UNIT I

Analysis of Axially loaded bars, beams and portal frames by Rayleigh-Ritz method

UNIT II

Analysis of Axially loaded bars, beams and portal frames by Gelarkin's method

UNIT – III

Analysis of beams and plates by Finite Difference Method

UNIT – IV

Analysis of Statically determinate and Indeterminate beams, Frames and Trusses by Stiffness method

UNIT –V

Analysis of Statically determinate and Indeterminate beams, Frames and Trusses by Flexibility method

UNIT – VI

Approximate methods of analysis of Multi-storey frames

UNIT – VII

Influence lines for indeterminate beams, Arches and Trusses

UNIT VIII

Cables and suspension bridges.

REFERENCE :

1. Wang C. K., "Indeterminate Structural Analysis", McGraw-Hill, 2nd Edition, 2000.
2. Sinha, N. C. and Gayen, P. K., Advanced theory of structures, Dhanpat Rai & Sons, 4th Edition, 2002
1. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Co., 3rd edition, 2001
2. Hibbeler R.C, Structural Analysis, Macmillan Pub.Co., 2nd Edition, 2000
3. Au T and Christiano, P., Structural analysis, Prentice Hall, 1st Edition, 2002

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

UNIT-I

STRUCTURAL DYNAMICS: Introduction, Physical and Mathematical Modelling, Discrete and continuum modelling. Laws of Equilibrium, Newton's Law of Motion, D-Alembert's Principle, Principle of virtual displacement. Types of Dynamic Loading. Single Degree of Freedom System (SDOF), Undamped Free Vibrations, Damped Free Vibrations (concept only). Two Degrees of Freedom System (2DOF), Undamped Free Vibrations. Determination of Natural frequencies and Mode shapes.

UNIT-II

ENGINEERING SEISMOLOGY: Introduction,- Internal structure of earth, Chemical properties, Physical properties, Continental drift theory, Plate tectonics, Movement of plate Boundaries, Movement of Indian plate ,Faults, Types of faults, Elastic Rebound theory. Earthquakes, Earthquake terminology, Classification of Earthquakes, Causes and effects of Earthquakes, Earthquake waves, Quantification of Earthquakes, Intensity and Magnitude, Recording Earthquakes.

UNIT-III

EARTHQUAKE RESISTANT DESIGN: Reviews of latest I.S : 1893 (Part 1) provisions for buildings, General principles and design criteria, Assumptions, Design Acceleration spectrum, Horizontal seismic coefficient, Design acceleration, Seismic zones of India, Importance factor, Response reduction factor, Design lateral force, Design imposed loads for Earthquake force calculation, Seismic weight, Analysis by Equivalent Static Method and Dynamic Method (Response Spectrum Method), Storey drift limitation.

UNIT-IV

BUILDING CONFIGURATIONS: Introduction, Regular and Irregular Buildings. Plan Irregularities, Torsion Irregularity, Re-entrant corners, Floor slabs having excessive cut-outs or openings, Out of plane offsets in Vertical Elements, Non-parallel Lateral Force system. Vertical Irregularities, Stiffness Irregularity (soft storey,) Mass Irregularity, Vertical Geometric Irregularity, In-plane discontinuity in Vertical Elements resisting lateral force, strength Irregularity (weak storey), Floating or stub columns, Irregular Modes of Oscillation in two Principle Plan Directions.

UNIT-V

DUCTILE DESIGN AND DETAILING: Review of Latest IS: 13920 provisions General specifications, Beams, Columns, Shear walls. Special confining reinforcement. Review of Latest IS: 4326 provisions, General principles, Special Construction features relating to separations of structures (above ground only).

REFERENCES

1. A.K. Jain “Dynamics of Structures with Mat Lab Applications” Pearson India Education Series Pvt.Ltd., Delhi, 2016

2. Pankaj Agarwal & Manish Shrikhande, “Earthquake Resistant Design of Structures”, 5th Edition Prentice Hall of India, New Delhi, 2011.

3. S.K.Duggal, “Earthquake Resistant Design of Structures”, Oxford University Press, 1st Edition, 2012.

1. Chopra A.K., “Dynamics of Structures”, 5thEdition, Pearson Education, Indian Branch, Delhi, 2007.

2. Mario Paz, “Structural Dynamics - Theory and Computations”, 6thEdition, Pearson Education, 2005.

GEOTECHNICAL ENGINEERING

ADVANCED SOIL MECHANICS

UNIT-I

Principles of Elasticity and Plasticity Concept of stress and strain – Principal stresses – Stress – strain relationships – Plane stress and plane strain – Mohr's diagram – Yield criteria – Theories of failure – Mohr – Coulomb failure condition.

UNIT-II

Clay Mineralogy -Nature of soils – atomic bonds - Clay mineral structure – clay water relation – electrical effects – clay mineral identification – Soil fabric and structure Water flowin Soils Flow equation – Darcy's Law – General equation – mathematical analysis – solution by sketching – electrical analogy – numerical solution

UNIT-III

Transient Flow Effective stress - change in degree of saturation – change in void ratio – compressibility of pore water – compressibility of soil solids – rate of storage equation –transient flow condition – one dimensional consolidation – mathematical analysis – approximate numerical analysis.

UNIT-IV

Consolidation: Mechanism of consolidation – Primary consolidation – Stress history – Pre-consolidation pressure – Terzaghi's one-dimensional consolidation theory and equation – Solution by Fourier series and finite difference methods – Determination of coefficient of consolidation including Scott's method – U versus T relationship for deferent forms of initialexcess pore water pressure distribution – Degree of consolidation under time – dependent loading – secondary consolidation.

UNIT-V

Shear strength Principle of effective stress – Measurement of strength parameter – Strength tests based on drainage conditions – Skempton's pore pressure coefficients – Stress paths – Hvorslev' spacing parameters – Shear strength of cohesion-less sands – Strength and deformation behavior – Dilatancy – Critical. Void ratio Liquefaction – Shear strength of saturated cohesive soils – Triaxial testing – Normally and over consolidated clays – Partiallysaturated clays – Stress – state variables – Measurement of pore- water and pore – air pressure – Axis translation technique.

REFERENCES:

1. "Foundations of theoretical soil mechanics" by M.E. Harr., McGraw Hill Co.
2. "Fundamentals of soil behaviour " by J.K. Mitchell., John Wiley & Sons.
3. " Advanced soil mechanics" by Braja M. Das., Mc Graw Hill Co.,
4. "Introduction to Geotechnical engineering" by Holtz and Kovacs., Prentice Hall.
5. "Elements of soil mechanics" by G.N. Smith., B.S.P. Professional Books, Oxford,London

ADVANCED FOUNDATION ENGINEERING

UNIT – I:

Foundations- estimating bearing capacity- Meyerhof's, Hansen's and I.S code methods- Effect of water table, eccentricity, and inclination of load on Bearing Capacity Elastic settlement –Effect of size of footing on settlement. Steinbrenner's method of calculating settlement

UNIT - II :

Allowable bearing pressure from penetration test data – Meyerhoff's and Teng's expressions. Consolidation settlement of footings - Combined footings and raft foundations, methods of analysis of raft, concept of floating raft, excavations.

UNIT - III

Deep foundations –Need. Types. Classification of piles. static equation – Single piles -– Critical depth concept. Pile capacity in clay and sand by the I.S. code method . Piles in layered soils. Piles with enlarged base in clays (under reamed piles). Piles for resisting uplift – straight shaft and under reamed piles in clays and sands – Dynamic formulae – Engineering News formula – Modified Hiley formula – Different types of pile load tests –initial and routine tests maintained load test, CRP test, pullout test, lateral load test and cyclic pile load test. Separation of skin friction and end bearing. – ultimate load from pile load tests.

UNIT – IV:

Pile groups – Efficiency of pile groups- Group capacity in clays– Minimum spacing of piles in a group – Negative skin friction of single piles and pile groups –Settlement of pile groups in clays – Equivalent raft approach – Settlement of pile groups in sands - Skempton's and Meyerhof's methods-

UNIT - V

Well foundations– Components of a well foundation–Procedure for construction and sinking of wells–Thickness of well steining for sinking under self weight - Grip length- Problems encountered in well sinking–Tilts and Shifts– Causes – Permissible tilts and shifts - Methods to rectify tilts and shifts – Forces acting on a well foundation –Allowable bearing pressure – Lateral stability of well foundations - Terzaghi's analysis

References:

1. Murthy, V.N. S. Advanced Foundation Engineering, CBS Publishers, New Delhi, 2007
2. Ranjan G. and A. S. R. Rao, Basic and Applied Soil Mechanics, New Age International, 2002.
1. Gulhati, S. K. and Datta, M. Geotechnical Engineering, Tata McGraw Hill Education, 2005
2. Tomlinson, M. J. and Booman, R. Foundation Design and Construction, Prentice Hall Publishing, 2001.
3. Tomlinson, M. J. and Woodwrd, J. Pile Design and Construction Practice. CRS Press, 2015.
4. Kurien, N. P. Design of foundation systems: principles and practices. Alpha Science International, 2005.

TRANSPORTATION ENGINEERING

PAVEMENT ANALYSIS AND DESIGN

UNIT-I

1. Pavement Types, Wheel Loads and Design Factors

Definition of Pavement Types, Comparison of Highway pavements, Wheel Loads, Tyre pressure, Contact pressure, Design Factors: Traffic and Loading, Environment, Materials, Failure criteria, Reliability.

UNIT-II

Stresses in Pavements-Layered System Concepts: One Layer System: Boussinesq Theory. Two Layer Theory: Burmister's Theory. Three Layer System. Stresses in Rigid Pavements. Relative Stiffness of Slabs, Modulus of Subgrade Reaction, Stresses due to Warping, Stresses due to Friction, Stresses due to Load, IRC Recommendations.

UNIT-III

Pavement Design IRC Method of Flexible Pavement Design, AASHTO Method of Flexible Pavement Design, IRC Method for Rigid Pavements, use of Geosynthatics in pavements.

UNIT-IV

Pavement Inventories Serviceability Concepts, Visual Rating, Pavement Serviceability Index, Roughness Measurements, Measurement of Distress Modes Cracking, Rutting, Rebound Deflection using Benkleman Beam Deflection Method, Load Man Concept, Skid Resistance Measurement.

UNIT-V

Pavement Evaluation Functional Pavement Performance Evaluation: AASHTO Method, Psycho Physical and Psycho Metric Scaling Techniques, Deduct Value Method. Structural Conditional Evaluation Technique: Benkelman Beam Deflection Method, Pavement Distress Rating Technique. Design of Overlays by Benkelmen Beam Deflection Methods as per IRC –81 - 1997 – pavements on problematic soils.

REFERENCES:

1. Yoder and Witzorack, "Principles of Pavement Design", John Willey and Sons.
2. Yang, H. Huang, "Pavement Analysis and Design", Prentice Hall Publication, Englewood Cliffs, New Jersy.
3. Sargious, M.A. Pavements and Surfacings for Highways and Airports – Applied science Publishers limited
4. Ralps Hass and Hudson, W.R. " Pavement Management System" Mc-Graw Hill Book Company.
5. IRC codes of practice.

GEOMETRIC DESIGN OF HIGHWAYS

UNIT-I

Highway Cross Section Elements and Geometric Design Of Highways: FunctionalClassification of Highway System; Design Controls – Topography, Driver characteristics, Vehicle Characteristics, Traffic, Capacity and Level of Service, Design Speed. Objectives of Geometric Design. Carriageway, Shoulders, Formation, Right of way; Kerbs, foot paths, Medians- design specifications; Pavement Surface characteristics – Skid Resistance, factors affecting Skid resistance, Measurement of Skid Resistance; Road Roughness, measurement of Road roughness; Camber, Objectives of Camber, design standards.

UNIT-II

Horizontal and Vertical Alignment: Objectives of horizontal curves; Super elevation – Need forSuper elevation; Method of computing super elevation; Minimum Radius of Curve; Methods of attainment of super elevation; Extra widening on Curves; Transition Curves – Objectives and Design. Gradients – Types of Gradients, Design Standards; Vertical Curves – Summit Curves, Valley Curves and Design criteria for Vertical Curves; Combination of Vertical and Horizontal Curves – Grade Compensation; Sight Distances – Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance; Importance of Sight Distances for Horizontal and Vertical Curves.

UNIT-III

Intersection Design: Types of Intersections; Design Principles for Intersections; Design of At-grade Intersections – Channelisation, Objectives; Traffic Islands and Design standards; Rotary Intersection – Concept and Design, Advantages and Disadvantages; Grade separated Interchanges – Types, warrants and Design standards.

UNIT-IV

Traffic Signs and Road Markings : Types of Road Signs; Guidelines for the provision of RoadSigns; Cautionary Signs, Regulatory Signs, Information Signs – Design standards; Road markings – Objectives of Road Markings; Types of Road Markings; Role of Road markings in Road Safety and Traffic Regulation; Specification for Road Markings. Highway Appurtenances – Delineators, Traffic Impact Attenuators, Safety Barriers.

UNIT-V

Miscellaneous Elements: Requirements of Pedestrians; Pedestrian facilities on Urban Roads;Cycle Tracks – Guidelines and Design standards; Bus bays – Types and Guide lines; Design of On-street and Off street Parking facilities – Guidelines for lay out Design.

REFERENCES:

1. Principles and Practice of Highway Engineering, L.R.Kadiyali and N.B.Lal, Khanna Publications
2. Traffic Engineering and Transportation Planning, L.R.Kadiyali, Khanna Publications
3. Highway Engineering, C.E.G.Justo and S.K.Khanna, Nem Chand and Brothers.
4. IRC Codes for Signs, Markings and Mixed Traffic Control in Urban Areas.

WATER RESOURCES ENGINEERING

ADVANCED FLUID MECHANICS

UNIT – I: Reynolds's Transport Theorem

Review of physical properties of fluids – intrinsic and extrinsic properties – measurement of pressure.Basic equations of motion -Continuity equation-Energy Equation-Momentum Equation-Applications

UNIT – II: Viscous Flow

Stress and Strain analysis- Classification of viscous flow-Viscosity measurements-Derivation of Navier –Stoke's equations -Exact Solutions of Navier –Stoke's equations-Laminar Flow through inclined pipes. Stationery Plates -One plate moving-Both plates moving ; Flow between two concentric rotating cylinders; Flow between two coaxial cylinders

UNIT-III: Turbulent Flow

Initiation of turbulent motion-Classification of turbulence-Reynold's stresses-Prandtls' mixing length theory-Measurement of turbulence, Continuity equation-Reynold's Navier-Stokes equations and Energy equation -Equation for dissipation rate of energy-Velocity distribution in case of flow through pipes using mixing length

UNIT-IV: Potential Flow

Uniform flow and their combinations-Source Flow-Sink Flow-Free Vortex Flow-Superimposed Flow - Concept of Doublet-Flow past Rankine Oval Shape-Flow past a circular cylinder (doublet in uniform flow)-Flow past a circular cylinder with circulation-Introduction to 3D sources and sinks

UNIT-V: Theory of Boundary Layer and Drag & Lift

Von Karman Momentum Integral equation - Prandtl Boundary layer equation-Blasius solution for laminar boundary layer flow-Hydrodynamically smooth and rough boundaries-Boundary Layer Separation-Methods of controlling Boundary Layer

Drag and lift-Types of drag-Streamlined and Bluff body-Terminal Velocity of a body- Drag on Sphere and Cylinder-Lift on a Circular cylinder-Drag & Lift on an airfoil

REFERENCES:

1. Fluid Mechanics including Fluid machines by Dr.A.K.Jain, Khanna Publishers.
2. Hydraulics and Fluid Mechanics including hydraulic machines", by Modi and Seth, Standard book house Publisher.
3. Fluid Mechanics and Hydraulic Machines by K Subramanya, Tata McGraw Hill Pvt. Ltd
1. Introduction to Fluid Mechanics and Machines by S.K. Som& G. Biswas, Tata McGraw Hill Pvt. Ltd.
2. Fluid Mechanics and Machinery by C S P OJHA, R BERNDTSSON AND P N CHANDRMOULI, Published by OXFORD, University Press.
3. Fluid Mechanics by Streeter & Wylie, Tata McGraw Hill.

ENVIRONMENTAL ENGINEERING

URBAN DRAINAGE AND WASTE WATER TREATMENT

UNIT I

Urban Hydrological Cycle, Effects of Urbanization on Catchment Hydrology, Need for Urban Drainage System, Planning Objectives, Interaction of Urban and Surrounding Areas.

Approaches to Urban Drainage, Urban Wastes and Urban Runoff Options for Waste Disposal, Separate and Combined System's, Open Channels and Closed Conduits, Wastewater and Storm water Reuse, Data Requirements, Master Drainage Plans.

UNIT II

Elements of Drainage System, Conveyance Elements, Appurtenances, Overflow Structures, Runoff Control, Pumping Stations. Design Parameters, Design Period, Catchment, Physical Parameters, Process Parameters, Rainfall, water Quality Parameters, Instrumentation for Data Collection. Hydraulic Design of Conveyance Elements, Sizing of Sewers and Drainage Channels, Design of Appurtenances, Layout of Road Drainage, Layout of Pumping Stations.

UNIT III

Operation and Maintenance of Urban Drainage Systems, Interaction of Urban Drainage and Solid Waste Management, Cleansing of Sewers and Drains, Repairs and Maintenance, Planning.

UNIT IV

Wastewater Treatment Technologies: Sedimentation, sedimentation with Coagulation, Filtration, Activated Sludge Process, trickling Filters. Tertiary Treatment Systems: Nitrogen removal, Phosphorous removal, biological phosphorus removal, advanced biological systems, aerobic ponds, facultative ponds, aerated ponds, anaerobic ponds, chemical oxidation.

UNIT V

Wetlands: Introduction, definition, classification, delineation, Identification methods, Importance of wetlands, Human impacts, wetland protection, mitigation. Wetland Management: Designed ecosystem, water recycling, soil filters, Constructed wetlands

REFERENCES:

1. Industrial Wastewater Treatment, M.N. Rao, A.K. Dutta Oxford and IBH Publishing House, 1987.
2. Waste Water Treatment and Disposal by Metcalf Eddy & Co., Mc. Graw Hill Co., 1993
3. Water and wastewater Treatment by Hammer and Hammer: Prentice-Hall 1998
4. Hall, M.J. (1984), "Urban Hydrology ", Elsevier Applied Science Publishers.
5. Geiger, W.F., Marsalek, J. Zudima and Rawls, G. J. (1987 "Manual on Drainage in Urban Areas", 2 Volumes, UNESCO, Paris.
6. Geiger, W.F. and Jayakumar, K.V. (Ed.) (1996) "Lecture Notes of the V
7. International Course on Urban Drainage in Developing Countries", Regional Engineering College, Warangal

INDUSTRIAL WASTEWATER MANAGEMENT

UNIT-I

Sources and types of industrial wastewater – Environmental impacts – Regulatory requirements – generation rates – characterization – Toxicity and Bioassay tests. Prevention vs Control of Industrial Pollution– Source reduction techniques – Waste Audit- Evaluation of pollution prevention options.

UNIT-II

Waste minimization - Equalization - Neutralization – Oil separation – Flotation – Precipitation – Heavy metal Removal –adsorption – Aerobic and anaerobic biological treatment – Sequencing batch reactors – High Rate reactors - Chemical oxidation – Ozonation– Photocatalysis – Wet Air Oxidation – Evaporation – Ion Exchange – MembraneTechnologies – Nutrient removal.

UNIT-III

Individual and Common Effluent Treatment Plants – Zero effluent discharge systems - Wastewater reuse – Disposal of effluent on land – Quantification, characteristics and disposal of Sludge.

UNIT-IV

Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing.

UNIT-V

Petrochemical -Pharmaceuticals – Sugar and Distilleries – Food Processing – fertilizers –Thermal Power Plants and Industrial Estates, ISO 14000:2003 – Waste Audit.

REFERENCES:

1. Eckenfelder, W.W., *Industrial Water Pollution Control*, McGraw-Hill, 1999.
2. Arceivala, S.J., *Wastewater Treatment for Pollution Control*, McGraw-Hill, 1998.
3. Frank Woodard, *Industrial waste treatment Handbook*, Butterworth Heinemann, New Delhi, 2001.

M. Tech. (Environmental Engineering)

4. Department of Civil Engineering, National Institute of Technology, Tiruchirappalli – 620015

REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEMS

DIGITAL IMAGE PROCESSING

UNIT I: Sensor, Satellite Data, and Data Model: Satellite systems, Data acquisition & storage - Data formats - Data products.-Image display system. Sensor model-Resolutions - Pixel characters - Image formation. The histogram and its significance- ENTROPY and its significance - Univariate & multivariate Image statistics – Spatial Statistics.

UNIT II: Geometric Preprocessing: Over view of Image Processing, Geometric distortion, Image registration, resampling, orthorectification – Image Mosaic.

UNIT III: Image Enhancements: Image characteristics- Spectral signatures .contrast enhancements- Image domain filtering. first order, second order ,directional filters , linear and non linear filters, Spatial enhancement, Multiband enhancements, ratioing, indices and Principal component analysis , Point, local and regional operators - Fourier transform-Fourier domain filtering, Ideal, Butterworth and Gaussian filters; scale-space transform, wavelet transform.

UNIT IV: Information Extraction: Classification algorithms: Non- parametric, parametric, Feature extraction, Un Supervised, training sets-Supervised methods and algorithms. Accuracy Assessment: Sources of Classification Error, Interpretation of the Error Matrix. Measurement of Classification Accuracy

UNIT V: Image Analyses : Pattern recognition, boundary detection and representation, textural and contextual Analysis.

REFERENCES:

1. John R.Jenson, .Introductory Digital Image Processing., Prentice Hall Series, 1996. 2. John A. Richards, Springer-Verlag, .Remote Sensing Digital Image Analysis. 1999. 3. Lillisand T.M and R.W.Kiefer (2004) 4th edition. Remote sensing and image interpretation, John Wiley & Sons, New York. 4. Rafael C.Gonzalez, .Digital Image Processing (2nd Edition)., Prentice Hall, 2002. 5. Remote sensing models and methods for Image processing. Schowengerdt 2nd edition. 6. Remote Sensing: The Quantitative Approach, edited by Swain, P.H.and Davis, S.M. Mc Graw Hills.

David L. Verbyla .Satellite Remote sensing of Natural Resource Management., Lewis publishers, Florida. 2. Anil K. Jain .Fundamentals of Digital Image Processing. Prentice Hall Publications, USA. 3. Image Analysis, Classification and change Detection in Remote Sensing . Mortan J.Century Taylor and Francis, 2007

GENERAL CIVIL ENGINEERING

PROBABILISTIC AND STATISTICAL METHODS IN CIVIL ENGINEERING

UNIT-1

Deterministic and Stochastic processes, Probability axioms, Continuous and discrete distributions commonly used.

UNIT-2

Moments and expectations of distributions, Parameter estimation, Introduction to Frequency Analysis, Frequency Analysis and Probability, Annual Duration Series and Partial Duration Series.

UNIT-3

Simple linear regression and multi variate linear regression, evaluation of regression, hypothesis testing

UNIT-4

Characteristics of time series data, components of time series data, autocorrelation and spectral analysis, data generation technique

UNIT-5

Principles of time series modeling, Autoregressive models (AR), Autoregressive Moving Average models, Thomas-Fiering model, calibration and validation.

REFERENCES:

1. SC Gupta, VK Kapoor, Fundamentals of Mathematical Statistics, S Chand and Sons
2. Kotteguda, N.T., and Resso, R., Statistics, Probability and Reliability for Civil and Environmental Engineers, McGraw Hill Companies Inc., New York, 1998.
3. Haan T. C., Statistical Methods in Hydrology, East West Publishers, 1998.
4. Kotteguda, N.T., Stochastic Water Resources Technology, The Macmillan Press, New York, 1982.
5. McCuen, R.H., Hydrologic Analysis and Design, Prentice Hall Inc. N York, 2005
6. Mauro Naghettini, Fundamental of Statistical Hydrology, Springer

STRUCTURAL ENGINEERING

COURSE – II

PRESTRESSED CONCRETE AND STEEL STRUCTURES

UNIT-I

INTRODUCTION: Development of prestressed concrete –Advantages and Disadvantages of PSC over RCC General principles of pre-stressing-pre tensioning and post tensioning – Materials used in PSC-high strength concrete –High tension steel- Different types /methods/systems of prestressing. **Losses of prestress**: Estimation of the loss of prestress due to various causes like elastic shortening of concrete ,creep of concrete, shrinkage of concrete, relaxation of steel, slip in anchorage, friction etc.

UNIT-II

a) **Flexure:** Analysis of sections for flexure in accordance with elastic theory-Allowable stresses-Design criteria as per I.S code of practice –Elastic design of Beams (rectangular, I and T sections) for Flexure –Introduction to partial prestressing.

b) **Shear, bond, Bearing and Anchorage:** shear in PSC beams –Principal stresses – Conventional elastic design for shear-transfer of prestress in pretensioned memberstransmission length –Bond stresses-bearing at anchorage –Anchorage zonestresses in post-tensioned members-Analysis and design of end blocks by Guyon, Magnel and approximate methods –Anchorage zone reinforcements.

UNIT-III

a) **Deflections:** Introduction-Factors influencing deflections-short term and long termtime deflections of uncracked and cracked members.

b) **Composite Construction:** Types of composite construction-stress distribution in composite sections analysis of stresses-Differential shrinkage-Design of simple composite sections.

UNIT-IV

Statistically indeterminate structures: Introduction –advantages and disadvantages of continuity –Layouts for continuous beams-primary and secondary moments –Elastic analysis of continuous beams-Linear transformation-Concordant cable profile-Design of continuous beams.

UNIT-V

a) **Circular prestressing**: Introduction –Circumferential prestressing Design ofPrestressed concrete tanks –vertical prestressing in tanks-Dome prestressing.

b) Introduction to pre-stressed of steel structures.

REFERENCE BOOKS:

1. Prestressed Concrete by Lin
2. Prestressed Concrete by S.Krishnam raju
3. Research materials on prestressing steel structur

ADVANCED CONCRETE TECHNOLOGY

UNIT-I

Materials- Cement, Aggregates, mixing water soundness of aggregate- Fresh and hardened concrete: Admixtures- types of admixtures- purposes of using admixtures- chemical composition- effect of admixtures on fresh and hardened concretes- Natural admixtures. Non destructive evaluation: Importance- Concrete behavior under corrosion, disintegrated mechanisms- moisture effects and thermal effects – Visual investigation- Acoustical emission methods- Corrosion activity measurement- chloride content – Depth of carbonation- Impact echo methods- Ultrasound pulse velocity methods- Pull out tests

UNIT-II

Repair and rehabilitation of structural elements: Analysis, strategy and design- Material requirement- Material selection- Surface preparation- Reinforcing steel cleaning, repair and protection- Bonding repair materials to existing concrete- placement methods-

UNIT-III

Strengthening and stabilization- Techniques- design considerations- Beam shear capacity strengthening- Shear Transfer strengthening- stress reduction techniques- Column strengthening- flexural strengthening- Connection stabilization and strengthening Crack stabilization

UNIT-IV

Fiber-reinforced concrete- Properties of constituent materials- Mix proportions, mixing and casting methods-Mechanical properties of fiber reinforced concrete- applications of fibre reinforced concretes. Light weight concrete- Introduction- properties of light weight concrete- No fines concrete- design of light weight concrete

UNIT-V

Fly ash concrete- Introduction- classification of flyash- properties and reaction mechanism of flyash- Properties of flyash concrete in fresh state and hardened state- Durability of flyash concretes. High performance concretes- Introduction- Development of high performance concretes- Materials of high performance concretes- Properties of high performance concretes.

REFERENCE:

1. Concrete technology- Neville & Brooks
2. Special Structural concrete- Rafat Siddique
3. Concrete repair and maintenance illustrated- Peter H Emmons

ADVANCED REINFORCED CONCRETE DESIGN

UNIT-I

Introduction: History of Reinforced Concrete (RC), advantages of RC, load paths, introductions to different structural systems used in modern concrete construction. Stress-Strain Behaviour of concrete and steel under Compression and Tension, Behaviour of concrete under multi-axial stress, High strength concrete, lightweight concrete, Failure theories for concrete under Combined stress state, Tension-stiffening of Concrete, Effects of creep, shrinkage and temperature on material and structural behaviour.

UNIT-II

Behaviour under Pure Axial Loads: Basic Laws of Mechanics, Load displacement behaviour of RC members under pure axial compression and tension, Role of concrete and steel in compression and tension; differences in Behaviour of high strength and normal strength concrete.

Behaviour and Design under Flexure: Analysis at ultimate; Moment-curvature and load-deflection relationships, Effect of reinforcement ratios and concrete strength on moment-curvature Behaviour; Flexural design aspects using IS Code,

UNIT III

Analysis and Design for Shear: Relationship between flexure and shear, Effect of shear span to depth ratio, Definition of nominal shear, critical sections for shear, concept of Mohr circle; different failure modes in shear; Internal resisting mechanisms under shear

Analysis and Design for Torsion: Behaviour of reinforced concrete members subjected to Torsion, Design methods of Torsion, Difference between equilibrium and compatibility torsion; concepts behind the derivation of code equations; concept of equivalent shear and bending; design examples, Design for combined loading (Torsion + Bending + Shear)

UNIT-IV

Columns: Concept of effective length; short columns vs slender column, Effect of confinement, Derivation of axial compression and bending interaction curves, Design of slender columns; Design for biaxial bending

Serviceability Checks: Difference between short-term and long-term deflections; estimation of deflections, estimation of crack widths and shrinkage cracks, vibrations and fatigue

UNIT-V

Analysis and Design of Two-way Slabs: Difference between one way and two-way slabs; limitations of code coefficient method; direct design method; equivalent frame method; Yield line analysis of slabs, Design of two-way slabs with a commercial package and comparing results from direct Design and equivalent frame methods

Special Topics Part 1: Design of Shear Walls, Design of Curved beams, Moment redistribution in continuous beams; bond and development length, curtailment of reinforcing steel

REFERENCES:

- S. Unnikrishna Pillai and Devdas Menon, Reinforced Concrete Design, 3rd Edition, 2009, Tata Mcgraw Hill

- Krishnam Raju, N. "Design of Reinforced Concrete Structures", 2 nd Edition, CBS Publishers and Distributors, New Delhi, 2007.
- Varghese P.C. "Advanced Reinforced Concrete Design", 2 ndEdition, Prentice - Hall of India, , 2008.
- Purushothaman P, "Reinforced Concrete Structural Elements", 3rd Edition, Tata Mc Graw- Hill Publishing Co, 2004.
- J. Wight and J.G. MacGregor, Reinforced Concrete - Mechanics & Design, 6th Edition, Prentice-Hall, 2011
- A Nilson, D Darwin, C Dolan Design of Concrete Structures, McGraw-Hill Education; 14 edition (16 August 2009), 816 pages.

Codes and Standards:

- 1. IS 456: 2000 — Plain and reinforced concrete – Code of practice (fourth revision)
- 2. SP 16: 1980 — Design Aids (for Reinforced Concrete) to IS 456: 1978.
- 3. IS 875 (Parts 1-5): 1987 — Code of practice for design loads (other than earthquake) for buildings and structures (second revision)
- 4. SP 24: 1983 — Explanatory Handbook on IS 456: 1978
- 5. SP 34: 1987 — Handbook on Concrete Reinforcement and Detailin

GEOTECHNICAL ENGINEERING

SOIL DYNAMICS AND MACHINE FOUNDATIONS

UNIT-I

Fundamentals of Vibration: Definitions, Simple harmonic motion, Response of SDOF systems of Free and Forced vibrations with and without viscous damping, Frequency dependent excitation, Systems under transient loads, Rayleigh's method of fundamental frequency, Logarithmic decrement, Determination of viscous damping, Transmissibility, Systems with Two and Multiple degrees of freedom, Vibration measuring instruments.

UNIT- II

Wave Propagation and Dynamic Soil Properties: Propagation of seismic waves in soil deposits - Attenuation of stress waves, Stress-strain behaviour of cyclically loaded soils, Strength of cyclically loaded soils, Dynamic soil properties - Laboratory and field testing techniques, Elastic constants of soils, Correlations for shear modulus and damping ratio in sand, gravels, clays and lightly cemented sand. Liquefaction of soils: An introduction and evaluation using simple methods.

UNIT-III

Vibration Analyses: Types, General Requirements, Permissible amplitude, Allowable soil pressure, Modes of vibration of a rigid foundation block, Methods of analysis, Lumped Mass models, elastic half space method, elasto-dynamics, effect of footing shape on vibratory response, dynamic response of embedded block foundation, Vibration isolation.

UNIT-IV

Design of Machine Foundations: Analysis and design of block foundations for reciprocating engines, Dynamic analysis and design procedure for a hammer foundation, IS code of practice design procedure for foundations of reciprocating and impact type machines.
Vibration isolation and absorption techniques.

UNIT-V

Machine Foundations on Piles: Introduction, Analysis of piles under vertical vibrations, Analysis of piles under translation and rocking, Analysis of piles under torsion, Design procedure for a pile supported machine foundation.

REFERENCES:

1. I.Chowdhary and S P Dasgupta - Dynamics of Structures and Foundation, 2009.
2. Arya, S. D, O'Neil, M. and Pincus, G.- Design of Structures and Foundations for Vibrating Machines, Gulf Publishing Co., 1979.
3. Prakash, S. and Puri, V. K. - Foundation for Machines: Analysis and Design, John Wiley & Sons, 1998.
4. Prakash, S. - Soil Dynamics, McGraw Hill, 1981.
5. Kameswara Rao, N. S. V. - Vibration Analysis and Foundation Dynamics, Wheeler Publication Ltd., 1998.

6. Richart, F. E. Hall J. R and Woods R. D. - Vibrations of Soils and Foundations,Prentice Hall Inc., 1970.
7. Swami Saran - Soil Dynamics and Machine Foundation, Galgotia Publishing,1999.
8. Das, B. M. - Principles of Soil Dynamics, PWS KENT publishing Company,Boston

SOIL- STRUCTURE INTERACTION

UNIT-I

Soil-Foundation Interaction: Introduction to soil-foundation interaction problems, Soil behaviour, Foundation behaviour, Interface behaviour, Scope of soil foundation interaction analysis, soil response models, Winkler, Elastic continuum, Two parameter elastic models, Elastic-plastic behaviour, Time dependent behaviour. Idealized Soil Response Models for the Analysis of Soil – Foundation Interaction – Elastic Models for Soil Behaviour, Cointler model, Elastic Continuous Model, Two – Parametric Elastic Models – Elastic – Plastic and Time Dependent Behaviour of Soil Masses.

UNIT-II

Beam on Elastic Foundation- Soil Models: Infinite beam, Two-parameters models, Isotropic elastic half-space model, Analysis of beams of finite length, combined footings.Finite Beams on a Winkler Medium – Method of Initial Parameters – Method of Super Position – Strain Energy Method.

Plates on Elastic Continuum: Thin and thick rafts, Analysis of finite plates, Numericalanalysis of finite plates. Analysis of finite plates – Axi Symmetric Leading of a Circular Plate – Circular Plate Resting on a Winkler Medium – Circular Plate Resting on a Two –parameter elastic.

UNIT- III

Analysis of Axially and Laterally Loaded Piles and Pile Groups: Elastic analysis of singlepile, Theoretical solutions for settlement and load distributions, Analysis of pile group, Interaction analysis, Load distribution in groups with rigid cap, Load deflection prediction forlaterally loaded piles, Subgrade reaction and elastic analysis, Interaction analysis, Pile-raft system.

UNIT-IV

Reinforcement – Backfill Interaction in Reinforced Soil Structures

UNIT-V

Ground-Foundation-Structure Interaction: Effect of structure on ground-foundation interaction, Static and dynamic loads.

REFERENCES:

1. Selvadurai, A. P. S. - Elastic Analysis of Soil-Foundation Interaction
2. Poulos, H. G., and Davis, E. H. - Pile Foundation Analysis and Design
3. Scott, R. F. - Foundation Analysis
4. Bowles, J. E. - Foundation Design & Analyses
5. Das, B. M. - Advanced Foundation Engineering.
6. Soil mechanics by TW Lambe & Whitmen.
7. Analytical and computer methods in foundation engineering, JE Bowles, McGraw Hill publications.
8. Foundation analysis and design, JE Bowles, McGraw Hill Publications.
9. Foundation analysis by RF Scott, Printice Hall
10. Hytenyi, Beams on Elastic Foundations – university of Michigan Press.
11. Elastic Analysis of soil – Foundation Interaction. APS Selvadurai – Elsevier
12. Vibration Analysis and Foundation Dynamics, NSV Kameswara Rao, WheelerPublishing, New Delhi

TRANSPORTATION ENGINEERING

HIGHWAY CONSTRUCTION, QUALITY CONTROL AND MAINTENANCE

UNIT I COMPONENTS OF PAVEMENT

Subgrade system, functions, requirements and sequence of construction operations. Plants and equipment for production of materials - crushers, mixers, bituminous mixing plants, cement concrete mixers – various types, advantages and choice.

UNIT II CONSTRUCTION OF DRAINAGE

Drainage – Assessment of drainage requirements for the road and design of various components, drainage materials, Construction of surface and subsurface drainage system and design of filter materials for roads. Drainage for urban roads.

UNIT III CONSTRUCTION EQUIPMENTS

Road construction equipment – different types of excavators, graders, soil compactors / rollers, pavers and other equipment for construction of different pavement layers – their uses and choice Problem on equipment usage charges; Pre-construction surveys and marking on ground - Specifications and steps for the construction of road formation in embankment and cut, construction steps for granular sub-base, quality control tests.

UNIT IV PAVEMENT LAYERS AND SPECIFICATIONS

Different types of granular base course – WMM, CRM, WBM; specifications, construction method and quality control tests. Different types of bituminous layers for binder and surface courses; their specifications (as per IRC and MORTH); construction method and quality control tests. Different types of sub-base and base course for cement concrete (CC) pavement and construction method. Construction of cement concrete (PQC) pavements joints quality control during construction. Construction details of interlocking concrete block pavements

UNIT V QUALITY CONTROL AND MAINTENANCE

Principle of construction planning, application of CPM and PERT(Problems not included) Road maintenance works – day to day and periodic maintenance works of various components of road works and road furniture. Preparation of existing pavement – patching, profile correction, Special measures to deal with reflection cracks in pavement layers, slipperiness of surface, etc. Special problems in construction & maintenance of hill roads, land slide, causes, investigation, and preventive and remedial measures, protection of embankment and cut slopes.

REFERENCES

1. Peurifoy, R.L., and Clifford,JS ―Construction Planning Equipment and Method- McGraw Hill Book Co. Inc.
2. Sharma S.C., "Construction Equipment and its Management- Khanna Publishers
3. Freddy L Roberts, Prithvi S Kandhal et al, ―Hot Mix Asphalt Materials, mixture design and construction- (2nd Edition), National Asphalt Pavement Association Research and Education Foundation, Maryland, USA.
4. National Asphalt Pavement Association ―Hot Mix Asphalt Paving Hand book- 5100 Forbes Boulevard, Lanhm, Mary Land, USA
5. "Hand Book on Cement Concrete Roads"- Cement Manufacturers Association, New Delhi
6. MoRTH ―Specifications for Roads and Bridge Works‖ - 2001,fourth revision, Indian Roads Congress
7. MoRTH ―Manual for Maintenance of Roads"- 1989, Indian Roads Congress
8. IRC: 42-1994, IRC:15-2002, IRC SP :11-1988, , 55-2001, 57-2001,58-2001, IRC 19-1977, 27-1967, 29-1988, 34-1970, 36-1970,48-1972,61-1976, 63-1976, 68-1976, 81-1997,82-1982, 84-1983,93-1985, 94-1986, 95-1987, 98-1997, 105-1988.

PAVEMENT MATERIALS

UNIT I

PROPERTIES OF SUBGRADE SOIL AND AGGREGATES

Subgrade soil – Soil composition and structure – Soil classification for engineering purposes - Origin, Classification, requirements, properties and tests on road aggregates

UNIT II

PROPERTIES OF BITUMEN

Origin, preparation, properties and tests, constitution of bituminous road binders, requirements – Bituminous Emulsions and Cutbacks: Preparation, characteristics, uses and tests.

UNIT III

CHARACTERISTIC OF BITUMINOUS MIXES

Bituminous Mixes: Mechanical properties – Resilient modulus, dynamic modulus and fatigue characteristics of bituminous mixes.

UNIT IV

DESIGN OF BITUMINOUS MIX

Weathering and Durability of Bituminous Materials and Mixes – Performance based Bitumen Specifications – Super pave mix design method.

UNIT V

DESIGN OF CEMENT CONCRETE MIX

Cement Concrete for Pavement Construction: Requirements, design of mix for CC pavement, joint filler and sealer materials.

REFERENCE BOOKS

1. Alkins and Harold, “Highway Material” , Prentice Hall, Pearson, 2003
2. Kerbs and Walkes, “Highway Materials”, McGraw Hill Book Co.2007
3. IRC 37-2001, IRC 81-1997, IRC 58 – 2002, IRC 59 – 1976, IRC 101-1988.

WATER RESOURCES ENGINEERING

OPEN CHANNEL HYDRAULICS AND SEDIMENT TRANSPORT

UNIT I

Basic Concepts of Free Surface Flow: Flow Regimes, Velocity and Pressure Distribution, Energy Principles and its applications, Specific Energy, Critical Flow Computations, Momentum Equation and its Applications, Specific force Diagram, theoretical Concepts of Surface Roughness, Velocity Equation, Uniform Flow Computation.

UNIT II

Steady Gradually Varied Flow: Dynamic Equation, Characteristics of Flow Profile and Methods of Computation, Practical Problems, Gradually Varied Flow Analysis and Computation.

UNIT III

Steady Rapidly Varied Flow: Hydraulic Jump Analysis and Location, Jump in Sloping Channels and Oblique Jump. Unsteady Rapidly Varied Flow: Dam Break Problem, Moving Hydraulic Jump, Positive and Negative Surges.

UNIT IV

Fluvial Hydraulics: Basic Characteristics of River Beds and Sediments, initiation of Motion, Regimes of Flow, Resistance to Flow in Alluvial Streams, Theories of Bed Load, Suspended Load and Total Load. Design of stable Channels: Regime and Tractive force Methods.

UNIT V

Sediment Transport Modelling in rivers – 1D, 2D and 3D models

REFERENCE BOOKS:

1. Chow, . V.T. (1979) “Open Channel Hydraulics”, Mc Graw Hill Inc. N York.
2. Subramanya, K (1996) “Flow in Open Channels”, Tata Mc Graw Hill Pub., 1995.
3. Pasquali, D. (Ed.). (2022). Modeling of Sediment Transport. IntechOpen. doi: 10.5772/intechopen.97911

1. Chaudhry M.H. (1994), "Open –Channel Flow", Prentice Hall of India, N Delhi
2. French, R.H.(1986), "Open Channel Hydraulics", Mc Graw Hill Pub Co., N York.
3. Garde and Ranga Raju, K.G. (1980): "Mechanics of Sediment Transportation and Alluvial Stream Problems", Wiley Eastern, N Delhi

ENVIRONMENTAL ENGINEERING

SOLID & HAZARDOUS WASTE MANAGEMENT

UNIT I

Solid Waste Collection, Segregation and Transport:

Definition of solid wastes – types of solid wastes – Sources - Industrial, mining, agriculturaland domestic – Characteristics. Solid waste Problems - impact on environmental health – Concepts of waste reduction, recycling and reuse. Handling and segregation of wastes at source. Collection and storage of municipal solid wastes; Analysis of Collection systems.Transfer stations.

UNIT II

Municipal Solid Waste Management:

Solid waste processing technologies. Mechanical and thermal volume reduction. Biological and chemical techniques for energy and other resource recovery: composting, vermi- composting, termi-gradation, fermentation. Incineration of solid wastes. Disposal in landfills: site selection, design, and operation of sanitary landfills; Leachate and landfill gas management; landfill closure and post-closure environmental monitoring; landfill remediation. Regulatory aspects of municipal solid waste management.

UNIT III

Hazardous Wastes:

Hazardous waste definition. Physical and biological routes of transport of hazardous substances – sources and characterization categories and control. Sampling and analysis ofhazardous wastes –

analytical approach for hazardous waste characterization – proximate analysis – surveyanalysis – directed analysis – analytical methods.

UNIT IV

Hazardous Wastes Management:

Sources and characteristics: handling, collection, storage and transport, TSDF concept.Hazardous Waste treatment technologies - Physical, chemical and thermal treatment of hazardous waste: solidification, chemical fixation, encapsulation, pyrolysis and incineration. Hazardous waste landfills - Site selections, design and operation. Hazardous waste reduction and Recycling - Regulatory aspects of HWM.

UNIT V

Biomedical, Radioactive and e-Waste Management:

Biomedical waste: Definition, sources, classification, collection, segregation Treatment and disposal.

Radioactive waste: Definition, Sources, Low level and high level radioactive wastes and their management, Radiation standard by ICRP and AERB. Waste characteristics, generation, collection, transport and disposal.

REFERENCE BOOKS:

1. Hazardous waste management by Prof. Y. Anjaneyulu.
2. Hazardous waste management Charles A. Wentz. Second edition 1995. McGraw Hill
3. International.
4. Integrated solid waste management, George Tchobanoglous, Hilary Theisen & Sammuel A. Vigil.
5. Criteria for hazardous waste landfills – CPCB guidelines 2000.
6. Environmental Science by Daniel B. Botkin and Edward A. Keller, Wiley student, 6th edition-2009.

AIR POLLUTION AND CONTROL TECHNOLOGIES

UNIT I

Classification and properties of air pollutants:
Emission sources -major emissions from Global sources -importance of anthropogenic sources- behaviour and fate of air pollutants- photochemical smog-effects of air pollution- health, vegetation and materials damage in India-air pollution standards - Isolation and heat balance of the atmosphere – different types of terrain – effects of terrain features on atmosphere – mechanical and thermal turbulence- Indoor air pollution.

UNIT II
Meteorological aspects of air pollution dispersions:

Temperature lapse Rates and Stability-wind velocity and turbulence-Plume behaviour dispersion of air pollutants- solutions to the atmospheric dispersion equation - the GaussianPlume Model.

UNIT III

Air pollution sampling and measurement: Types of pollutant sampling and measurement - Ambient air sampling - collection of gaseous air pollutants - collection of particulate pollutants - stack sampling, analysis of air pollutants - sulfur dioxide - nitrogen dioxide, carbon monoxide, oxidants and ozone - hydrocarbons - particulate matter.

UNIT IV
Control methods:

Sources- correction methods - particulate emission control - gravitational settling chambers - cyclone separators- fabric filters - electrostatic precipitators - wet scrubbers - control of gaseous emissions - adsorption by solids - absorption by liquids - combustion, condensation –control of SO2 emission – desulphurization of flue gases – dry methods – wet scrubbing methods. Control of sulphur dioxide emission - desulphurization of flue gases - dry methods- wet scrubbing methods - control of nitrogen oxides - modification of operating conditions - modification of design conditions - effluent gas treatment methods - carbon monoxide control
- control of hydrocarbons - mobile sources.

UNIT V
Air pollution from specific industries:

Portland cement plants – steel mills – petroleum refineries
Vehicular air pollution:

Genesis of Vehicular emissions-Natural Pollution - Gasification of Vehicles - Point sources of

Air Pollution from automobiles - Fuel tank, carburettor, crank case - Exhaust emissions - Mechanism of Origin of air pollution from automobiles. Automobile air pollution – Indian Scenario - Population and pollution loads of vehicles - Automobile Pollution Control - Control at sources - Exhaust gas treatment devices - Alternate fuels comparison - Thermal Reactor - Catalytic Converter - Automobile Emission Control - Legal measures.

REFERENCE BOOKS:

Air Pollution, H.C.V. Rao, 1990, McGraw Hill Co.
Environmental Pollution Control, C.S.Rao, Wiley Eastern Ltd., 1993 Air Pollution, M.N. Rao McGraw Hill 1993.

Fundamentals of Air Pollution, Samuel, J.W., 1971, Addison Wesley Publishing Co. Air Pollution, Kudesia, V.P. International Student Edition McGraw Hill - KosakushaLtd.,Tokyo.
Fundamentals of Environmental Pollution, Krishnan Khannan, S. Chand & CompanyLtd., 1994

REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM

REMOTE SENSING AND GIS FOR URBAN PLANNING AND MANAGEMENT

UNIT I : Introduction : Remote sensing for detection of urban features – Scale and resolution – Scope and limitations – Interpretation from Aerial and satellite images – Digital image processing techniques – Image fusion.

UNIT II: Settlement Mapping : Classification and settlement – settlement structure – Segmentation of Built-up areas – Classification algorithms – Land use/ Land cover mapping – change detection – high resolution remote sensing.

UNIT III: Analysis and Planning : Urban morphology – Housing typology – Population estimation from remote sensing – Infrastructure demand analysis – Urban renewal Land suitability analysis – Plan formulation – Regional, Master and detailed development – Use of remote sensing and GIS in plan preparation – Urban information system – Web GIS

Unit IV: Transportation Planning : Mapping transportation network – Classification – Optimum route/ shortest route – Alignment planning – Traffic and parking studies – Accident analysis.

UNIT V : Current Trends : Urban growth modeling – Expert systems in planning – 3D city models – ALTM – Land use Transportation interaction models – Intelligent transportation systems .

REFERENCES: 1. Juliana Maantay, John Ziegler, John Pickles, GIS for the Urban Environment, Esri Press 2006. 2. Allan Brimicombe, GIS Environmental Modeling and Engineering, CRC; 1 edition 2003. 3. Paul Longley, Michael Batty, Spatial Analysis: Modeling in a GIS Environment Wiley,1997. 4. Michael F. Goodchild, Louis T. Steyaert , Bradley O. Parks, Carol Johnston, David Maidment, Michael Crane , Sandi Glendinning, GIS and Environmental Modeling: Progress and Research Issues (Hardcover) by,Publisher: Wiley; 1 edition, 1996. 5. Roland Fletcher, The Limits of Settlement Growth: A Theoretical Outline (New)

GENERAL CIVIL ENGINEERING

APPLICATIONS OF SOFT COMPUTING TECHNIQUES

UNIT-1 Information and uncertainty, Chance versus ambiguity, Classical sets and fuzzy sets, Logic and reasoning,

UNIT-2 Fuzzy set operations and fuzzy relations, Membership Functions.

UNIT-3 Fuzzy Systems, Decision Making with Fuzzy Information. Fuzzy Classification and Pattern Recognition.

UNIT-4 Artificial Neural Networks (ANN), Types of ANN, Learning algorithms

UNIT-5 Neuro-Fuzzy Systems, Applications in Civil Engineering.

REFERENCES :

1. Haykin (2008), "Neural Networks: A Comprehensive Foundation", Prentice Hall India, New Delhi

2. Rajasekaran S., and Vijayalakshmi Pai G.A. (2003), Nueral Neworks, Fuzzy Logic and Genetic Algorithms – Synthesis and Applications, Prentice-Hall India, New Delhi

1. Jang, J.R., Sun Chuen-tsai, and Mizutani Eiji, (2009), "Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence", PHI Learning

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Pre-Ph.D Syllabus

COURSE STRUCTURE

S. No	Pre-Ph.D Course-1-Subjects	Pre-Ph.D Course-2-Subjects
1.	Optimal Control Theory	Discrete Control Systems
2.	Electrical Distribution system & Automation	EHVAC Transmission Systems
3.	Power Quality & Custom power devices	Power System Dynamic & Stability
4.	Analysis of power Electronic Converters	Advanced Power Electronics
5.	Power Electronic Control of DC drives	Power Electronic Control of AC drives
6.	Advanced Electrical Machines	Unified Theory of Electric Machines
7.	SCADA & Energy Management Systems	Grid Integration of Renewable Energy Systems
8.	Artificial Intelligent Techniques	Hybrid Electrical Vehicle Systems
9.	Battery Management system for Electrical Vehicles	High Voltage DC Transmission
10.	Distributed Generation & Micro Grids	Smart Grid Technologies

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Pre - Ph.D Syllabus

S. No	Pre-Ph.D Course-1-Subjects
1.	Optimal Control Theory
2.	Electrical Distribution system & Automation
3.	Power Quality & Custom power devices
4.	Analysis of power Electronic Converters
5.	Power Electronic Control of DC drives
6.	Advanced Electrical Machines
7.	SCADA & Energy Management Systems
8.	Artificial Intelligent Techniques
9.	Battery Management System for Electrical Vehicles
10.	Distributed Generation & Micro Grids

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

OPTIMAL CONTROL THEORY

UNIT-I: Introduction

Problem formulation- State variable representation of systems – Performance measures for optimal control problems – selecting a performance measure.

UNIT-II: Dynamic programming

The optimal control law - principle of optimality and its application - optimal control system - interpolation - recurrence relation of dynamic programming-computational procedure for solving optimal control problems –characteristics of dynamic programming solution-analytical results-discrete linear regulator problems-Hamilton- Jacobi-Bellman equation-continuous linear regulator problems, Riccati Equation

UNIT-III: Calculus of variants

Fundamental concepts- linearity of functional-closeness of functions-the increment of a functional-The variation of a functional- maxima and minima of functional- the fundamental theorem of the calculus of variations - Functional of a single function- the simplest variational problem

UNIT-IV: Optimal control problems

Necessary conditions for optimal control - Linear regulator problem-Pontryagin's minimum principle and state inequality constraints.

UNIT-V: Iterative numerical techniques for finding optimal controls

Two-point boundary-value problems-The method of steepest descent-Features of the steepest descent algorithm.

Text Books:

1. Optimal control theory-An Introduction by Donald E.Kirk - Prentice Hall Networks series.
2. M. Gopal: Modern Control Systems Theory, Wiley Eastern Limited, New Delhi, 2005

Reference Books:

1. Katsuhiko Ogata: Modern control Engineering, Prentice-Hall of India, 2010
2. B.C.Kuo, Automatic control systems (5thEdition),Prentice HallofIndia,1988.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ELECTRICAL DISTRIBUTION SYSTEMS & AUTOMATION

UNIT – I: General

Introduction to Distribution systems, an overview of the role of computers in distribution system planning- Load modelling and characteristics - definition of basic terms like demand factor, utilization factor, load factor, plant factor, diversity factor, coincidence factor, contribution factor and loss factor-Relationship between the load factor and loss factor - Classification of loads (Residential, Commercial, Agricultural and Industrial) and their characteristics.

UNIT –II : Distribution Feeders and Substations

Design consideration of Distribution feeders: Radial and loop types of primary feeders, voltage levels, and feeder-loading. Design practice of the secondary distribution system. Location of Substations: Rating of a Distribution Substation, service area with 'n' primary feeders. Benefits derived through optimal location of substations.

UNIT – III : Protective devices and coordination

Objectives of distribution system protection, types of common faults and procedure for fault calculation. Protective Devices: Principle of operation of fuses, circuit reclosers, line sectionalizer and circuit breakers. Coordination of protective devices: General coordination procedure; types of coordination.

UNIT – IV : Capacitive compensation for power factor control

Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and switched), power factor correction, capacitor location. Economic justification. Procedure to determine the best capacitor location. Voltage control: Equipment for voltage control, effect of series capacitors, effect of AVB/AVR, line drop compensation.

UNIT – V : Distribution automation functions

Electrical system automation, EMS functional scope, DMS functional scope functionality of DMS- Steady state and dynamic performance improvement; Geographic information systems- AM/FM functions and Database management; communication options, supervisory control and data acquisition: SCADA functions and system architecture; Synchrophasors and its application in power systems.

Text Books:

1. Electric Power Distribution System Engineering by Turan Gonen, McGraw-Hill Book Company,1986.
2. Distribution System Analysis and Automation, by Juan M. Gers, The Institution of Engineering and Technology, UK 2014.

Reference Books:

1. Electric Power Distribution-by A.S.Pabla, Tata McGraw-Hill Publishing Company, 4thedition, 1997.
2. Electrical Distribution V.Kamaraju-McGraw Hill
3. Handbook of Electrical Power Distribution – Gorti Ramamurthy-Universities press

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

POWER QUALITY AND CUSTOM POWER DEVICES

UNIT– I: Introduction to power quality

Overview of Power Quality, Concern about the Power Quality, General Classes of Power Quality Problems, Voltage Unbalance, Waveform Distortion, Voltage fluctuation, PowerFrequency Variations, Power Quality Terms, Voltage Sags, swells, flicker and Interruptions - Sources of voltage and current interruptions, Nonlinear loads.

UNIT– II: Transient and Long Duration Voltage Variations

Source of Transient Over Voltages - Principles of Over Voltage Protection, Devices for Over Voltage Protection, Utility Capacitor Switching Transients, Utility Lightning Protection, Load Switching Transient Problems.

Principles of Regulating the Voltage, Device for Voltage Regulation, Utility Voltage Regulator Application, Capacitor for Voltage Regulation, End-user Capacitor Application, Regulating Utility Voltage with Distributed generation

UNIT– III: Harmonic Distortion and solutions

Voltage vs. Current Distortion, Harmonics vs. Transients - Power System Quantities under Non-sinusoidal Conditions, Harmonic Indices, Sources of harmonics, Locating Sources of Harmonics, System Response Characteristics, Effects of Harmonic Distortion, Inter harmonics,Harmonic Solutions Harmonic Distortion Evaluation, Devices for Controlling Harmonic Distortion, Harmonic Filter Design, Standards on Harmonics

UNIT– IV: Custom Power Devices

Custom power and custom power devices, voltage source inverters, reactive power and harmonic compensation devices, compensation of voltage interruptions and current interruptions, static series and shunt compensators, compensation in distribution systems, interaction with distribution equipment, installation considerations.

UNIT– V: Application of custom power devices in power systems

Static and hybrid Source Transfer Switches, Solid state current limiter - Solid state breaker. P-Q theory – Control of P and Q, Dynamic Voltage Restorer (DVR): Operation and control – Interline Power Flow Controller (IPFC): Operation and controlof Unified Power Quality Conditioner (UPQC); Generalized power quality conditioner

Text Books:

1. Electrical Power Systems Quality, Dugan R C, McGranaghan M F, Santoso S, and Beaty H W,Second Edition, McGraw-Hill, 2002.
2. Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M H J, FirstEdition, IEEE Press; 2000.
3. Guidebook on Custom Power Devices, Technical Report, Published by EPRI, Nov 2000
4. Power Quality Enhancement Using Custom Power Devices – Power Electronics and PowerSystems, Gerard Ledwich, ArindamGhosh, Kluwer Academic Publishers, 2002.

Reference Books:

1. Power Quality Primer, Kennedy B W, First Edition, McGraw-Hill, 2000.
2. Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley & Sons,2003.
3. Electric Power Quality control Techniques, W. E. Kazibwe and M. H. Sendaula, Van NostradReinhold, New York.
4. Power Quality c.shankaran, CRC Press, 2001
5. Harmonics and Power Systems –Franciso C.DE LA Rosa-CRC Press (Taylor & Francis).
6. Power Quality in Power systems and Electrical Machines-EwaldF.fuchs, Mohammad A.S. Masoum-Elsevier
7. Power Quality, C. Shankaran, CRC Press, 2001
8. Instantaneous Power Theory and Application to Power Conditioning, H. Akagiet.al., IEEE Press, 2007.
9. Custom Power Devices - An Introduction, ArindamGhosh and Gerard Ledwich, Springer, 2002
   A Review of Compensating Type Custom Power Devices for Power Quality Improvement, Yash Pal et.al., Joint International Conference on Power System Technology and IEEE Power India Conference, 2008. POWERCON 2008.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ANALYSIS OF POWER ELECTRONICS CONVERTERS

Unit-1: Single Phase AC voltage Controllers

Single Phase AC Voltage Controllers with RL and RLE loads-ac voltage controller's with PWM control-Effects of source and load inductances –synchronous tap changers –Application- numerical problems

Three Phase AC Voltage Controllers

Three Phase AC Voltage controllers-Analysis of Controllers with star and delta connected resistive, resistive –inductive loads-Effects of source and load inductances–Application- numerical problems.

Unit –II: Single phase AC-DC converters

Single phase Half controlled and Fully controlled Converters with RL load– Evaluation of input power factor and harmonic factor-Continuous and Discontinuous load current-Power factor improvements-Extinction angle control-symmetrical angle control-PWM single phase sinusoidal PWM-Single phase series converters- numerical problems

Three Phase AC-DC Converters

Three Phase ac-dc Converters- Half controlled and fully controlled Converters with RL load– Evaluation of input power factor and harmonic factor-Continuous and Discontinuous load current-three phase dual converters-Power factor improvements-three phase PWM-twelve pulse converters- numerical problems

Unit-III: Power Factor Correction Converters

Single-phase single stage boost power factor corrected rectifier, power circuit principle of operation, and steady state- analysis, three phase boost PFC converter

Unit –VI: Single phase PWM Inverters

Principle of operation-Voltage control of single phase inverters - sinusoidal PWM – modified PWM – phase displacement Control – Trapezoidal, staircase, stepped, harmonic injection and delta modulation – numerical problems

Three Phase PWM Inverters

Voltage Control of Three-Phase Inverters- Sinusoidal PWM- 60^0 PWM- Third Harmonic PWM- Space Vector Modulation- Comparison of PWM Techniques-current source inverters-Variable dc link inverter - numerical problems

Unit V: Multi level inverters

Introduction, Multilevel Concept, Types of Multilevel Inverters- Diode-Clamped Multilevel Inverter, Principle of Operation, Features of Diode-Clamped Inverter, Improved Diode-Clamped Inverter- Flying-Capacitors Multilevel Inverter- Principle of Operation, Features of Flying-Capacitors Inverter- Cascaded Multilevel Inverter- Principle of Operation- Features of Cascaded Inverter- Switching Device Currents-DC-Link Capacitor Voltage Balancing- Features of Multilevel Inverters- Comparisons of Multilevel Converters

Textbooks

1. Power Electronics-Md.H.Rashid –Pearson Education Third Edition- First Indian Reprint- 2008
2. Power Electronics- Ned Mohan, Tore M.Undelan and William P.Robbins –John Wiley& Sons -2nd Edition.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

POWER ELECTRONIC CONTROL OF DC DRIVES

UNIT – I: Controlled Bridge Rectifier (1-Φ) with DC Motor Load

Separately excited DC motors with rectified single –phase supply – single-phase semi converter and single phase full converter for continuous and discontinuous modes of operation – power and power factor.

UNIT – II : Controlled Bridge Rectifier (3 - Φ) with DC Motor Load

Three phase semi converter and Three phase full converter for continuous and discontinuous modes of operations – power and power factor - Addition of Freewheeling diode – Three phase double converter.

Three phase naturally commutated bridge circuit as a rectifier or as an inverter.

Three phase controlled bridge rectifier with passive load impedance , resistive load and ideal supply – Highly inductive load and ideal supply for load side and supply side quantities, shunt capacitor compensation, three phase controlled bridge rectifier inverter.

UNIT – III: Phase controlled DC Motor drives.

Three phase controlled converter, control circuit, control modeling of three phase converter – Steady state analysis of three phase converter control DC motor drive – Two quadrant, Three phase converter controlled DC motor drive – DC motor and load, converter.

Current and speed controlled DC Motor drives.

Current and speed controllers - Current and speed feedback – Design of controllers – Current and speed controllers – Motor equations – filter in the sped feed back loop speed controller – current reference generator – current controller and flow chart for simulation – Harmonics and associatedproblems – sixth harmonics torque.

UNIT – IV: Chopper controlled DC motor drives.

Principle of operation of the chopper – Four – quadrant chopper circuit – Chopper for inversion – Chopper with other power devices – model of the chopper – input to the chopper – steady state analysis of chopper controlled DC motor drives – rating of the devices – Pulsating torque.

Closed loop operation of DC motor drives.

Speed controlled drive system – current control loop – pulse width modulated current controller –hysterisis current controller – modeling of current controller – design of current controller.

UNIT – V: Simulation of DC motor drives

Dynamic simulations of the speed controlled DC motor drives – Speed feedback speed controller – command current generator – current controller.

Textbooks:

1. Power Electronics circuits, Devices and Applications – MH Rashid – PHI – 1 Edition 1995.
2. Fundamentals of Electric Drives – GK Dubey Narosa Publishers 1995

REFERENCES:

1 Power Electronics and motor control – Shepherd , Hulley, Liang – II Edition Cambridge Univeristy Press.

2. Electronic motor drives modeling Analysis and control – R. Krishnan – I Edition PrenticeHall India.

3. Power Semiconductor drives – SB Dewan and A Straughen -1975.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ADVANCED ELECTRICAL MACHINES

UNIT - I: Permanent Magnet Materials

Types, properties and characteristics of permanent magnets, features of permanent magnet excitation, magnetic circuit model, sintered permanent magnet and bonded permanent magnet materials , effect of temperature, handling of permanent magnets

UNIT - II: Permanent Magnet Brushless Motors

Construction, operating principle & features of permanent magnet brushless(PMBL)motors, various types of PMBL motors, magnetic circuit model, armature reaction ,derivation of emf and torque equation, types of emf generated, performance characteristics ,closed loop control of PMBL motors, sensor less control of PMBL motors, case studies considering applications viz. electric vehicle, marine propulsion & PV fed water ping, advancements in topologies and reviews, applications of PMSG in various energy conversion systems.

UNIT - III: Stepper Motors

Concept of Stepper Motors, types and operating principle of stepper motors, static and dynamic characteristics of stepper motors, stepper motor converters

UNIT - IV: Switched Reluctance Motors:

Construction and operating principle and features of switched reluctance motors(SRM), equivalent circuit, inductance profile, derivation of torque equation and factors affecting torque, performance characteristics, control of SRM, various types of converters, closed loop control of SRM, sensor less control of SRM, case studies considering applications viz. electric vehicle, washing machine

UNIT-V: Synchronous Reluctance Motors

Construction, operating, principle, features, equivalent circuit, vector diagram, control and topological advancements of synchronous reluctance motors, case studies considering Applications viz. electric vehicle, water pumping and etc

Text books:

1. MillerT.J.E., BrushlessPermanentMagnetandReluctanceMotorDrives,ClarendonPress
2. V.V.Athani,“StepperMotors:Fundamentals,ApplicationsandDesign”,NewAgeInternationalPvt.Ltd.

Reference Books:

1. R.Krishnan,Permanent Magnet Synchronou sand Brushless DC Motor Drives ,CRC Press
2. VenkatratnamK.,Special Electric Machines, CRC Press.
3. Recent papers from IEEE transactions and reputed journals

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SCADA AND ENERGY MANAGEMENT SYSTEMS

UNIT-I: General Theory

Purpose and necessity, general structure, data acquisition, transmission and monitoring, general power system hierarchical structure, overview of the methods of data acquisition systems, commonly acquired data, transducers, RTUs, data concentrators, various communication channels, cables, telephone lines, power line carrier, microwaves, fiber- optical channels and satellites.

UNIT-II: Supervisory and Control Functions

Data acquisitions, status indications, measured values, energy values, monitoring alarm and event application processing. Control function: ON/OFF control of lines, transformers, capacitors and applications in process industry, valve, opening, closing etc. Regulatory functions: set points and feed-back loops, time tagged data, disturbance data collection and analysis, calculation and report preparation.

UNIT- III: Man- Machine Communication

Operator consoles and VDUs, displays, operator dialogues, alarm and event loggers, mimic diagrams, report and printing facilities.

UNIT-IV: Data Bases - SCADA, EMS And Network Data Bases

SCADA system structure - local system, communication system and central system, Configuration- non-redundant single processor, redundant dual processor, multi control centers, system configuration. Performance considerations, real time operation system requirements, modularization of software programming languages.

UNIT- V: Energy Management Center

Functions performed at a centralized management center, production control and load management, economic dispatch, distributed centers and power pool management.

Text Books:

1. TorstenCegrell, Power System Control Technology, Prentice Hall International, 1986
2. Stuart A. Boyer, SCADA: Supervisory Control And Data Acquisition, The Instrumentation, Systems and Automation Society, 4th edition, 2009.
3. Krishna Kant, Computer-Based Industrial Control, PHI Learning,2nd edition, 2013

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ARTIFICIAL INTELLIGENCE TECHNIQUES

Unit – I: Introduction to Neural Networks
Introduction, Humans and Computers, Biological Neural Networks, Historical development of neural network, Terminology and Topology, Biological and artificial neuron models, Basic learning laws.

Unit- II: Feed Forward Neural Networks
Introduction, Perceptron models: Discrete, continuous and multi-category, Training algorithms: Discrete and Continuous Perceptron Networks, Perceptron convergence theorem, Limitations and applications of the Perceptron model, Generalized delta learning rule, Feedforward recall and error back propagation training-Radial basis function algorithms-Hope field networks

Unit III: Genetic algorithms & Modelling-introduction-encoding-fitness function-reproduction operators-genetic operators-cross over and mutation-generational cycle-convergence of genetic algorithm

Unit – VI: Classical and Fuzzy Sets

Introduction to classical sets - properties, operations and relations; Fuzzy sets, membership, Uncertainty, operations, properties, fuzzy relations, cardinalities, membership functions.
Fuzzy Logic System Components-Fuzzification, Membership value assignment, development of rule base and decision making system, defuzzification to crisp sets, defuzzification methods.

UNIT V: APPLICATION OF AI TECHNIQUES-load forecasting-load flow studies-economic load dispatch-load frequency control-reactive power control-speed control of dc and ac motors

TEXT BOOK:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication.

2. Introduction to Artificial Neural Systems - Jacek M. Zuarda, Jaico Publishing House, 1997.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BATERY MANAGEMENT SYSTEM FOR ELECTRIC VEHICLES

UNIT-I: Batteries - Specifications and components:
Batteries: Lead Acid Battery, Nickel based batteries, Sodium based batteries, Lithium based batteries – Li-ion & Li-poly, Metal Air Battery, Zine Chloride battery; Ultra capacitors; Flywheel Energy Storage System; Hydraulic Energy Storage System; Comparison of different Energy Storage System. Battery Specifications: Variables to characterize battery operating conditions and Specifications to characterize battery nominal and maximum characteristics; Efficiency of batteries; Electrical parameters Heat generation- Battery design- Performance criteria for Electric vehicles batteries

UNIT-II: Design features of batteries for Electric vehicles:
Selection of battery for EVs & HEVs, Traction Battery Pack design, Requirement of Battery Monitoring, Battery State of Charge Estimation methods, Battery Cell equalization problem, thermal control, protection interface, SOC Estimation, Energy & Power estimation, properties for cell safety and battery design, battery testing, limitations for transport and storage of cells and batteries, Recycling, disposal and second use of batteries. Battery Leakage: gas generation in batteries, leakage path, leakage rates. Ruptures: Mechanical stress and pressure tolerance of cells, safety vents, Explosions: Causes of battery explosions, explosive process, Thermal Runway: High discharge rates, short circuits, charging and discharging. Environment and Human Health impact assessments of batteries,

UNIT-III: Static Modelling of Battery: Static modelling of battery: static model parameters of the battery, lab test to determine the parameters of battery model, static equivalent circuit determination.
Dynamic Modelling of Battery: Dynamic modelling of battery, parameters affecting the dynamic model, lab test to determine the dynamic model parameters, dynamic equivalent circuit determination

UNIT-IV: Battery Management Systems:
Identify electronic components that can provide protection and specify a minimum set of protections needed - Compute stored energy in a battery pack - List the manufacturing steps of different types of lithium-ion cells and possible failure modes. major functions provided by a battery-management system and their purpose - Understand how a battery-management system “measures” current, temperature, and isolation. Battery thermal management system.

UNIT-V: Functions of Battery Management System: Definition, Parts: Power Module, Battery, DC/DC Converter, load, communication channel, Battery Pack Safety, Battery Standards & Tests. Vehicle propulsion factors- Power and energy requirements of batteries- Meeting battery performance criteria- setting new targets for battery performance.

Text books:

1. AK Bandyopadhyay, Nanomaterials, New Age International (P) Ltd., 2 nd Edition, 2010
2. N. Kumar, Concise concepts of nanoscience and nanomaterials, Scientific publishers, 2018
3. L.Plett , Gregory, Battery management systems: Battery Modeling, Artech house, 2015.
4. Gregory L.Plett, Battery management systems: Equivalent circuit methods, Artech house, 2015.

Reference books:

1. Chris Mi, M. AbdulMasrur and David Wenzhong Gao, Hybrid Electric Vehicles-Principles and Applications with practical perspectives, Wiley Publications,1 edition 2011
2. Gianfranco Pistoia, Electric and Hybrid Vehicles power sources, models, sustainability, infrastructure and the market, Elsevier 1 edition 2010.
3. Iqbal Hussain, Electric and Hybrid Vehicles Design Fundamentals, CRC Press2nd edition, 2010.

4. Ibrahim Dinçer, Halil S. Hamut and Nader Javani, Thermal Management of Electric Vehicle Battery Systems, JohnWiley& Sons Ltd., 2016

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DISTRIBUTED GENERATION & MICRO GRIDS

UNIT – I: Need for Distributed Generation

Renewable sources in distributed generation – Current scenario in distributed generation – Planning of DGs – Siting and sizing of DGs – Optimal placement of DG sources in distribution systems.

UNIT – II: Grid integration of DGs

Different types of interfaces – Inverter based DGs and rotating machine-based interfaces – Aggregation of multiple DG units – Energy storage elements – Batteries, ultracapacitors, flywheels.

UNIT – III: Technical impacts of DGs

Transmission systems, Distribution systems, De-regulation – Impact of DGs upon protective relaying – Impact of DGs upon transient and dynamic stability of existing distribution systems.

UNIT-IV: Economic and control aspects of DGs

Market facts, issues and challenges – Limitations of DGs – Voltage control techniques, Reactive power control, Harmonics, Power quality issues – Reliability of DG based systems – Steady state and Dynamic analysis.

UNIT – V: Introduction to micro-grids

Types of micro-grids – Autonomous and non-autonomous grids – Sizing of micro-grids – Modeling& analysis – Micro-grids with multiple DGs – Micro-grids with power electronic interfacing units – Transients in micro-grids – Protection of micro-grids – Case studies.

Text Books:

1. H. Lee Willis, Walter G. Scott , 'Distributed Power Generation – Planning and Evaluation', Marcel Decker Press, 2000.
2. M.GodoySimoes, Felix A.Farret, 'Renewable Energy Systems – Design and Analysis with Induction Generators', CRC press.
3. Nikos Hatziargyriou ,Microgrids: Architectures and Control (Wiley - IEEE),2014.

Reference Books:

1. Z. Ye, R. Walling, N. Miller, P. Du, K. Nelson, 'Facility Microgrids', General Electric Global Research Center, Niskayuna, New York, Subcontract report, May 2005.
2. K.Venkatanagaraju,M. Biswal ,'Microgrid: Operation, Control, Monitoring and Protection' , Monalisa (Eds.),2020

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Pre-Ph.D Syllabus

S. No	Pre-Ph.D Course-2-Subjects
1.	Discrete Control Systems
2.	EHVAC Transmission Systems
3.	Power System Dynamic & Stability
4.	Advanced Power Electronics
5.	Power Electronic Control of AC drives
6.	Unified Theory of Electric Machines
7.	Grid Integration of Renewable Energy Systems
8.	Hybrid Electrical Vehicle Systems
9.	High Voltage DC Transmission
10.	Smart Grid Technologies

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DISCRETE DATA CONTROL SYSTEMS

UNIT – I: Modelling and parameter estimation

Introduction to probability theory, elements of estimation theory, application to parameter estimation for a dynamical model, some methods for the determination of transfer functions.

UNIT – II: Parameter estimation for large scale systems

Hierarchical parameter estimation, the multiple projection approach, recursive algorithm for the minimum variance estimator Aggregation of control systems, problem statement, properties of the aggregated system matrix, determination of the Aggregation matrix; Generation of feedback controls: linear dynamic optimization, bounds on sub optimality, eigen value assignment.

UNIT – III: Model reduction techniques

Model analysis approach, mathematical development, three basic methods, and a general approach. Subspace projection methods, projection error minimization, and derivation of reduced model. Optimal order reduction, problem formulation, conditions of optimality, numerical algorithm, polynomial input functions. A comparative study. Extension to discrete systems, preliminary analysis, two model reduction techniques, output error minimization. Examples.

UNIT-IV: Model simplification using frequency domain techniques

Simplification by continued function expansions: three Cauer forms, a generalized Routh algorithm, simplified models, relationship to aggregation, and extension to discrete models; Approximation methods for simplification: time moment matching, Padetype approximations, Routh-Hurwitz method. Minimal realization algorithms: conditions of reliability, Pade - type realizable models, aggregated model of Routh approximants

UNIT–V: Scale Analysis Block-Diagonalization of Continuous Systems

Problem statement, numerical algorithms, basic properties, relation to model aggregation. Feedback control design: two stage eigen value placements. Decoupling of discrete systems:, state feedback design.

Text Books:

1. Magdi S. Mahmoud and Madan G. Singh – “Large scale systems modeling”, Pergamon press, Oxford.
2. LanLunze – “Feedback control of Large scale systems”, Prentice Hall International, New York.

Reference Books:

1. Magdi S. Mahmoud, Mohamed F. Hassan, Mohamed G. Darwish- “Large scale control systems - Theories and Techniques”, Marcel Dekkar, Inc, New York and Basel.
2. Andrew P. Sage, “Methodology for large-scale systems”, McGraw-Hill, 1977
3. Efficient Modeling and Control of Large-Scale Systems, edited by Javad Mohammad pour, and Karolos M., Springer, 2010.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

EHVAC TRANSMISSION SYSTEMS

Unit I: E.H.V. A.C. Transmission

E.H.V. A.C. Transmission line trends and preliminary aspects standard transmission voltages – power handling capacities and line losses – mechanical aspects.

Unit II: Calculation of Line Resistance and Inductances

Resistance of conductors, temperature rise of conductor and current carrying capacity. Properties of bundled conductors and geometric mean radims of bundle, inductance of two conductor lines and multi – conductor lines, Maxwell's coefficient matrix.

Line capacitance calculation: capacitance of two conductor line, and capacitance of multiconductor lines, potential coefficients for bundled conductor lines, sequence inductances and capacitances and diagonalization.

Unit III: Calculation of Electro Static Field

Calculation of electro static field traveling waves due to corona – Audio noise die to corona, its generation, characteristics and limits measurement of audio noise.

Surface voltage Gradient on conductors, surface gradient on 2 conductor bundle and consine law, Maximum surface voltage gradient of bundle with more than 3 sub conductors, Mangolt formula.

Unit IV: Corona

Corona in EHV lines – corona loss formulate – attenuation of traveling waves due to corona – Audio noise due to corona, its generation, characteristics and limits measurement of audio noise.

Power Frequency voltage control : Problems at power frequency, generalized constants, No load voltage conditions and charging currents, voltage control using synchronous conductor, cascade connection of components : Shunt and series compensation, sub synchronous resonance in series – capacitor compensated lines

Unit V: Static Reactive Compensation Systems

Introduction, SVC schemes, Harmonics injected in to network by TCR, design of filters for suppressing harmonics injected in to the system.

Text Books:

1. Extra High Voltage AC Transmission Engineering – Rakosh Das Begamudre, WileyEastem ltd.,New Delhi – 1987.
2. EHV Transmission line reference book – Edision Electric Institute (GEC) 1986.

REFERENCE BOOKS:

1. HVAC and DC Transmission by S. Rao

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

POWER SYSTEMS DYNAMICS AND STABILTY

UNIT – I: System Dynamics
Synchronous machine model in state space from computer representation for excitation and governor system – modelling of loads and induction machines.

UNIT – II: Steady state stability
Steady state stability limit – Dynamics Stability limit – Dynamic stability analysis – State space representation of synchronous machine connected to infinite bus-time response – Stability by eigen value approach.

UNIT – III: Digital Simulation of Transient Stability
Swing equation machine equations – Representation of loads – Alternate cycle solution method – Direct method of solution – Solution Techniques: Modified Euler method – Runge Kutta method – Concept of multi machine stability.

UNIT – IV: Effects on Stability
Effect of governor action and excite on power system stability effect of saturation, saliency & automatic voltage regulators on stability.

UNIT – V: Excitation Systems
Rotating Self-excited Exciter with direct acting Rheostatic type voltage regulator – Rotating main and Pilot Exciters with Indirect Acting Rheostatic Type Voltage Regulator – Rotating Main Exciter, Rotating Amplifier and Static Voltage Regulator – Static excitation scheme – Brushless excitation system.

Text Books:

1. Power System Stability by Kimbark Vol. I & II, III, Willey.
2. Power System control and stability by Anderson and Fund, IEEE Press.

Reference Books:
1. Power systems stability and control by PRABHA KUNDUR, TMH.
2. Computer Applications to Power Systems–Glenn.W.Stagg& Ahmed. H.El.Abiad, TMH.
3. Computer Applications to Power Systems – M.A.Pai, TMH.
4. Power Systems Analysis & Stability – S.S.Vadhera Khanna Publishers

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ADVANCED POWER ELECTRONICS

UNIT-I: Resonant Converters

Introduction, Basic resonant circuit concepts, Classification -Load resonant converters, Resonant switch converters, zero voltage switching clamped voltage converters, Resonant DC link inverters High frequency link integral half cycle converters, Phase modulated resonant converters, Dual active bridge converters, High gain converters.

UNIT-II: Modeling of DC-DC Converters

Basic ac modeling approach, State space averaging, Circuit averaging and averaged switch modeling, Canonical circuit modeling, Converter transfer functions for buck, boost and buck-boost topologies.

UNIT-III: Current Mode Control

Introduction, types, advantages and disadvantages, Slope compensation, Determination of duty cycle and transfer functions for buck, boost and buck-boost converters.

UNIT-IV: Design of Closed Loop Control

Controller Design: Introduction, mechanism of loop stabilization, Shaping E/A gains vs frequency characteristics, Conditional stability in feed-back loop, Stabilizing a continuous mode forward and fly-back converter, Feedback loop stabilization with current mode control, right plane zero.

UNIT-V: Design of Power Converters Components:

Design of magnetic components - design of transformer, design of inductor and current transformer - Selection of filter capacitors, Selection of ratings for devices, input filter design, Thermal design

Text books:

1. M.H. Rashid: Power Electronics-Circuits, Devices & Applications, Pearson, 4th edition, 2013.
2. N. Mohan, T.M. Undeland, W.P. Robbins: Power Electronics: Converters, Applications & Design, J.Wiley & Sons, 3rd edition, 2003.

References:

1. Abraham I. Pressman, Keith Billings &Taylor Morey: Switching Power Supply Design, McGraw Hill International, 3rd Edition, 2009.
2. R.W. Erickson and Dragan Maksimonic: Fundamentals of Power Electronics, Springer, 2nd Edition, 2001.
3. Umanand, L., Power Electronics: Essentials and Applications, John Wiley India, 1st Edition, 2009.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

POWER ELECTRONIC CONTROL OF A.C. DRIVES

UNIT – I: Introduction to AC Drives.

Introduction to motor drives – Torque production – Equivalent circuit analysis – Speed – Torque Characteristics with variable voltage operation Variable frequency operation constant v/t operation – Variable stator current operation – Induction motor characteristics in constant torque and field weakening regions.

UNIT - II : Control of Induction Motor Drives at Stator Side

Scalar control – Voltage fed inverter control – Open loop volts / Hz control – speed control slip regulation – speed control with torque and flux control – current controlled voltage fed inverter drive – current – fed inverter control – Independent current and frequency control – Speed and flux control in Current –Fed inverter drive – Volts/Hz control of Current –fed inverter drive – Efficiency optimization control by flux program.

UNIT – III: Control of Induction Motor Drive at Rotor Side.

Slip power recovery drives – Static Kramer Drive – Phasor diagram – Torque expression – speed control of a Kramer Drive – Static Scheribus Drive – modes of operation.

Vector control of Induction Motor Drives

Principles of Vector control – Vector control methods – Direct methods of vector control – Indirect methods of vector control – Adaptive control principles – Self tuning regulator Model referencing control.

UNIT – IV: Control of Synchronous motor drives

Synchronous motor and its characteristics – Control strategies – Constant torque angle control –Unity power factor control – Constant mutual flux linkage control.

Controllers

Flux weakening operation – Maximum speed – Direct flux weakening algorithm – Constant Torque mode controller – Flux Weakening controller – indirect flux weakening – Maximum permissible torque – speed control scheme – Implementation strategy speed controller design.

UNIT – V: Variable Reluctance Motor Drive

Variable Reluctance motor drive – Torque production in the variable reluctance motor Drive characteristics and control principles – Current control variable reluctance motor service drive.

Brushless DC Motor Drives

Three phase full wave Brushless dc motor – Sinusoidal type of Brushless dc motor- currentcontrolled Brushless dc motor Servo drive

Text books:

1. Electric Motor Drives Pearson Modeling, Analysis and control – R. Krishnan – Publications –1st edition – 2002.
2. Modern Power Electronics and AC Drives B K Bose – Pearson Publications 1st edition
3. Power Electronics and Control of AC Motors – MD Murthy and FG Turn Bull pergman Press(For Chapters II, III, V) 1st edition

REFERENCES:

1. Power Electronics and AC Drives – BK Bose – Prentice Hall Eagle wood diffs New Jersey(for chapters I, II, IV) - 1st edition
2. Power Electronic circuits Deices and Applications – M H Rashid – PHI – 1995.
3. Fundamentals of Electrical Drives – G. K. Dubey – Narora publications–1995 (for chapter II)
4. Power Electronics and Variable frequency drives – BK Bose – IEEE Press – Standardpublications - 1st edition – 2002.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

UNIFIED THEORY OF ELECTRICAL MACHINES

UNIT - I: Introduction
Introduction to the theory of basic two pole machine applicable to DC machines, 3-ph induction machines and synchronous machine. Kron'sprimitive Machine. Need of modeling, Introduction to modeling of electrical machines, voltage and torque equations

UNIT - II: Concept of Transformation
Change of variables & Machine variables and transform variables for arbitrary reference frames. Application to D.C. machine for steady state and transient analysis, and equation of cross field commutator machine, linear transformation from 3-phase to 2-phase - transformation from rotating axes to stationary axes - power invariance - park's transformation for 3-phase synchronous and induction machines...

UNIT - III: Poly phase Induction Machines& Synchronous Machines

Voltage, torque equations, Equivalent circuit, Steady state analysis, Dynamic performance during sudden changes in load torque and three phase faults at the machine terminals.

Poly phase Synchronous Machine: Voltage and Torque Equations in stator, rotor and air-gap field reference frames. Transformation and Transformed Equations. Parks Transformation Voltage and power equation for salient and non-salient machines, their phasor diagrams, simplified equations of a synchronous machine with two damper coils

UNIT - IV: Dynamic Analysis of Interconnected Machines
Machine Interconnection Matrices. Transformation of Voltage and Torque Equations using Interconnection Matrix. Large Signal Transient Analysis using Transformed Equations.

UNIT-V: Linearized Machine Equations:

Linearization of machine equations. Small displacement stability: Eigen values, Eigen values of typical induction machine and synchronous machine, Transfer Function Formulation.

Text books:

1. P.C. Krause, Analysis of Electric Machinery, Wiley publication.
2. B. Adkins, The General theory of Electrical Machines, Chapman & Hall publication.
3. P.S. Bhimbra, Generalized theory of Electrical machines, Khanna publisher.

Reference Books:

1. B. Adkins & R.G. Harley, The General theory of AC Machines, Springer Natherland
2. Boldia& S.A. Nasar, Electrical Machine Dynamics, The Macmillan Press Ltd.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

GRID INTEGRATION OF RENEWABLE ENERGY SYSTEMS

UNIT-I: Introduction

Various techniques of utilizing power from renewable energy sources, concept of nano / micro / mini grid. Need of integrating large renewable energy sources, issues related to integration of large renewable energy sources, rooftop plants. Concept of VPP.

UNIT-II: Power system equipments for grid integration Synchronous generator synchronization/integration to existing grid, load sharing during parallel operation, stability (swing equation and solution) Induction Generator: working principle, classification, stability due to variable speed and counter measures Power Electronics: need of power electronic equipments in grid integration, converter, inverter, chopper, ac regulator and cyclo converters for AC/DC conversion.

UNIT-III: Power quality and management

THD, voltage sag, voltage swell, frequency change and its effects, network voltage management, frequency management, system protection, grid codes.

UNIT-IV: Grid stabilization

Scheduling and dispatch, Forecasting, reactive power and voltage control, frequency control, operating reserve, storage systems, electric vehicles Ancillary services in Indian Electricity Market (regulatory aspect), CERC and CEA orders (technical and safety standards)

UNIT – V: Integration of alternate sources of energy

Introduction, principles of power injection: converting technologies, power flow; instantaneous active and reactive power control approach; integrating multiple renewable energy sources; DC link integration; AC link integration; HFAC link integration; islanding and interconnection

Text Book:

1. Integration of Alternative sources of Energy, Felix A. Farret and M. Godoy Simoes, IEEE Press – Wiley-Interscience publication, 2006.
2. Grid integration of solar photovoltaic systems, Majid Jamil, M. Rizwan, D.P.Kothari, CRC Press (Taylor & Francis group), 2017
3. Renewable Energy Grid Integration, Marco H. Balderas, Nova Science Publishers, New York, 2009.
4. Wind Power Integration connection and system operational aspects, B. Fox, D. Flynn L. Bryans, N. Jenkins, M. O' Malley, R. Watson and D. Milborrow, IET Power and Energy Series 50 (IET digital library), 2007

Reference Books:

1. Power Generation, Operation, and Control, Allen J. Wood, Bruce F. Wollenberg, Gerald B. Sheblé, John Wiley & Sons, New York, 2013 (3rd edition)
2. Power Electronics: Circuits, Devices, and Applications. M.H.Rashid, Pearson Education India, 2013
3. Advanced power system analysis and dynamics, L.P.Singh, New age international publishers, 2017

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

HYBRID ELECTRIC VEHICLE SYSTEMS

UNIT-I: Introduction to Hybrid Electric Vehicles

Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, and mathematical models to describe vehicle performance. History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

UNIT-II: Hybrid Electric Drive-trains

Basic concept of electric traction, introduction tovarious electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis. Basic concept of hybrid traction, Introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNIT-III: Electric Propulsion unit

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives,Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT-IV: Energy Storage

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storageand its analysis, Hybridization of different energy storage devices.

UNIT-V: Energy Management Strategies

Introduction to energy management strategies used inhybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies. Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

TEXT BOOKS:

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.
2. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric andFuel Cell Vehicles: Fundamentals, Theory and Design,CRC Press, 2004.
3. Ali Emadi,Advanced Electric Drive Vehicles, ,CRC Press, 2017

REFERENCE BOOKS:

1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.
2. Sheldon S. Williamson, Energy Management Strategies for Electric and Plug-in Hybrid ElectricVehicles, Springer, 2013.
3. http://nptel.ac.in/syllabus/108103009

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

HIGH VOLTAGE DC TRANSMISSION

Unit I:

Comparison of DC transmission and AC Transmission. Application of DC transmission, Description of DC transmission systems, planning for HVDC transmission, Modern trends in DC transmission.

Unit II:

Static Power Conversion Basic conversion principle, pulse number, analysis of GRAETZ circuit with and without overlap, equivalent circuit, inverter equations, PowerFactor and reactive power, 12 pulse converter unit.

Unit III:

Basic philosophy, constant current Vs constant voltage, desired features of control, actual control characteristics, individual characteristics of rectifier and inverter, combined characteristics of rectifier and inverter, constant-minimum-ignition-angle control, constant current control, constant-extinction-angle control, individual phase-control, equidistant firing control, voltage dependent current order limit (VDCOL), basic philosophy of system control, direction of DC power flow, reversal of power flow, starting and stopping of DC link.

Unit IV:

DC system model for load flow studies. Load flow study of Ac Dc system sequentialmethod, simultaneous method.

Reactive power requirements in steady state, conventional control strategies, alternatecontrol strategies equipment for reactive power.

short circuit ratio, Effective short circuit ratio, dynamic over voltages, DC power modulation, commutation failure, disturbances on AC side, disturbances on DC side.

Unit V

Characteristic harmonics, derivation of relevant equations for 12 pulse converter. AC filters, single tuned, doubled tuned filters. Brief introduction to DC circuit breakers,multi terminal DC transmission.

Text books:

1. Direct current transmission by E.W. Kimbark. Wiley Interscience 1971.
2. HVDC Transmission by K.R. Padiyar.
3. High voltage Direct current transmission by J. Arrillaga IEE controlengineering series 2000

REFERENCE BOOKS:

1. HVAC and DC Transmission by S. Rao

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SMART GRID TECHNOLOGIES

UNIT - I: Introduction to Smart Grid & Evolving it to a Perfect Power System:

Introduction: Introduction to smart grid- Electricity network-Local energy networks- Electric transportation-Low carbon central generation-Attributes of the smart grid- Alternate views of a smart grid.

Smart Grid to Evolve a Perfect Power System: Introduction- Overview of the perfect power system configurations- Device level power system- Building integrated power systems- Distributed power systems-Fully integrated power system-Nodes of innovation.

UNIT - II: DC Distribution and Smart Grid

AC vs DC sources-Benefits of and drives of DC power delivery systems-Powering equipment and appliances with DC-Data centers and information technology loads-Future neighborhood-Potential future work and research.

Intelligrid Architecture for the Smart grid: Introduction-Launching intelligrid - Intelligrid today- Smart grid vision based on the intelligrid architecture-Barriers and enabling technologies. SCADA, synchrophasors (WAMS)

UNIT – III: Dynamic Energy Systems Concept

Smart energy efficient end use devices-Smart distributed energy resources-Advanced whole building control systems- Integrated communications architecture-Energy management-Role of technology in demand response-Current limitations to dynamic energy management-

Distributed energy resources-Overview of a dynamic energy management-Key characteristics of smart devices-Key characteristics of advanced whole building control systems-Key characteristics of dynamic energy management system.

UNIT - IV: Energy Port as a Part of The Smart Grid & Market Implementation

Energy Port As Part Of The Smart Grid: Concept of energy -Port, generic features of the energy port. Policies and Programs to Encourage End – Use Energy Efficiency: Policies and programs in action -multinational - national-state-city and corporate levels.

Market Implementation: Framework-factors influencing customer acceptance and response - program planning-monitoring and evaluation.

UNIT - V: Efficient Electric End – Use Technology Alternatives

Existing technologies – lighting - Space conditioning - Indoor air quality - Domestic water heating - hyper efficient appliances - Ductless residential heat pumps and air conditioners - Variable refrigerant flow air conditioning-Heat pump water heating - Hyper efficient residential appliances - Data center energy efficiency-LED street and area lighting - Industrial motors and drives - Equipment retrofit and replacement - Process heating - Cogeneration, Thermal energy storage - Industrial energy management programs - Manufacturing process-Electro-technologies, Residential, Commercial and industrial sectors.

Text Books:

1. The Smart Grid, Enabling Energy Efficiency and Demand Side Response, Clark W Gellings, CRC Press,2009
2. Smart Grids, Jean Claude Sabonnadiere, Nouredine Hadjsaid, Wiley-ISTE, IEEE Press, May 2012.
3. SMART GRID Fundamentals of Design and Analysis, James Momoh, IEEE press, A John Wiley & Sons, Inc.,Publication.

Reference Books:

1. Smart Grid: Technology and Applications, Janaka Ekanayake, Kithsiri Liyanage, Jianzhong. Wu, Akihiko Yokoyama, Nick Jenkins, Wiley,2012.
2. Smart Grid: Fundamentals of Design and Analysis, James Momoh, Wiley, IEEE Press, 2012.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM

Syllabus for Pre-Ph.D. Examination

Mechanical Engineering

PAPER–I		Subject Code
S. No	**Subject**	
1	Signal Analysis and Condition Monitoring	**1303105**
2	Fuels, combustion & Environmental Pollution Control	**1303108**
3	Thermal Systems Simulation & Design	**1303112**
4	Combustion & Emission in Engines	**1303113**
5	Computational Fluid Dynamics	**1303114**
6	Advanced Optimization Techniques	**1303115**
7	Theory of Metal Cutting &Tool Design	**1303116**
8	Metal Forming Processes	**1303117**
9	Rapid Prototyping &Tooling	**1303118**
10	Non-Destructive Evaluation	**1303119**
11	Quality Engineering and Manufacturing	**1303120**
12	Mechanics and Manufacturing Methods of Composites	**1303121**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM

Syllabus for Pre-Ph.D. Examination

Mechanical Engineering

PAPER–II		SubjectCode
S.No	**Subject**	
1	CAD Theory & Practice	**1303201**
2	Advanced Mechanical Vibrations	**1303203**
3	Simulation and Modeling	**1303204**
4	Electric & Hybrid Vehicles	**1303208**
5	IC Engines & Alternative Fuels	**1303211**
6	Thermal &Nuclear Power Plants	**1303212**
7	Intelligent Manufacturing Systems	**1303215**
8	Logistics & Supply Chain Management	**1303216**
9	Advances in Manufacturing Technology	**1303217**
10	Production & Operations Management	**1303218**
11	Materials Technology	**1303220**
12	Statistical Quality Control	**1303221**

PAPER – I

SIGNAL ANALYSIS AND CONDITION MONITORING

UNIT-I

Introduction: Basic concepts. Fourier analysis. Bandwidth. Signal types. Convolution. Signal analysis: Filter response time. Detectors. Recorders. Analog analyzer types.

UNIT-II

Practical analysis of stationary signals: Stepped filter analysis. Swept filter analysis. High speed analysis. Real-time analysis.

UNIT-III

Practical analysis of continuous non-stationary signals: Choice of window type. Choice of window length. Choice of incremental step. Practical details. Scaling of the results.

UNIT-IV

Practical analysis of transients: Analysis as a periodic signal. Analysis by repeated playback (constant bandwidth). Analysis by repeated playback (variable bandwidth).

UNIT-V

Condition monitoring in real systems: Diagnostic tools. Condition monitoring of two stage compressor. Cement mill foundation. I.D. fan. Sugar centrifugal. Cooling tower fan. Air separator. Preheater fan. Field balancing of rotors. ISO standards on vibrations.

Suggested Assignment:

To refer ASME Series of Journal of Tribology for giving a seminar on any current topic of relevance.

TEXT BOOK:

1. Condition Monitoring of Mechanical Systems by Kolacat

REFERENCES:

1. Frequency Analysis by R.B.Randall. Bruel Kjaer, 3rd Ed. 1987
2. Mechanical Vibrations Practice with Basic Theory by V. Ramamurti, Narosa Publishing House.

FUELS, COMBUSTION AND ENVIRONMENTAL POLLUTION CONTROL

UNIT I

Fuels:- Detailed classification-Conventional and unconventional, solid, liquid, gaseous fuels – Coal-carbonization, Gasification and liquefaction – Lignite; Petroleum based fuels- problems associated with low calorific value gases. Coal gas, Blast furnace gas, Alcohols, Biogas and Nuclear fuels.

UNIT II

Principles of Combustion:- Chemical kinetics – Adiabatic flame temperature – Laminar and turbulent flame propagation and structure – Flame stability – Combustion of fuel droplets and sprays – Combustion systems – pulverized fuel furnaces – Fixed, entrained and fluidized bed systems.

UNIT III

Environmental considerations:- Air pollution – Effects on environment, human health, etc., Principal pollutants – Legislative measures – Methods of emission control. Environmental segments, Natural cycles of environment, Atmospheric structure, Green house effect, Ozone hole, Effect of pollution on living systems, Minimum national standards.

UNIT IV

AIR POLLUTION -Sources and classification of pollutants, Effect of air pollution, Pollution from industries, Chemical reactions in a contaminated atmosphere, urban air pollution, Acid rain, Photo chemical smog, Meteorological aspects of air pollution. Air pollution sampling and measurement, Air pollution control methods and equipment.

UNIT V

WATER POLLUTION AND CONTROL - Origin of waste water, Types of water pollutants and their effects ,Water pollution laws and standards Waste water sampling and analysis , Treatment of waste water.

SOLID WASTE MANAGEMENT - Sources and classification, Public health aspects, methods of collection, Disposal methods, Potential methods of disposal.

NOISE POLLUTION - Human acoustics, Sound and its general features, Noise and its measurement, Noise pollution hazards & Controlling methods.

Suggested Assignment:

To refer Elsevier Publishers International Journal of Environmental Pollution, Inder Science Publishers International Journal of Environment and Pollution for giving a seminar on any current topic of relevance.

TEXTBOOKS:

1. Combustion Fundamentals by Roger A. Strehlow – Mc.Graw Hill
2. Fuels and Combustion by Sharma and Chander Mohan – Tata Mc.Graw Hill.
3. Combustion Engineering and fuel Technology by Shaha A.K. – Oxford and IBH.
4. Principles of Combustion by Kenneth K. Kou – wiley & Sons.
5. Pollution control in process industries - S.P. Mahajan/Tata Mc Graw Hill
6. Environmental pollution control engineering - C.S.Rao/New age Int. Pvt.Ltd
7. Air pollution - M.N.Rao and M.V.N.Rao /Tata Mc Graw Hill
8. Energy Technology - S.Rao and B.B.Parulekar /Khanna publishers

THERMAL SYSTEMS SIMULATION AND DESIGN

AIM: To provide review and use knowledge from thermodynamics, heat transfer and fluid mechanics, modeling and simulation techniques for thermal system component analysis and their synthesis in integral engineering systems and processes

OBJECTIVES:
To learn basic principles underlying piping, pumping, heat exchangers; modeling and optimization in design of thermal systems. To develop representational modes of real processes and systems. To optimization concerning design of thermal systems.

UNIT I
DESIGN CONCEPTS
Design Principles , Workable Systems , Optimal Systems , Matching of System Components , Economic Analysis , Depreciation , Gradient Present Worth factor.

UNIT II
MATHEMATICAL MODELLING
Equation Fitting , Nomography , Empirical Equation , Regression Analysis , Different Modes of Mathematical Models , Selectio n, Computer Programmes for Models.
UNIT III
MODELLING THERMAL EQUIPMENTS
Modelling Heat Exchangers , Evaporators , Condensers , Absorption and Rectification Columns, Compressors, Pumps, Simulation Studies, Information Flow Diagram , Solution Procedures.

UNIT IV
OPTIMIZATION
Objective Function Formulation , Constraint Equations , Mathematical Formulation , Calculus Method , Dynamic Programming , Search Methods , ANN and Genetic Algorithm.
UNIT V
DYNAMIC BEHAVIOUR
Steady state Simulation , Laplace Transformation , Feedback Control Loops , Stability Analysis , Non-Linearities.

Suggested Assignment:
To refer ASME Series of Journal of Heat Transfer, Elsevier Publishers Journal of Applied Thermal Engineering, AIAA Transactions of Journal of Energy for giving a seminar on any current topic of relevance.
TEXT BOOKS:
1. Stoecker W. F., Design of Thermal Systems , McGraw Hill Edition , 1989.
2. Bejan A., George Tsatsaronis , Michael J. Moran , Thermal Design and Optimization , Wiley , 1996.
REFERENCES:
1. Kaput J. N., Mathematical Modelling , Wiley Eastern Ltd , New York , 1989.
2. Yogesh Jaluria , Design and Optimization of Thermal Systems , CRC Press , 2007.
3. Rao S. S., Engineering Optimization Theory and Practice , New Age Publishers ,

COMBUSTION AND EMISSION IN ENGINES

AIM

To Demonstrate extensive mastery of the fundamental principles which govern the design and operation of internal combustion engines as well as a sound technical framework for understanding real world problems.

OBJECTIVE :

(i) Understand combustion in spark ignition and diesel engines.

(ii) To identify the nature and extent of the problem of pollutant formation and control in internal combustion engines government legislation.

UNIT I

COMBUSTION PRINCIPLES

Combustion – Combustion equations, heat of combustion - Theoretical flame temperature - chemical equilibrium and dissociation - Theories of Combustion - Pre-flame reactions - Reaction rates - Laminar and Turbulent Flame Propagation in Engines.

UNIT II

COMBUSTION IN S.I. ENGINE

Initiation of combustion, stages of combustion, normal and abnormal combustion, knocking combustion, pre-ignition, knock and engine variables, features and design consideration of combustion chambers. Flame structure and speed, Cycle by cycle variations, Lean burn combustion, stratified charge combustion systems. Heat release correlations. After treatment devices for SI engines.

UNIT III

COMBUSTION IN C.I. ENGINE

Stages of combustion, vaporization of fuel droplets and spray formation, air motion, swirl measurement, knock and engine variables, features and design considerations of combustion chambers, delay period correlations, heat release correlations, Influence of the injection system on combustion. Direct and indirect injection systems. Afer treatment devices for diesel enignes.

UNIT IV

COMBUSTION IN GAS TURBINES

Flame stability, re-circulation zone and requirements - Combustion chamber configuration, materials.

UNIT V

EMISSIONS

Main pollutants in engines, Kinetics of NO formation, NOx formation in SI and CI engines. Unburned hydrocarbons, sources, formation in SI and CI engines, Soot formation and oxidation, Particulates in diesel engines, Emission control measures for SI and CI engines, Effect of emissions on Environment and human beings.

Suggested Assignment:

To refer SAE Transactions International Journal of Engines, International Journal of Fuels and Lubrications for giving a seminar on any current topic of relevance.

TEXT BOOKS :

1. Ramalingam, K.K., Internal Combustion Engines, Scitech Publications (India) Pvt. Ltd., 2004.
2. Ganesan, V, Internal Combustion Engines, Tata McGraw Hill Book Co., 2003.
3. John B.Heywood, Internal Combustion Engine Fundamentals,McGraw Hill Book, 1998

REFERENCES :

1. Mathur,M.L., and Sharma,R.P., A Course in Internal Combustion Engines, Dhanpat Rai Publications Pvt. New Delhi-2, 1993.
2. Obert,E.F., Internal Combustion Engine and Air Pollution, International Text Book Publishers, 1983.
3. Cohen,H, Rogers,G,E.C, and Saravanamuttoo, H.I.H., Gas Turbine Theory, Longman Group Ltd., 1980.

COMPUTATIONAL FLUID DYNAMICS

UNIT I

Introduction: Basic tools of CFD, Numerical Vs experimental tools. ; Mathematical Behavior of PDEs: Parabolic, Hyperbolic and Elliptic PDEs.

UNIT II

Methodology of CFDHT: Discrete representation of flow and heat transfer domain: Grid generation, Governing equations and boundary conditions based on FVM/FDM, Solution of resulting set of linear algebraic equations, Graphical representation and analysis of qualitative results, Error analysis in discretization using FVM/FDM.

UNIT III

Solution of 1-D/2-D steady/unsteady: Diffusion problems, Convection problems, Convection-diffusion problems, source term linearization. ; Explicit and Implicit Approach: Explicit and implicit formulation of unsteady problems,

UNIT IV

Stability analysis. ; Solution of Navier-Stokes Equations for Incompressible Flows: Staggered and collocated grid system, SIMPLE and SIMPLER algorithms. ;

UNIT V

Special Topics in CFDHT: Numerical Methodology for Complex Geometry, Multi-block structured grid system, Solution of phase change Problems.

Suggested Assignment:

To refer ASME Series of Journal of Fluids Engineering for giving a seminar on any current topic of relevance.

TEXT BOOK:

1. S.V. Patankar, Numerical Heat Transfer and Fluid Flow, Taylor and Francis, ISBN-10: 0891165223.

REFERENCES:

1. H. K. Versteeg and W. Malalasekra, Introduction to Computational Fluid Dynamics: The Finite Volume Method, Prentice Hall (2nd Edition), ISBN-10: 0131274988.
2. Jr. D. A. Anderson, Computational Fluid Mechanics and Heat Transfer by McGraw-Hill Education
3. M. N. Ozisik, Finite Difference Method, CRC (1st Edition).

ADVANCED OPTIMIZATION TECHNIQUES

UNIT I

Linear programming: Two-phase simplex method, Big-M method, duality, interpretation, applications.

Assignment problem: Hungarian's algorithm, Degeneracy, applications, unbalanced problems, traveling salesman problem.

UNIT II

Classical optimization techniques: Single variable optimization with and without constraints, multi – variable optimization without constraints, multi – variable optimization with constraints – method of Lagrange multipliers, Kuhn-Tucker conditions.

Numerical methods for optimization: Nelder Mead's Simplex search method, Gradient of a function, Steepest descent method, Newton's method, types of penalty methods for handling constraints.

UNIT III

Genetic algorithm (GA) : Differences and similarities between conventional and evolutionary algorithms, working principle, reproduction, crossover, mutation, termination criteria, different reproduction and crossover operators, GA for constrained optimization, draw backs of GA,

UNIT IV

Genetic Programming (GP): Principles of genetic programming, terminal sets, functional sets, differences between GA & GP, random population generation, solving differential equations using GP.

Multi-Objective GA: Pareto's analysis, Non-dominated front, multi – objective GA, Non-dominated sorted GA, convergence criterion, applications of multi-objective problems .

UNIT V

Applications of Optimization in Design and Manufacturing systems: Some typical applications like optimization of path synthesis of a four-bar mechanism, minimization of weight of a cantilever beam, optimization of springs and gears, general optimization model of a machining process, optimization of arc welding parameters, and general procedure in optimizing machining operations sequence.

Suggested Assignment:

To refer ASME Series of Journal of Engineering Materials and Technology, Journal of Mechanical Design, Elsevier Publishers Finite Elements in Analysis and Design, Simulation modeling Practice and Theory for giving a seminar on any current topic of relevance.

TEXT BOOKS:

1. Optimal design – Jasbir Arora, Mc Graw Hill (International) Publishers
2. Optimization for Engineering Design – Kalyanmoy Deb, PHI Publishers
3. Engineering Optimization – S.S.Rao, New Age Publishers

REFERENCES:

1.Genetic algorithms in Search, Optimization, and Machine learning – D.E.Goldberg, Addison-Wesley Publishers
2. Genetic Programming- Koza
3. Multi objective Genetic algorithms - Kalyanmoy Deb, PHI Publishers

THEORY OF METAL CUTTING AND TOOL DESIGN

UNIT I

Mechanics of Metal Cutting: Geometry of Metal Cutting Process, Chip formation, Chip Thickness ratio, radius of chip curvature, cutting speed, feed and depth of cut - Types of Chips, Chip breakers.

Orthogonal and Oblique cutting processes-definition, Forces and energy calculations (Merchant's Analysis).- Power consumed – MRR – Effect of Cutting variables on Forces, Force measurement using Dynamometers.

UNIT II

Single Point Cutting Tool: Various systems of specifications, single point cutting tool geometry and their inter-relation. Theories of formation of built-up edge and their effect, design of single point contact tools throwaway inserts.

UNIT III

Multipoint Cutting Tools: Drill geometry, design of drills, Rake & Relief angles of twist drill, speed, feed and depth of cut, machining time, forces, milling cutters, cutting speed & feed – machining time – design - from cutters.

Grinding: Specifications of grinding of grinding wheel, mechanics of grinding, Effect of Grinding conditions on wheel wear and grinding ratio. Depth of cut, speed, machining time, temperature, power.

UNIT IV

Tool Life and Tool Wear: Theories of tool wear-adhesion, abrasive and diffusion wear mechanisms, forms of wear, Tool life criteria and machinability index.

Types of sliding contact, real area of contact, laws of friction and nature of frictional force in metal cutting. Effect of Tool angle, Economics, cost analysis, mean co-efficient of friction.

UNIT V

Cutting Temperature: Sources of heat in metal cutting, influence of metal conditions. Temperature distribution, zones, experimental techniques, analytical approach. Use of tool work thermocouple for determination of temperature. Temperature distribution in Metal Cutting

Suggested Assignment:

To refer ASME Series of Journal of Manufacturing Science and Engineering, Springer Publishers International Journal of Advanced Manufacturing Technology for giving a seminar on any current topic of relevance.

REFERENCES:

1. Metal Cutting Principles - M C Shaw / Oxford and IBH Publications, New Delhi
2. Fundamentals of Machining - Boothryd / Edward Amold publishers Ltd.
3. Metal cutting theory and cutting tool design -V. Arshinov and G. Alekseev / Mir Publishers, Moscow
4. Fundamentals of Metal cutting and Machine tools -B.L.Juneja, G. S. Sekhom and Nitin Seth / New Age International publishers

METAL FORMING PROCESSES

UNIT I

Fundamentals of Metal Forming: Classification of forming processes, mechanism of metal forming, temperature of metal working, hot working, cold working, friction and lubricants. Rolling of metals: Rolling processes, forces and geometrical relationship in rolling, simplified analysis, rolling load, rolling variables, theories of cold and hot rolling, problems and defects in rolling, torque and power calculations.

UNIT II

Forging: Classification of forging processes, forging of plate, forging of circular discs, open die and closed-die forging, forging defects, and powder metallurgy forging. Extrusion: Classification, Hot Extrusion, Analysis of Extrusion process, defects in extrusion, extrusion of tubes, production of seamless pipes.

UNIT III

Drawing: Drawing of tubes, rods, and wires: Wire drawing dies, tube drawing process, analysis of wire, deep drawing and tube drawing. Sheet Metal forming: Forming methods, Bending, stretch forming, spinning and Advanced techniques of Sheet Metal Forming, Forming limit criteria, defect in formed parts.

UNIT IV

Advanced Metal forming processes: HERF, Electromagnetic forming, residual stresses, in process heat treatment, computer applications in metal forming. Press tool design: Design of various press tools and dies like piercing dies, blanking dies, compound dies and progressive blanking dies, design of bending, forming and drawing dies.

UNIT V

Jigs and Fixture design: Principles of location, six-point location principle, clamping elements and methods.

Suggested Assignment:

To refer ASME Series of Journal of Manufacturing Science and Engineering, Springer Publishers International Journal of Advanced Manufacturing Technology SAE Transactions International Journal of Materials and Manufacturing for giving a seminar on any current topic of relevance

REFERENCE BOOKS:

1. Mechanical Metallurgy / G.E. Dieter / Tata McGraw Hill
2. Principles of Metal Working / Sunder Kumar
3. Jig and Fixture Design – Edward G. Hoffman, Thomson
4. Principles of Metal Working processes / G.W. Rowe
5. ASM Metal Forming Hand book.

RAPID PROTOTYPING AND TOOLING

UNIT I
INTRODUCTION
Need - Development of RP systems – RP process chain - Impact of Rapid Prototyping and Tooling on Product Development – Benefits- Applications – Digital prototyping - Virtual prototyping.

UNIT II
LIQUID BASED AND SOLID BASED RAPID PROTOTYPING SYSTEMS
Stereolithography Apparatus, Fused deposition Modeling, Laminated object manufacturing, Three dimensional printing: Working Principles, details of processes, products, materials, advantages, limitations and applications - Case studies.

UNIT III
POWDER BASED RAPID PROTOTYPING SYSTEMS
Selective Laser Sintering, Direct Metal Laser Sintering, Three Dimensional Printing, Laser Engineered Net Shaping, Selective Laser Melting, Electron Beam Melting: Processes, materials, products, advantages, applications and limitations – Case Studies.

UNIT IV
REVERSE ENGINEERING AND CAD MODELING
Basic concept- Digitization techniques – Model Reconstruction – Data Processing for Rapid Prototyping: CAD model preparation, Data Requirements – geometric modeling techniques: Wire frame, surface and solid modeling – data formats - Data interfacing, Part orientation and support generation, Support structure design, Model Slicing and contour data organization, direct and adaptive slicing, Tool path generation.

UNIT V
RAPID TOOLING
Classification: Soft tooling, Production tooling, Bridge tooling; direct and indirect – Fabrication processes, Applications. Case studies - automotive, aerospace and electronic industries.

Suggested Assignment:
To refer ASME Series of Journal of Manufacturing Science and Engineering, Springer Publishers International Journal of Advanced Manufacturing Technology SAE Transactions International Journal of Materials and Manufacturing for giving a seminar on any current topic of relevance

TEXT BOOKS:
1. Rapid prototyping: Principles and applications, second edition, Chua C.K., Leong K.F., and Lim C.S., World Scientific Publishers, 2003.
2. Rapid Tooling: Technologies and Industrial Applications, Peter D.Hilton, Hilton/Jacobs, Paul F.Jacobs, CRC press, 2000.

REFERENCES:
1. Rapid prototyping, Andreas Gebhardt, Hanser Gardener Publications, 2003.
2. Rapid Prototyping and Engineering applications : A tool box for prototype development, Liou W.Liou, Frank W.Liou, CRC Press, 2007.
3. Rapid Prototyping: Theory and practice, Ali K. Kamrani, Emad Abouel Nasr, Springer, 2006

NON - DESTRUCTIVE EVALUATION

UNIT I

Ultra Sonic Hardness Testing: Flaw Detection Using Dye Penetrants. MagneticParticle Inspection introduction to electrical impedance, Principles of Eddy Current testing, Flaw detection using eddy currents.

Introduction to X-Ray Radiography: The Radiographic process, X-Ray and Gamma-ray sources, Geometric Principles, Factors Governing Exposure, Radio graphic screens, Scattered radiation, Arithmetic of exposure, Radiographic image quality and detail visibility, Industrial X-Ray films,

UNIT II

X-Ray Radiography processes: Fundamentals of processing techniques, Process control, The processing Room, Special Processing techniques, Paper Radiography, Sensitometric characteristics of x-ray films, Film graininess signal to noise ratio in radiographs, The photographic latent image, Radiation Protection,

UNIT III

Introduction to Ultrasonic Testing: Generation of ultrasonic waves, Horizontal and shear waves, Near field and far field acoustic wave description, Ultrasonic probes straight beam, direct contact type, Angle beam, Transmission/reflection type, and delay line transducers, acoustic coupling and media,

UNIT IV

Ultrasonic tests: Transmission and pulse echo methods, A-scan, B-scan, C-scan,F-scan and P-scan modes, Flaw sizing in ultrasonic inspection: AVG, Amplitude, Transmission, TOFD, Satellite pulse, Multi-modal transducer, Zonal method using focused beam. Flow location methods, Signal processing in Ultrasonic NDT; Mimics, spurious echos and noise. Ultrasonic flaw evaluation.

UNIT V

Holography: Principles and practices of Optical holography, acoustical, microwave, x-ray and electron beam holography techniques.

Applications - I: NDT in flaw analysis of Pressure vessels, piping

Applications - II: NDT in Castings, Welded constructions, etc., Case studies.

Suggested Assignment:

To refer ASTM Series of Journal of Testing and Evaluation for giving a seminar on any current topic of relevance.

TEXT BOOKS:

1. Ultrasonic testing by Krautkramer and Krautkramer
2. Ultrasonic inspection & Training for NDT : E. A. Gingel, Prometheus Press,
3. ASTM Standards, Vol 3.01, Metals and alloys

QUALITY ENGINEERING AND MANUFACTURING

UNIT-I

Quality value and Engineering: An overall quality system, quality engineering in production design, quality engineering in design production processes.

Loss function and quality level: Derivation and use of quadratile loss function, economic consequences of tightening tolerances as a means to improve quality, evaluations and types tolerances (N-type-, S-type and L-type)

UNIT-II

Tolerance Design and Tolerancing: Functional limits, tolerance design for N-type, L-type and S-type characteristics, tolerance allocation for multiple components.

Parameter and tolerance design: Introduction to parameter design, signal to noise ratios, parameter design strategy, Introduction to tolerance design, tolerance design using the loss function, identification of tolerance design factors.

UNIT-III

Design of Experiments: Introduction, Task aids and Responsibilites for DOE process steps, DOE process steps description.

Analysis of variance (ANOVA): no-WAY anova, One-way ANOVA, two-way ANOVA, Critique of F-test, ANOVA for four level factors, multiple level factors.

UNIT-IV

Orthogonal Arrays: Typical test strategies, better test strategies, efficient test strategies, conducting and analyzing an experiment.

UNIT-V

Interpolation of experimental results: Interpretation methods, percent contribution, estimating the mean.

ISO-9000 Quality system, BDRE,6-sigma, bench marking, quality circles-brain storming fishbone diagram-problem analysis.

Suggested Assignment:

To refer ASME Series of Journal of Manufacturing Science and Engineering, Springer Publishers International Journal of Advanced Manufacturing Technology SAE Transactions International Journal of Materials and Manufacturing for giving a seminar on any current topic of relevance

REFERENCE BOOKS:

1. Taguchi techniques for quality engineering/Philip J.Ross / McGraw Hill Intl. 2nd Edition.
2. Quality Engineering in Production systems/G.Taguchi, A.Elasayed et al/Mc.Graw Hill Intl. Edition.
3. Taguchi methods explained: Practical steps to Robust Design/Papan P.Bagchi/Prentice Hall Ind. Pvt. Ltd. New Delhi.

MECHANICS AND MANUFACTURING METHODS OF COMPOSITES

UNIT I

Basic concepts and characteristics: Geometric and Physical definitions, natural and man-made composites, Aerospace and structural applications, types and classification of composites.

Reinforcements: Fibres- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and born carbide fibres. Particulate composites, Polymer composites, Thermoplastics, Thermosetts, Metal matrix and ceramic composites.

UNIT II

Micromechanics: Unidirectional composites, constituent materials and properties, elastic properties of a lamina, properties of typical composite materials, laminate characteristics and configurations. Characterization of composite properties.

UNIT III

Coordinate transformations: Hooke's law for different types of materials, Hooke's law for two dimensional unidirectional lamina, Transformation of stress and strain, Numerical examples of stress strain transformation, Graphic interpretation of stress – strain relations. Off - axis, stiffness modulus, off - axis compliance.

UNIT IV

Elastic behavior of unidirectional composites: Elastic constants of lamina, relationship between engineering constants and reduced stiffness and compliances, analysis of laminated composites, constitutive relations.

Strength of unidirectional lamina: Micro mechanics of failure, Failure mechanisms, Strength of an orthotropic lamina, Strength of a lamina under tension and shear maximum stress and strain criteria, application to design. The failure envelope, first ply failure, free-edge effects. Micro mechanical predictions of elastic constants.

UNIT V

Analysis of laminated composite plates

Introduction, thin plate theory, specially orthotropic plate, cross and angle ply laminated plates, problems using thin plate theory.

Manufacturing methods: Autoclave, tape production, moulding methods, filament winding, man layup, pultrusion, RTM.

Suggested Assignment:

To refer ASTM Series of Journal of Composites, Technology and Research and ASTM e-news for giving a seminar on any current topic of relevance.

TEXT BOOKS:

1. R. M. Jones, Mechanics of Composite Materials, Mc Graw Hill Company, New York, 1975.
2. Engineering Mechanics of Composite Materials by Isaac and M.Daniel, Oxford University Press, 1994.

REFERENCES:

1. B. D. Agarwal and L. J. Broutman, Analysis and performance of fibre Composites, Wiley-Interscience, New York, 1980.
2. L. R. Calcote, Analysis of Laminated Composite Structures, Van Nostrand Rainfold, New York, 1969.

PAPER II

CAD THEORY AND PRACTICE

UNIT I

CAD TOOLS:

Definition of CAD Tools, Types of system, CAD/CAM system evaluation criteria, brief treatment of input and output devices. Graphics standard, functional areas of CAD, Modeling and viewing, software documentation, efficient use of CAD software.

GEOMETRIC MODELLING:

Types of mathematical representation of curves, wire frame models wire frame entities parametric representation of synthetic curves her mite cubic splines Bezier curves B-splines rational curves

UNIT II

SURFACE MODELING :

Mathematical representation surfaces, Surface model, Surface entities surface representation, Parametric representation of surfaces, plane surface, rule surface, surface of revolution, Tabulated Cylinder.

PARAMETRIC REPRESENTATION OF SYNTHETIC SURFACES –

Hermite Bi-cubic surface, Bezier surface, B- Spline surface, COONs surface, Blending surface , Sculptured surface, Surface manipulation – Displaying, Segmentation, Trimming, Intersection, Transformations (both 2D and 3D).

UNIT III

GEOMETRIC MODELLING-3D:

Solid modeling, Solid Representation, Boundary Representation (B-rep), Constructive Solid Geometry (CSG).

CAD/CAM data Exchange: Evaluation of data – exchange format, IGES data representations and structure, STEP Architecture, implementation, ACIS & DXF.

UNIT IV

DESIGN APPLICATIONS:

Mechanical tolerances, Mass property calculations, Finite Element Modeling and Analysis and Mechanical Assembly.

UNIT V

Collaborative Engineering: Collaborative Design, Principles, Approaches,
Tools, Design Systems.

Suggested Assignment:

To refer ASME Series of *Journal of Tribology, Journal of Mechanical Design* for giving a seminar on any current topic of relevance.

REFERENCES :

1. CAD/CAM Theory and Practice / Ibrhim Zeid / Mc Graw Hill international.
2. Mastering CAD/CAM / Ibrhim Zeid / Mc Graw Hill international.
3. CAD/CAM / P.N.Rao / TMH.
4. CAD CAM: Principles, Practice and Manufacturing Management / Chris Mc Mohan, Jimmie Browne / Pearson edu. (LPE)
5. Concurrent Engineering Fundamentals: Integrated Product Development/ Prasad / Prentice Hall.
6. Successful Implementation of Concurrent Product and Process / Sammy G Sinha / Wiley, John and Sons Inc..

ADVANCED MECHANICAL VIBRATIONS

UNIT I

Introduction: Characterization of engineering vibration problems, Review of single degree freedom systems with free, damped and forced vibrations

Two-degree of Freedom Systems: Principal modes of vibration, Spring coupled and mass coupled systems, Forced vibration of an undamped close coupled and far coupled systems, Undamped vibration absorbers, Forced damped vibrations, Vibration isolation.

UNIT II

Multi-degree Freedom systems: Eigen-value problem, Close coupled and far coupled systems, Orthogonality of mode shapes, Modal analysis for free, damped and forced vibration systems, Approximate methods for fundamental frequency- Rayleigh's, Dunkerely, Stodola and Holzer method, Method of matrix iteration, Finite element method for close coupled and far coupled systems.

UNIT III

Free and forced vibration of continuous elastic systems. Longitudinal vibration of rods. The effects of boundaries and discontinuities on longitudinal vibration transmission. Phase closure principle and natural frequencies.

UNIT IV Transient Vibrations: Response to an impulsive, step and pulse input, Shock spectrum

Non-linear Vibrations: Non-linear systems, Undamped and forced vibration with non-linear spring forces, Self-excited vibrations.

UNIT V

Flexural vibration of beams: Derivation of the equation of motion and the procedure to obtain free vibration solutions. Introduction to forced response (harmonic).

Suggested Assignment:

To refer ASME Series of *Journal of Vibration and Acoustics, Journal of Mechanical Design* for giving a seminar on any current topic of relevance.

TEXT BOOKS:

1. Theory and practice of Mechanical Vibrations J.S. Rao and K. Gupta New Age International
2. Mechanical Vibrations (3rd edition), S.S. Rao, Addiston Wesley
3. Mechanical Vibrations G.K. Groover Nem Chand & Brothers
4. Mechanical Vibration Practice V. Ramamurti Narosa Publications
5. Mechanical Vibrations V.P. Singh Dhanpat Rai & sons
6. Textbook of Mechanical Vibrations R.V. Dukkipati & J. Srinivas Prentice Hall of India

SIMULATION AND MODELLING

UNIT I

System – ways to analyze the system – Model - types of models – Simulation – Definition – Types of simulation models – steps involved in simulation – Advantages & Disadvantages. Parameter estimation – estimator – properties – estimate – point estimate – confidence interval estimates – independent – dependent – hypothesis – types of hypothesis- steps – types 1& 2 errors – Framing – strang law of large numbers.

UNIT II

Building of Simulation model – validation – verification – credibility – their timing – principles of valid simulation Modeling – Techniques for verification – statistical procedures for developing credible model. Modeling of stochastic input elements – importance – various procedures – theoretical distribution – continuous – discrete – their suitability in modeling.

UNIT III

Generation of random variates – factors for selection – methods – inverse transform – composition – convolution – acceptance – rejection – generation of random variables – exponential – uniform – weibull – normal Bernoullie – Binomial – uniform – poisson

UNIT IV

Simulation languages – comparison of simulation languages with general purpose languages – Simulation languages vs Simulators – software features – statistical capabilities – G P S S – SIMAN- SIMSCRIPT –Simulation of M/M/1 queue – comparison of simulation languages.

UNIT V

Output data analysis – Types of Simulation w.r.t output dat analysis – warmup period- Welch algorithm – Approaches for Steady – State Analysis – replication – Batch means methods – comparisons. Applications of Simulation – flow shop system – job shop system – M/M/1 queues with infinite and finite capacities – Simple fixed period inventory system – Newboy paper problem.

Suggested Assignment:

To refer Elsevier Publishers *Journal of Simulation Modeling Practice and Theory and ASME Journal of Mechanical Design* for giving a seminar on any current topic of relevance.

TEXT BOOKS:

1. Simulation Modelling and Analysis, Law, A.M.& Kelton, McGraw Hill, 2nd Edition, New York.
2. Discrete Event System Simulation, Banks J. & Carson J.S., PH, Englewood Cliffs, NJ.
3. Simulation of Manufacturing Systems, by Carrie A., Wiley, NY.
4. A Course in Simulation, Ross, S.M., McMillan, NY.
5. Simulation Modelling and SIMNET, Taha H.A., PH, Englewood Cliffs, NJ

ELECTRIC AND HYBRID VEHICLES

AIM :

OBJECTIVE: To understand working of different configurations of electric vehicles, and its components, hybrid vehicle configuration and performance analysis.

UNIT I

ELECTRIC VEHICLES

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

UNIT II

BATTERY

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

UNIT III

DC & AC ELECTRICAL MACHINES

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

UNIT IV

ELECTRIC VEHICLE DRIVE TRAIN

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

UNIT V

HYBRID ELECTRIC VEHICLES

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

Suggested Assignment:

To refer SAE Transactions *International Journal of Engines, International Journal of Fuels and Lubricants, International Journal of Passenger Cars-Electronic & Electrical Systems* for giving a seminar on any current topic of relevance.

REFERENCES :

1. Iqbal Hussain, Electric & Hybrid Vechicles – Design Fundamentals, CRC Press.
2. Rand D.A.J, Woods, R & Dell RM Batteries for Electric vehicles.

I.C. ENGINES AND ALTERNATE FUELS

UNIT I

ntroduction: Historical Review –Broad classification of fuels - Engine Types – Design and operating Parameters. Cycle Analysis: Thermo-chemistry of Fuel – Air mixtures, properties – Ideal Models of Engine cycles – Real Engine cycles difference and Factors responsible for – Computer Modeling and simulation of combustion process.

UNIT II

Gas Exchange Processes: Volumetric Efficiency – Flow through ports – Supercharging and Turbo charging. Exhaust gas recirculation system and their designing. Charge Motion: Mean velocity and Turbulent characteristics – Swirl, Squish – Pre chamber Engine flows. Fuel supply systems for SI and CI engines to use gaseous fuels like LPG, CNG, and Hydrogen.

UNIT III

Engine Combustion: Combustion and Speed – Cyclic Variations – Ignition – Abnormal combustion Fuel factors. Combustion in CI engines: Essential Features – Types of Cylinders. Pr. Data – Fuel Spray Behavior – Ignition Delay – Mixing Formation and control:

UNIT IV

Pollutant Formation and Control: Nature and extent of problems – Nitrogen Oxides, Carbon monoxide, Unburnt Hydrocarbon and particulate emission – Measurement – Exhaust Gas Treatment. Catalytic converter, 2 way type & 3 way type.

UNIT V

Modern Trends in IC Engines: Computer Simulation and Optimized Design –Lean Burning and Adiabatic concepts - Rotary Engines. Modification in IC Engines to suite Bio-Fuels.

Suggested Assignment:

To refer SAE Transactions *International Journal of Engines, International Journal of Fuels and Lubricants, International Journal of Passenger Cars-Electronic & Electrical Systems* for giving a seminar on any current topic of relevance.

REFERENCES:

1. I.C. Engines Fundamentals/Heywood/Mc Graw Hill
2. I.C. Engines /Ferguson
3. I.C. Engines / Maleev
4. IC Engines / V Ganesan
5. I.C. Engine in theory and Practice Vol. I and II / Taylor
6. I.C. Engines / Obert / Int.Text Book Co.
7. Combustion Engine Processes / Lichty
8. Scavenging of two stroke Cycle Engines / Switzer

THERMAL AND NUCLEAR POWER PLANTS

UNIT I
Energy scenario. Overview of steam power plant. Analysis of steam cycles. Feedwater heaters. De-aerator and drain cooler. Optimization of cycle parameters, reheat and regeneration. Analysis of multi-fluid coupled cycles. Cogeneration of power and process heat. Combined cycle power generation.

UNIT II
Fuels. Combustion mechanisms. Draft systems. Combustion control. Furnaces for burning coal in fluidized beds and in pulverized form. Coal handling installation.
Different types of boilers and their specific uses. Boiler mountings and accessories. Feedwater treatment.

UNIT III
Boiler maintenance. Circulation theory. Downcomers and risers. Drum and its internals. Economiser. Convective and radiant super heaters. Superheat temperature control. Recuperative and regenerative air preheaters. Dust and ash removal systems. Environmental aspects of power generation

UNIT IV
Basic concepts of reactor physics, radioactivity. Neutron Scattering. Thermal and fast reactors. Nuclear cross-sections. Neutron flux and reaction rates. Moderator criteria. Reactor core design. Conversion and breeding. Types of reactors. Characteristics of boiling water, pressurized water, pressurized heavy water, gas cooled and liquid metal cooled reactors.

UNIT V
Future trends in reactor design and operation. Thermal-hydraulics of reactors. Heavy water management. Containment system for nuclear reactor. Reactor safety radiation shields. Waste management. Indian nuclear power programme.

Suggested Assignment:
To refer Inderscience Publishers *International Journal of Nuclear Science and Technology,* ASME Series of *Journal of Thermal Science and Engineering Applications* for giving a seminar on any current topic of relevance.

TEXT BOOKS:
1. M.M.EI. Wakil., _*Nuclear Power Engineering'*, McGraw Hill Book Company, New York, 1987.
2. S. Glasstone and A. Setonske., _*Nuclear Reactors, Engineering*', 3rd Ed., CBS Publishers and Distributors, 1992.

REFERENCES:
1. Loftness, _*Nuclear Power Plants'*, D. Van Nostrand Company Inc, Princeton, 1964.
2. S. Sarg et al., _*Physics of Nuclear Reactors'*, Tata McGraw Hill Publishing Company Ltd., 1985.
3. T. J. Connoly., _*Fundamentals of Nuclear Energy'*, John Wiley, 1978.

INTELLIGENT MANUFACTURING SYSTEMS

UNIT I
Computer Integrated Manufacturing Systems – Structure and functional areas of CIM system - CAD, CAPP, CAM, CAQC, ASRS. Advantages of CIM. Manufacturing Communication Systems – MAP/TOP, OSI Model, Data Redundancy, Top down and Bottom-up Approach, Volume of Information. Intelligent Manufacturing – System Components, System Architecture and Data Flow, System Operation.

UNIT II
Components of Knowledge Based Systems – Basic Components of Knowledge Based Systems, Knowledge Representation, Comparison of Knowledge Representation Schemes, Interference Engine, Knowledge Acquisition. Machine Learning – Concept of Artificial Intelligence, Conceptual Learning, Artificial Neural Networks - Biological Neuron, Artificial Neuron, Types of Neural Networks, Applications in Manufacturing.

UNIT III
Automated Process Planning – Variant Approach, Generative Approach, Expert Systems for Process Planning, Feature Recognition, Phases of Process planning.

UNIT IV
Knowledge Based System for Equipment Selection (KBSES) – Manufacturing system design, Equipment Selection Problem, Modeling the Manufacturing Equipment Selection Problem, Problem Solving approach in KBSES, Structure of the KBSES.

UNIT V
Group Technology: Models and Algorithms – Visual Method, Coding Method, Cluster Analysis Method, Matrix Formation – Similarity Coefficient Method, Sorting-based Algorithms, Bond Energy Algorithm, Cost Based method, Cluster Identification Method, Extended CI Method. Knowledge Based Group Technology - Group Technology in Automated Manufacturing System, Structure of Knowledge based system for group technology (KBSGT) – Data Baswe, Knowledge Base, Clustering Algorithm.

Suggested Assignment:
To refer ASME Series of *Journal of Manufacturing Science and Engineering,* Springer Publishers *International Journal of Advanced Manufacturing Technology* SAE Transactions *International Journal of Materials and Manufacturing* for giving a seminar on any current topic of relevance

TEXT BOOKS:
1. Intelligent Manufacturing Systems by Andre Kusaic.
2. Artificial Neural Networks by Yagna Narayana
3. Automation, Production Systems and CIM by Groover M.P.
4. Neural Networks by Wassarman.

LOGISTICS AND SUPPLY CHAIN MANAGEMENT

UNIT I

Logistics and Competitive Strategy: Competitive advantage through logistic – Mission – Integrated supply chains – Models in Logistics Management – Logistics to supply Chain Management – Focus areas in supply Chain Management – performance Measures for SCM. Customer Service Dimension: The marketing and logistics interface – Customer service and customer retention - Service driven logistics systems – Basic service capability – Increasing customer expectations – Value added services – Customer satisfaction and success – Time based logistics.

UNIT II

Logistics System Design: Logistics positioning – Logistics reengineering – reengineering procedure – logistics environmental assessment – time based logistics – alternative logistics strategies – strategic integration – logistics time based control techniques. Measuring Logistics Costs and Performance: The concept of Total Cost analysis – Principles of logistics costing – Logistics and the bottom line – Impact of Logistics on Shareholder value – customer profitability analysis – direct product profitability – cost driver and activity based costing.

UNIT III

Logistics and Supply chain relationships: Benchmarking the logistics process and SCM operation – Mapping the supply chain processes – Supplier and distributor benchmarking – setting benchmarking priorities – identifying logistics performance indicators – Channel structure – Economics of distribution – channel relationship – logistic service alliances.

UNIT IV

Sourcing, transporting and pricing products: Sourcing decisions – transportation in the supply chain – basic transportation economics and pricing – transportation documentation – pricing and revenue management in the supply chain – pricing and revenue management in supply chains.

UNIT V

Coordination and Technology in Supply chain: Lack of coordination and Bullwhip Effect – obstacles to coordination – managerial levers to achieve coordination – Building strategic partners and trust within a supply chain. Role of IT in the supply chain – Ebusiness. Managing global logistics and global supply chains: Logistics in a global economy – global operating levels – interlink global economy – Global supply chain business processes – Global strategy, purchasing, logistics – Global alliances – Issues and Challenges.

Suggested Assignment:

To refer Elsevier Publishers *International Journal of Computers and Industrial Engineering* Springer Publishers *Journal of Industrial Engineering International* for giving a seminar on any current topic of relevance

REFERENCES:

1. Donald J. Bowersox and David J. Closs, Logistical Management: The Integrated Supply Chain Process, TMH.
2. Martin Christopher, Logistics Supply Chain Management, Pitman, London.
3. Sunil Chopra and Peter Meindl: Supply Chain Management: Strategy, Planning and Operation, Pearson Education, New Delhi.
4. B.S.Sahay, supply Chain Management for Global competitivesness, Macmillan.
5. Philip B.Schary, Tage Skjott – Larsen: Manageing the Global Supply Chain.
6. Arjun J Van Weele: Purchasing and Supply Chain Management- Analysis, Planning and Practice, Thomson Learning.
7. Ballou, Business Logistics/Supply chain management, Pearson Education.

ADVANCES IN MANUFACTRURING TECHNOLOGY

AIM:

The aim of this course is to impart knowledge in various fields of advanced manufacturing technology

OBJECTIVE:

At the end of this course the students are expected to understand metal cutting and cutting tool materials, special machining processes, unconventional machining processes, micro machining process and rapid prototyping.

UNIT I

METAL CUTTING AND TOOL MATERIALS

Orthogonal and oblique cutting – types of tool wear, abrasion, diffusion, Oxidation. Fatigue and adhesive wear – Prediction of tool life – Monitoring of wear, Cutting forces and Vibration – tool Materials, Cemented Carbide, Coated Carbide, Cermets. Ceramic, CBN and PCD – Selection of Machining parameters and Tools.

UNIT II

SPECIAL MACHINING PROCESSES & EXPERIMENTAL TECHINIQUES

Deep hole drilling Honing – Lapping – Super finishing – Burnishing – Broaching High speed Machining, Measurement of cutting forces, temperature, Vibration and Tool wear in machining processes.

UNIT III

UNCONVENTIONAL MACHINING

Principles, Processes. Various influencing parameters and Applications of Ultrasonic Machining, Electro Discharge Machining, Electro Chemical Machining, Electron and Laser Beam Machining, Plasma Arc Machining and Water Jet Machining.

UNIT IV

MICRO MACHINING

Introduction to MEMS, principle, process capabilities, types, advantages, limitations and applications of bulk micro machining, surface micro machining and tool based micro machining processes.

UNIT V

RAPID PROTOTYPING

Introduction – Classification – Principle advantages limitations and applications- Stereo lithography – laminated object manufacturing – Selective laser sintering –FDM, SGC, 3D Printing.

Suggested Assignment:

To refer ASME Series of *Journal of Manufacturing Science and Engineering,* Springer Publishers *International Journal of Advanced Manufacturing Technology* SAE Transactions *International Journal of Materials and Manufacturing* for giving a seminar on any current topic of relevance.

TEXT BOOKS:

1. Shaw Milton.C., “Metal Cutting Principles”, Second Edition, Oxford University, Press, 2005.
2. Armarego E.J.A. and Brown R.H., “The Machining of metals”, Prentice Hall, 1982.

REFERENCES:

1. Battacharya, “ theory of metal cutting”, NCB Agency, 1984.

2. HMT Manual, "Non – t5raditional Machining Methods", 1975.
3. Pandley P.S. and shah.N. "Modern Manufacturing Processes", 1980.
4. Sadasivan T.A., and Sarathy.D. "cutting Tools for Productive Machining", Widia (India) Limited 1999.
5. Rich F. and Knight'K., "Artificial Intelligence", McGraw Hill Inc, 1991.
6. Marc J. Madou, Fundamentals of Microfabrication: The Science of Miniaturization, Second Edition, CRC Press (ISBN: 0849308267), 2006.

PRODUCTION AND OPERATIONS MANAGEMENT

UNIT I

Operation Management – Definition – Objectives – Types of production systems – historical development of operations management – Current issues in operation management. Product design – Requirements of good product design – product development – approaches – concepts in product development – standardization - simplification – Speed to market – Introduction to concurrent engineering.

UNIT II

Value engineering – objective – types of values –function & cost – product life cycle – steps in value engineering – methodology in value engineers – FAST Diagram –Matrix Method. Location – Facility location and layout – Factors considerations in Plant location – Comparative Study of rural and urban sites – Methods of selection plant layout – objective of good layout – Principles – Types of layout – line balancing.

UNIT III

Aggregate Planning – definition – Different Strategies – Various models of Aggregate Planning-Transportation and graphical models Advance inventory control systems push systems –Material Requirement – Terminology – types of demands – inputs to MRP-techniques of MRP – Lot sizing methods – benefits and drawbacks of MRP – Manufacturing Resources Planning (MRP –II). Pull systems – Vs Push system – Just in time (JIT) philosophy Kanban System - Calculation of number of Kanbans Requirements for implementation JIT – JIT Production process – benefits of JIT.

UNIT IV

Scheduling – Policies – Types of scheduling- Forward and Backward Scheduling – Gantt Charts – Flow shop Scheduling – n jobs and 2 machines, n jobs and 3 machines – Job shop Scheduling – 2 jobs and n machines – Line of Balance.

UNIT V

Project Management – Programming Evaluation Review Techniques (PERT) – three times estimation – critical path – probability of completion of project – critical path method - crashing of simple nature.

Suggested Assignment:

To refer Elsevier Publishers *Journal of Operations Management, International Journal of Production Economics* for giving a seminar on any current topic of relevance

REFERENCES:

1. “Operations Management” by E.S. Buffs.
2. “Operations Management, Theory and Problems” by Joseph G. Monks.
3. “Production Systems Management” by James. L. Riggs.
4. “Production and Operations Management” by Chary.
5. “Operation Management” by Chase
6. “Production & Operation Management” by PannerSelvam
7. “Production & Operation Analysis” by Nahima

MATERIALS TECHNOLOGY

UNIT I

Elasticity in metals and polymers, mechanism of plastic deformation, role of dislocations, yield stress, shear strength of perfect and real crystals, strengthening mechanism, work hardening, solid solution, grain boundary strengthening. Poly phase mixture, precipitation, particle, fiber and dispersion strengthening, effect of temperature, strain and strain rate on plastic behavior, super plasticity, deformation of non crystalline material.

UNIT II

Griffth's Theory, stress intensity factor and fracture Toughness, Toughening Mechanisms, Ductile and Brittle transition in steel, High Temperature Fracture, Creep, Larson : Miller Parameter, Deformation and Fracture mechanism maps. Fatigue, Low and High cycle fatigue test, Crack Initiation and Propagation mechanism and Paris Law, Effect of surface and metallurgical parameters on Fatigue, Fracture of non:metallic materials, fatigue analysis, Sources of failure, procedure of failure analysis.

UNIT III

Motivation for selection, cost basis and service requirements, Selection for Mechanical Properties, Strength, Toughness, Fatigue and Creep. Selection for Surface durability, Corrosion and Wear resistance, Relationship between Materials Selection and Processing, Case studies in Materials Selection with relevance to Aero, Auto, Marine, Machinery and Nuclear Applications.

UNIT IV

MODERN METALLIC MATERIALS : Dual Phase Steels, Micro alloyed, High Strength Low alloy (HSLA) Steel, Transformation induced plasticity (TRIP) Steel, Maraging Steel, Intermetallics, Ni and Ti Aluminides, Smart Materials, Shape Memory alloys, Metallic Glass, Quasi Crystal and Nano Crystalline Materials.

UNIT V

NONMETALLIC MATERIALS : Polymeric materials and their molecular structures, Production Techniques for Fibers, Foams, Adhesives and Coatings, Structure, Propertiesand Applications of engineering Polymers, Advanced Structural Ceramics WC, TiC, TaC, Al2 O3, SiC, Si3 N4 , CBN and Diamond : properties, Processing and applications.

Suggested Assignment:

To refer ASME Series of *Journal of Engineering Materials and Technology,* SAE Transactions *International Journal of Materials and Manufacturing* for giving a seminar on any current topic of relevance.

TEXT BOOKS:

1. Mechanical Behaviour of Materials / Thomas H. Courtney, McGraw Hill.
2. Mechanical Metallurgy / George E. Dieter / McGraw Hill.
3. Selection and use of Engineering Materials /Charles J.A/ Butterworth Heiremann.

STATISTICAL QUALITY CONTROL

OBJECTIVE:

This course is concerned with the applications of statistical tools in measuring and controlling the quality of products/processes.

UNIT I

QUALITY FUNDAMENTALS

Importance of quality, meaning of quality, quality dimensions, quality planning, quality control, SQC, Quality assurance, quality costs, economics of quality, quality and productivity, quality and reliability, quality loss function.

UNIT II

CONTROL CHARTS FOR VARIABLES

Process variation,– Statistical basis, 3 – sigma control limits, Rational sub-grouping, X ,R and S charts, Interpretation of charts, warning and modified control limits, operating characteristic curve for X – chart, SPC -process capability analysis – Cp, CPK, Cpm, Machine capability, Gauge capability.

UNIT III

CONTROL CHARTS FOR ATTRIBUTES

P, np, C, U and ku charts, demerits control chart, Multi – variable chart, individual measurement charts – moving average and moving range charts, quality control in service sector.

UNIT IV

ACCEPTANCE SAMPLING

Need for Acceptance sampling, economics of sampling, sample selection, single and Double sampling – O.C. curves, Average outgoing quality (AOQ), Average sample Number (ASN), Average total inspection (ATI), Multiple and sequential sampling, sampling plans – military standards, Dodge – Roming, IS 2500.

UNIT V

METROLOGY & INSPECTION

Fundamental methods of measurement, precision & accuracy, measurement devices - Linear and Angular - Coordinate Measuring Machine, Destructive and Non- Destructive Testing methods.

Suggested Assignment:

To refer Springer Publishers *Journal of Industrial Engineering International,* Elsevier Publishers *Computers and Industrial Engineering* for giving a seminar on any current topic of relevance.

TEXT BOOK :

1. Douglus C.Montgomery, Introduction to Statistical Quality Control, John Wiley & Sons, 2004.

REFERENCES :

1. Statistical Quality Control, Eugene L.Grant and Richard S.Leaven Worth, TMH, Seventh Edition, 2000.
2. Quality Control. Dale H.Besterfield, Pearson Education Asia, Seventh Edition,2004.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
Electronics and Communication Engineering

PAPER – I	
S. No	**Subject**
1	DIGITAL SYSTEM DESIGN
2	EMBEDDED REAL TIME OPERATING SYSTEMS
3	ADVANCED DIGITAL SIGNAL PROCESSING
4	DIGITAL DATA COMMUNICATIONS
5	INFORMATION THEORY AND CODING TECHNIQUES
6	TRANSFORM TECHNIQUES
7	BIOMEDICAL SIGNAL PROCESSING
8	DATA ACQUISITION SYSTEMS
9	ADVANCED ANTENNA THEORY AND DESIGN
10	MICROWAVE INTEGRATED CIRCUITS
11	SMART ANTENNAS
12	LOW POWER VLSI DESIGN
13	CMOS ANALOG AND DIGITAL IC DESIGN
14	VLSI SIGNAL PROCESSING
15	NETWORK SECURITY AND CRYPTOGRAPHY

PAPER – II	
S. No	**Subject**
1	EMBEDDED SYSTEM DESIGN
2	WIRELESS COMMUNICATIONS AND NETWORKS
3	IMAGE AND VIDEO PROCESSING
4	OPTICAL COMMUNICATION TECHNOLOGY
5	STATISTICAL SIGNAL PROCESSING
6	PATTERN RECOGNITION PRINCIPLES
7	MOBILE COMPUTING TECHNOLOGIES
8	PHASED ARRAY SYSTEMS
9	MICROWAVE NETWORKS
10	RF CIRCUIT DESIGN
11	CMOS MIXED SIGNAL CIRCUIT DESIGN
12	SEMICONDUCTOR MEMORY DESIGN AND TESTING
13	DESIGN FOR TESTABILITY
14	CPLD AND FPGA ARCHITECURES AND APPLICATIONS
15	MICRO ELECTRO MECHANICAL SYSTEM DESIGN

PAPER – I

DIGITAL SYSTEM DESIGN

UNIT-I: Minimization Procedures and CAMP Algorithm

Review on minimization of switching functions using tabular methods, k-map, QM algorithm, CAMP-I algorithm, Phase-I: Determination of Adjacencies, DA, CSC, SSMs and EPCs,, CAMP-I algorithm, Phase-II: Passport checking, Determination of SPC, CAMP-II algorithm: Determination of solution cube, Cube based operations, determination of selected cubes are wholly within the given switching function or not, Introduction to cube based algorithms.

UNIT-II: PLA Design, PLA Minimization and Folding Algorithms

Introduction to PLDs, basic configurations and advantages of PLDs, PLA-Introduction, Block diagram of PLA, size of PLA, PLA design aspects, PLA minimization algorithm(IISc algorithm), PLA folding algorithm(COMPACT algorithm)-Illustration of algorithms with suitable examples.

UNIT -III: Design of Large Scale Digital Systems

Algorithmic state machine charts-Introduction, Derivation of SM Charts, Realization of SM Chart, control implementation, control unit design, data processor design, ROM design, PAL design aspects, digital system design approaches using CPLDs, FPGAs and ASICs.

UNIT-IV: Fault Diagnosis in Combinational Circuits

Faults classes and models, fault diagnosis and testing, fault detection test, test generation, testing process, obtaining a minimal complete test set, circuit under test methods- Path sensitization method, Boolean difference method, properties of Boolean differences, Kohavi algorithm, faults in PLAs, DFT schemes, built in self-test.

UNIT-V: Fault Diagnosis in Sequential Circuits

Fault detection and location in sequential circuits, circuit test approach, initial state identification, Haming experiments, synchronizing experiments, machine identification, distinguishing experiment, adaptive distinguishing experiments.

TEXT BOOKS:

1. Logic Design Theory-N. N. Biswas, PHI
2. Switching and Finite Automata Theory-Z. Kohavi , 2nd Edition, 2001, TMH
3. Digital system Design using PLDd-Lala

REFERENCE BOOKS:

1. Fundamentals of Logic Design – Charles H. Roth, 5th Ed., Cengage Learning.
2. Digital Systems Testing and Testable Design – Miron Abramovici, Melvin A. Breuer and Arthur D. Friedman- John Wiley & Sons Inc.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
Electronics and Communication Engineering

Embedded Real Time Operating Systems

UNIT-I: Introduction
OS Services, Process Management, Timer Functions, Event Functions, Memory Management, Device, File and IO Systems Management, Interrupt Routines in RTOS Environment and Handling of Interrupt Source Calls, Real-Time Operating Systems, Basic Design Using an RTOS, RTOS Task Scheduling Models, Interrupt Latency and Response of the Tasks as Performance Metrics, OS Security Issues.

UNIT-II: RTOS Programming
Basic Functions and Types of RTOS for Embedded Systems, RTOS mCOS-II, RTOS Vx Works, Programming concepts of above RTOS with relevant Examples, Programming concepts of RTOS Windows CE, RTOS OSEK, RTOS Linux 2.6.x and RTOS RT Linux.

UNIT-III: Program Modeling – Case Studies
Case study of embedded system design and coding for an Automatic Chocolate Vending Machine (ACVM) Using Mucos RTOS, case study of digital camera hardware and software architecture, case study of coding for sending application layer byte streams on a TCP/IP Network Using RTOS Vx Works, Case Study of Embedded System for an Adaptive Cruise Control (ACC) System in Car, Case Study of Embedded System for a Smart Card, Case Study of Embedded System of Mobile Phone Software for Key Inputs.

UNIT-IV: Target Image Creation & Programming in Linux
Off-The-Shelf Operating Systems, Operating System Software, Target Image Creation for Window XP Embedded, Porting RTOS on a Micro Controller based Development Board. Overview and programming concepts of Unix/Linux Programming, Shell Programming, System Programming.

UNIT-V: Programming in RT Linux
Overview of RT Linux, Core RT Linux API, Program to display a message periodically, semaphore management, Mutex, Management, Case Study of Appliance Control by RT Linux System.

TEXT BOOKS:

1. Dr. K.V.K.K. Prasad: "Embedded/Real-Time Systems" Dream Tech Publications, Black pad book.
2. Rajkamal: "Embedded Systems-Architecture, Programming and Design", Tata McGraw Hill Publications, Second Edition, 2008.

REFERENCES:

1. Labrosse, "Embedding system building blocks ", CMP publishers.
2. Rob Williams," Real time Systems Development", Butterworth Heinemann Publications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
Electronics and Communication Engineering

ADVANCED DIGITAL SIGNAL PROCESSING

UNIT –I:
Review of DFT, FFT, IIR Filters and FIR Filters:
Multi Rate Signal Processing: Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion.

UNIT –II:
Applications of Multi Rate Signal Processing:
Design of Phase Shifters, Interfacing of Digital Systems with Different Sampling Rates, Implementation of Narrow Band Low Pass Filters, Implementation of Digital Filter Banks, Sub-band Coding of Speech Signals, Quadrature Mirror Filters, Trans-multiplexers, Over Sampling A/D and D/A Conversion.

UNIT -III:
Non-Parametric Methods of Power Spectral Estimation: Estimation of spectra from finite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametric methods

UNIT –IV:
Implementation of Digital Filters:
Introduction to filter structures (IIR & FIR), Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Backward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.

UNIT –V:
Parametric Methods of Power Spectrum Estimation: Autocorrelation & Its Properties, Relation between auto correlation & model parameters, AR Models - Yule-Walker & Burg Methods, MA & ARMA models for power spectrum estimation, Finite word length effect in IIR digital Filters – Finite word-length effects in FFT algorithms.

TEXT BOOKS:

1. Digital Signal Processing: Principles, Algorithms & Applications - J.G.Proakis & D. G. Manolakis, 4th Ed., PHI.
2. Discrete Time Signal Processing - Alan V Oppenheim & R. W Schaffer, PHI.
3. DSP – A Practical Approach – Emmanuel C. Ifeacher, Barrie. W. Jervis, 2 Ed., Pearson Education.

REFERENCE BOOKS:

1. Modern Spectral Estimation: Theory & Application – S. M .Kay, 1988, PHI.
2. Multi Rate Systems and Filter Banks – P.P.Vaidyanathan – Pearson Education.
3. Digital Signal Processing – S.Salivahanan, A.Vallavaraj, C.Gnanapriya, 2000,TMH
4. Digital Spectral Analysis – Jr. Marple

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
Electronics and Communication Engineering

DIGITAL DATA COMMUNICATIONS

UNIT -I:
Digital Modulation Schemes:
BPSK, QPSK, 8PSK, 16PSK, 8QAM, 16QAM, DPSK – Methods, Band Width Efficiency, Carrier Recovery, Clock Recovery.

UNIT -II:
Basic Concepts of Data Communications, Interfaces and Modems:
Data Communication Networks, Protocols and Standards, UART, USB, I2C, I2S, Line Configuration, Topology, Transmission Modes, Digital Data Transmission, DTE-DCE interface, Categories of Networks – TCP/IP Protocol suite and Comparison with OSI model.

UNIT -III:
Error Correction: Types of Errors, Vertical Redundancy Check (VRC), LRC, CRC, Checksum, Error Correction using Hamming code
Data Link Control: Line Discipline, Flow Control, Error Control
Data Link Protocols: Asynchronous Protocols, Synchronous Protocols, Character Oriented Protocols, Bit-Oriented Protocol, Link Access Procedures.

UNIT -IV:
Multiplexing: Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM), Multiplexing Application, DSL.
Local Area Networks: Ethernet, Other Ether Networks, Token Bus, Token Ring, FDDI.
Metropolitan Area Networks: IEEE 802.6, SMDS
Switching: Circuit Switching, Packet Switching, Message Switching.
Networking and Interfacing Devices: Repeaters, Bridges, Routers, Gateway, Other Devices.

UNIT -V:
Multiple Access Techniques:
Random Access, Aloha- Carrier Sense Multiple Access (CSMA)- Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA), Controlled Access- Reservation- Polling- Token Passing, Channelization, Frequency- Division Multiple Access (FDMA), Time - Division Multiple Access (TDMA), Code - Division Multiple Access (CDMA), OFDM and OFDMA.

TEXT BOOKS:

1. Data Communication and Computer Networking - B. A.Forouzan, 2nd Ed., 2003, TMH.
2. Advanced Electronic Communication Systems - W. Tomasi, 5th Ed., 2008, PEI.

REFERENCE BOOKS:

1. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
2. Data and Computer Communications - William Stallings, 8th Ed., 2007, PHI.
3. Data Communication and Tele Processing Systems -T. Housely, 2nd Ed, 2008, BSP.
4. Data Communications and Computer Networks- Brijendra Singh, 2nd Ed., 2005, PHI.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
Electronics and Communication Engineering

INFORMATION THEORY AND CODING TECHNIQUES

UNIT I
INFORMATION THEORY AND SOURCE CODING

Uncertainty, information, entropy and its properties, entropy of binary memoryless source and its extension to discrete memoryless source, source coding theorem, data compression, prefix coding, Huffman coding, Lempel-Ziv coding, Source with memory and its entropy.

UNIT II
DISCRETE CHANNELS

Binary Symmetric Channel, mutual information & its properties, Channel capacity, channel coding theorem and its application to BSC, Shannon‟s theorem on channel capacity, capacity of a channel of infinite bandwidth, bandwidth - S/N trade off, practical communication systems in light of Shannon‟s theorem, Fading channel, channels with memory.

UNIT III
GROUPS, FIELDS AND LINEAR BLOCK CODES

Galois field and its construction in GF (2^m) and its basic properties, vector spaces and matrices in GF(2), Linear block codes, systematic codes and its encoding circuit, syndrome and error detection, minimum distance, error detecting and correcting capabilities of block code, decoding circuit, probability of undetected error for linear block code in BSC, Hamming code and their applications.

UNIT IV
CYCLIC CODES AND BCH CODES

Basic properties of Cyclic codes, Generator and parity check matrix of cyclic codes, encoding and decoding circuits, syndrome computation and error detection, cyclic Hamming codes, encoding and decoding of BCH codes, error location and correction.

UNIT V
CONVOLUTIONAL CODES

Introduction to convolution code, its construction and Viterbi algorithm for maximum likelihood decoding. Automatic repeat request strategies and their throughput efficiency considerations.

Reference Books

1. Lathi B. P., Modern Analog and Digital Communication Systems, Oxford Univ. Press
2. Shu Lin and Costello, Error Control Coding : Fundamentals and Applications, 2nd Edition, Pearson.
3. Sklar, Digital Communication, Pearson Education Asia.
4. Haykin Simon, Digital Communication, Wiley Publ.
5. Proakis, Digital Communication, McGraw Hill.
6. Schaum‟s Outline Series, Analog and Digital Communication, TMH.

TRANSFORM TECHNIQUES

UNIT -I:

Fourier Analysis:

Fourier series, Examples, Fourier Transform, Properties of Fourier Transform, Examples of Fourier transform, sampling theorem, Partial sum and Gibbs phenomenon, Fourier analysis of Discrete time Signals, Discrete Fourier Transform.

Time – Frequency Analysis: Window function, Short Time Fourier Transform, Discrete Short Time Fourier Transform, Continuous wavelet transform, Discrete wavelet transform, wavelet series, Interpretations of the Time-Frequency plot.

UNIT -II:

Transforms:

Walsh, Hadamard, Haar and Slant Transforms, DCT, DST, KLT, Singular value Decomposition – definition, properties and applications

UNIT -III:

Continuous Wavelet Transform (CWT):

Short comings of STFT, Need for wavelets, Wavelet Basis- Concept of Scale and its relation with frequency, Continuous time wavelet Transform Equation- Series Expansion using Wavelets- CWT- Tiling of time scale plane for CWT. Important Wavelets: Haar, Mexican Hat, Meyer, Shannon, Daubechies.

UNIT -IV:

Multi Rate Analysis and DWT:

Need for Scaling function – Multi Resolution Analysis, Two-Channel Filter Banks, Perfect Reconstruction Condition, Relationship between Filter Banks and Wavelet Basis, DWT, Structure of DWT Filter Banks, Daubechies Wavelet Function, Applications of DWT.

UNIT -V:

Wavelet Packets and Lifting: Wavelet Packet Transform, Wavelet packet algorithms, Thresholding-Hard thresholding, Soft thresholding, Multidimensional Wavelets, Bi-orthogonal basis- B-Splines, Lifting Scheme of Wavelet Generation, Multi Wavelets

TEXT BOOKS:

1. A Wavelet Tour of Signal Processing theory and applications -Raghuveer M.Rao and Ajit S. Bopardikar, Pearson Edu, Asia, New Delhi, 2003.
2. K.P.Soman and K.I Ramachandran, " Insight into Wavelets – from theory to practice" PHI, Second edition,2008

REFERENCE BOOKS:

1. Fundamentals of Wavelets- Theory, Algorithms and Applications -Jaideva C Goswami, Andrew K Chan, John Wiley & Sons, Inc, Singapore, 1999.
2. Jaideva C.Goswami and Andrew K.Chan, " Fundamentals of Wavelets" Wiley publishers, 2006
3. A Wavelet Tour of Signal Processing-Stephen G. Mallat, Academic Press, 2 Ed
4. Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar – TMH,2009

BIOMEDICAL SIGNAL PROCESSING

UNIT –I:

Random Processes:

Stationary random process, Ergodicity, Power spectral density and autocorrelation function of random processes. Noise power spectral density analysis, Noise bandwidth and noise figure of systems.

UNIT -II:

Data Compression Techniques:

Lossy and Lossless data reduction Algorithms, ECG data compression using Turning point, AZTEC, CORTES, Huffman coding, vector quantisation, DICOM Standards

UNIT -III:

Cardiological Signal Processing:

Pre-processing, QRS Detection Methods, Rhythm analysis, Arrhythmia Detection Algorithms, Morphological Analysis of ECG, Artifacts in ECG
Automated ECG Analysis, , ECG Pattern Recognition Analysis,
ECG Pattern Recognition.
Adaptive Noise Cancelling: Principles of Adaptive Noise Cancelling, Adaptive Noise Cancelling with the LMS Adaptation Algorithm, Noise Cancelling Method to Enhance ECG Monitoring, Fetal ECG Monitoring.

UNIT -IV:

Signal Averaging, Polishing: Mean and trend removal, Prony‟s method, Prony's Method based on the Least Squares Estimate, Linear prediction, Yule – Walker (Y –W) equations, Analysis of Evoked Potentials.

UNIT -V:

Neurological Signal Processing:

Modelling of EEG Signals, Detection of spikes and spindles Detection of Alpha, Beta and Gamma Waves, Auto Regressive (A.R.) modelling of seizure EEG, Sleep Stage analysis, Inverse Filtering, Least squares and polynomial modelling.

TEXT BOOKS:

1. Probability, Random Variables & Random Signal Principles – Peyton Z. Peebles, 4th Ed., 2009, TMH.
2. Biomedical Signal Processing- Principles and Techniques - D. C. Reddy, 2005, TMH.

REFERENCE BOOKS:

1. Digital Bio signal Processing - Weitkunat R, 1991, Elsevier.
2. R M Rangayyan “Biomedical Signal Analysis: A case Based Approach”, IEEE Press, John Wiley & Sons. Inc, 2002
3. Biomedical Signal Processing - Akay M , IEEE Press.
4. Biomedical Signal Processing -Vol. I Time & Frequency Analysis - Cohen.A, 1986, CRC Press.
5. Biomedical Digital Signal Processing: C-Language Experiments and Laboratory Experiments, Willis J. Tompkins, PHI.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
Electronics and Communication Engineering

DATA ACQUISITION SYSTEMS

UNIT-1

INTRODUCTION: Objective of a DAS, single channel DAS, Multi-channel DAS,Components used in DAS– Converter Characteristics-Resolution-Non-linearity,settling time, Monotonicity.

UNIT-2

ANALOG TO DIGITAL CONVERTERS (ADCS): Classification of A/D converters.Parallel feed back – Successive approximation – Ramp comparison – Dual slope integration – Voltage to frequency – Voltage to Time – Logarithmic types of ADCS.

NON-LINEAR DATA CONVERTERS (NDC): Basic NDC configurations – Some common NDACS and NADCS – Programmable non-linear ADCS – NADC using optimal sized ROM – High speed hybrid NADC – PLS based NADC – Switched capacitor NDCS.

ADC APPLICATIONS: Data Acquisition systems – Digital signal processing systems – PCM voice communication systems – Test and measurement instruments – Electronic weighing machines.

UNIT-3

DIGITAL TO ANALOG CONVERTERS (DACS): Principles and design of – Parallel R– 2R, Weighted resistor, inverted ladder, D/A decoding – Codes other than ordinary binary.

DATA CONVERTER APPLICATIONS: DAC applications – Digitally programmable V/I sources – Arbitrary waveform generators – Digitally programmable gain amplifiers – Analog multipliers/ dividers – Analog delay lines.

UNIT-4

Monolithic data converters: typical study of monolithic DACS and ADCS. Interfacing of DACS and ADCS to a μP.

UNIT-5

Error budget of DACS and ADCS: Error sources, error reduction and noise reduction techniques in DAS. Error budget analysis of DAS, case study of a DAC and an ADC.

TEXT BOOKS:

1. Electronic data converters fundamentals and applications – Dinesh K. Anvekar, B.S. Sonde – Tata McGraw Hill.

REFERENCES:

1. Electronic Analog/ Digital conversions – Hermann Schmid – Tata McGraw Hill.
2. E.R. Hanateck, User‟s Handbook of D/A and A/D converters - Wiley
3. Electronic instrumentation by HS Kalsi- TMH 2 nd Edition, 2004.
4. Data converters by G.B. Clayton

ADVANCED ANTENNA THEORY AND DESIGN

UNIT -I:

Antenna Theory:

Antennas, Radiation concept, Types of Antennas, Antenna parameters, Friis Transmission equation.

UNIT -II:

Aperture Antenna:

Introduction, Pyramidal Horns- Design Procedure, Conical and Corrugated Horns, Aperture Corrugated Horns, Reflected Antennas- Parameters, Analysis of front-fed parabolic reflector, Feed methods and feed types, Cassegrain Reflector Horns.

UNIT -III:

Microstrip Radiators:

Introduction, Rectangular Microstrip Antenna analysis and Design, Circular Microstrip Antenna Analysis and Design,

UNIT -IV:

Microstrip Slot Antennas:

Wave guide fed slots, Radiational mechanism, Micro strip slot antennas, Introduction rectangular slot antennas, narrow, wide, tapered and circularly polarized slot antennas, Annular slot antennas, Comparison of microstrip slot antennas with patch antennas.

UNIT -V:

Micro Strip Antenna Arrays:

Introduction, Micro strip array antennas, Characteristics of fixed beam linear antenna arrays, Linear micro strip arrays, Characteristics of planar arrays, Microstrip planar arrays, Microstrip scanned array antennas, Phase scanned microstrip arrays, Time delay scanning, Electronic feed switching, Frequency scanned microstrip arrays, Advantage and disadvantages of phased array antennas.

TEXT BOOKS:

1. Constantine Balanis. A - „Antenna Theory-Analysis and Design", 3rd Edition, John Wiley, 2005.
2. Bahl IJ, and Bhartia -NMicrostrip Antennas, Artech House, 1982.

REFERENCE BOOKS:

1. Microstrip Antenna Design Hand Book -Ramesh Garg, Prakash Bhatia, Architect House Inc. 2001.
2. Samuel Silve - Microwave Antenna - Theory and design, IEE Press, 1984.
3. James.J R. Hall, P S. Wood.C. - Micro strip Antenna-Theory and Design, PeterPeregrinu,1981.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
Electronics and Communication Engineering

MICROWAVE INTEGRATED CIRCUITS

UNIT I
MIC Technology – Thick film and Thin film technology, Hybrid MIC‟s, Monolithic MIC technology.

UNIT II
Analysis of stripline and microstripline, Method of conformal Transformation, Characteristic parameters of strip, Microstrip lines, Microstrip Circuit Design, Impedance transformers, Filters, Lumped constant Microstrip circuits.

UNIT III
Coupled Microstrips and Directional couplers, Even and odd mode analysis, Theory of couled microstrip Directional couplers, Calculations for a coupled pair of Microstrips, Branch line couplers.

UNIT IV
Lumped Elements for MIC‟s Design and fabrication of lumped elements, circuits using lumped elements.

UNIT V
Nonreciprocal components for MIC‟s Microstrip on Ferrimagnetic substrates, Microstrip circulators. Isolators and phase shifters, Design of microstrip circuits – high power and low power circuits.

TEXT BOOKS:
1. Gupta KC and Amarjit Singh - Microwave Integrated circuits, Wiley Eastern, 1974.
2. Leo Young - Advances in Microwaves, Academic Press.

REFERENCE BOOKS:
1. Bharathi Bhat,and S.K. Koul -“Stripline-like Transmission Lines for Microwave Integrated Circuits, New Age International, 2007.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
Electronics and Communication Engineering

SMART ANTENNAS

UNIT -I:

Smart Antennas:

Introduction, Need for Smart Antennas, Overview, Smart Antenna Configurations, Switched-Beam Antennas, Adaptive Antenna Approach, Space Division Multiple Access (SDMA), Architecture of a Smart Antenna System, Receiver, Transmitter, Benefits and Drawbacks, Basic Principles, Mutual Coupling Effects.

UNIT -II:

DOA Estimation Fundamentals:

Introduction, Array Response Vector, Received Signal Model, Subspace-Based Data Model, Signal Autocovariance, Conventional DOA Estimation Methods, Conventional Beamforming Method, Capon‟s Minimum Variance Method, Subspace Approach to DOA Estimation, MUSIC Algorithm, ESPRIT Algorithm, Uniqueness of DOA Estimates .

UNIT -III:

Beam Forming Fundamentals:

Classical Beam former, Statistically Optimum Beamforming Weight Vectors, Maximum SNR Beam former, Multiple Sidelobe Canceller and Maximum, SINR Beam former, Minimum Mean Square Error (MMSE), Direct Matrix Inversion (DMI), Linearly Constrained Minimum Variance (LCMV), Adaptive Algorithms for Beamforming

UNIT -IV:

Integration and Simulation of Smart Antennas:

Overview, Antenna Design, Mutual Coupling, Adaptive Signal Processing Algorithms, DOA, Adaptive Beam forming, Beam forming and Diversity Combining for Rayleigh-Fading, Channel, Trellis-Coded Modulation (TCM) for Adaptive Arrays, Smart Antenna Systems for Mobile Ad Hoc Networks (MANETs), Protocol, Simulations, Discussion.

UNIT -V:

Space–Time Processing:

Introduction, Discrete Space–Time Channel and Signal Models, Space–Time Beamforming, Intersymbol and Co-Channel Suppression, Space–Time Processing for DS-CDMA, Capacity and Data Rates in MIMO Systems, Discussion.

TEXT BOOKS:

1. „Introduction to Smart Antennas‟ - Constantine A. Balanis & Panayiotis I. Ioannides, Morgan & Claypool Publishers‟ series-2007
2. Joseph C. Liberti Jr., Theodore S Rappaport - “Smart Antennas for Wireless Communications IS-95 and Third Generation CDMA Applications”, PTR – PH publishers, 1st Edition, 1989.

REFERENCE BOOKS:

1. T.S Rappaport - “Smart Antennas Adaptive Arrays Algorithms and Wireless Position Location”, IEEE press 1998, PTR – PH publishers 1999.

Smart Antennas - Lal Chand Godara, CRC Press, LLC-2004.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
Electronics and Communication Engineering

LOW POWER VLSI DESIGN

UNIT-I: Fundamentals of Low Power VLSI Design

Need for Low Power Circuit Design, Sources of Power Dissipation – Switching Power Dissipation, Short Circuit Power Dissipation, Leakage Power Dissipation, Glitching Power Dissipation, Short Channel Effects –Drain Induced Barrier Lowering and Punch Through, Surface Scattering, Velocity Saturation, Impact Ionization, Hot Electron Effect.

UNIT-II: Low-Power Design Approaches

Low-Power Design through Voltage Scaling – VTCMOS circuits, MTCMOS circuits, Architectural Level Approach –Pipelining and Parallel Processing Approaches.

Switched Capacitance Minimization Approaches

System Level Measures, Circuit Level Measures, Mask level Measures.

UNIT-III: Low-Voltage Low-Power Adders

Introduction, Standard Adder Cells, CMOS Adder‟s Architectures – Ripple Carry Adders, Carry Look-Ahead Adders, Carry Select Adders, Carry Save Adders, Low-Voltage Low-Power Design Techniques –Trends of Technology and Power Supply Voltage, Low-Voltage Low-Power Logic Styles.

UNIT-IV: Low-Voltage Low-Power Multipliers

Introduction, Overview of Multiplication, Types of Multiplier Architectures, Braun Multiplier, Baugh-Wooley Multiplier, Booth Multiplier, Introduction to Wallace Tree Multiplier.

UNIT-V: Low-Voltage Low-Power Memories

Basics of ROM, Low-Power ROM Technology, Future Trend and Development of ROMs, Basics of SRAM, Memory Cell, Precharge and Equalization Circuit, Low-Power SRAM Technologies, Basics of DRAM, Self-Refresh Circuit, Future Trend and Development of DRAM.

TEXT BOOKS:

1. CMOS Digital Integrated Circuits – Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 2011.
2. Low-Voltage, Low-Power VLSI Subsystems – Kiat-Seng Yeo, Kaushik Roy, TMH Professional Engineering.

REFERENCE BOOKS:

1. Low Power CMOS Design – AnanthaChandrakasan, IEEE Press/Wiley International, 1998.
2. Low Power CMOS VLSI Circuit Design – Kaushik Roy, Sharat C. Prasad, John Wiley & Sons, 2000.
3. Practical Low Power Digital VLSI Design – Gary K. Yeap, Kluwer Academic Press, 2002.
4. Low Power CMOS VLSI Circuit Design – A. Bellamour, M. I. Elamasri, Kluwer Academic Press, 1995.

CMOS ANALOG AND DIGITAL IC DESIGN

UNIT-I:

MOS Devices and Modeling

The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modeling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOS Model.

MOS Design

Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT-II:

Combinational MOS Logic Circuits:

MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates , AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

Sequential MOS Logic Circuits

Behaviour of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

UNIT -III:

Dynamic Logic Circuits

Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

Semiconductor Memories

Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory-NOR flash and NAND flash.

UNIT -IV:

Analog CMOS Sub-Circuits

MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

UNIT-V:

CMOS Amplifiers

Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures.

CMOS Operational Amplifiers

Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power- Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Measurement Techniques of OP Amp.

TEXT BOOKS:

1. Digital Integrated Circuit Design – Ken Martin, Oxford University Press, 2011.
2. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Ed., 2011.
3. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.
4. Analysis and Design of Analog Integrated Circuits- Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, Wiley India, Fifth Edition, 2010.

REFERENCE BOOKS:

1. Analog Integrated Circuit Design- David A. Johns, Ken Martin, Wiley Student Edn, 2013.
2. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition.
3. CMOS: Circuit Design, Layout and Simulation- Baker, Li and Boyce, PHI.
4. Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, 2nd Ed., PHI.

****

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
Electronics and Communication Engineering

VLSI SIGNAL PROCESSING

UNIT-I:
Introduction to DSP
Typical DSP algorithms, DSP algorithms benefits, Representation of DSP algorithms
Pipelining and Parallel Processing
Introduction, Pipelining of FIR Digital filters, Parallel Processing, Pipelining and Parallel Processing for Low Power
Retiming
Introduction – Definitions and Properties – Solving System of Inequalities – Retiming Techniques

UNIT-II:
Folding: Introduction -Folding Transform - Register minimization Techniques – Register minimization in folded architectures – folding of multirate systems
Unfolding: Introduction – An Algorithm for Unfolding – Properties of Unfolding – critical Path, Unfolding and Retiming – Applications of Unfolding

UNIT-III:
Systolic Architecture Design
Introduction – Systolic Array Design Methodology – FIR Systolic Arrays – Selection of Scheduling Vector – Matrix Multiplication and 2D Systolic Array Design – Systolic Design for Space Representations contain Delays

UNIT-IV:
Fast Convolution
Introduction – Cook-Toom Algorithm – Winograd algorithm – Iterated Convolution – Cyclic Convolution – Design of Fast Convolution algorithm by Inspection

UNIT-V:
Low Power Design
Scaling Vs Power Consumption –Power Analysis, Power Reduction techniques – Power Estimation Approaches
Programmable DSP: Evaluation of Programmable Digital Signal Processors, DSP Processors for Mobile and Wireless Communications, Processors for Multimedia Signal Processing.

TEXT BOOKS:

1. VLSI Digital Signal Processing- System Design and Implementation – Keshab K. Parhi, 1998, Wiley Inter Science.
2. VLSI and Modern Signal Processing – Kung S. Y, H. J. While House, T. Kailath, 1985, Prentice Hall.

REFERENCE BOOKS:

1. Design of Analog – Digital VLSI Circuits for Telecommunications and Signal Processing – Jose E. France, Yannis Tsividis, 1994, Prentice Hall.
2. VLSI Digital Signal Processing – Medisetti V. K, 1995, IEEE Press (NY), USA.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
Electronics and Communication Engineering

NETWORK SECURITY AND CRYPTOGRAPHY

UNIT -I:

Introduction:

Attacks, Services and Mechanisms, Security attacks, Security services, A Model for Internetwork security. Classical Techniques: Conventional Encryption model, Steganography, Classical Encryption Techniques.

Modern Techniques:

Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operations.

UNIT -II:

Encryption Algorithms:

Triple DES, International Data Encryption algorithm, Blowfish, RC5, CAST-128, RC2, Characteristics of Advanced Symmetric block cifers. **Conventional Encryption :** Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation.

UNIT -III:

Public Key Cryptography: Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptograpy. **Number Theory:** Prime and Relatively prime numbers, Modular arithmetic, Fermat‟s and Euler‟s theorems, Testing for primality, Euclid‟s Algorithm, the Chinese remainder theorem, Discrete logarithms.

UNIT -IV:

Message Authentication and Hash Functions: Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs. **Hash and Mac Algorithms**

MD File, Message digest Algorithm, Secure Hash Algorithm, RIPEMD-160, HMAC. Digital signatures and Authentication protocols: Digital signatures, Authentication Protocols, Digital signature standards.

Authentication Applications : Kerberos, X.509 directory Authentication service. Electronic Mail Security: Pretty Good Privacy, S/MIME.

UNIT –V:

IP Security:

Overview, Architecture, Authentication, Encapsulating Security Payload, Combining security Associations, Key Management. Web Security: Web Security requirements, Secure sockets layer and Transport layer security, Secure Electronic Transaction.

Intruders, Viruses and Worms

Intruders, Viruses and Related threats.

Fire Walls: Fire wall Design Principles, Trusted systems.

TEXT BOOKS:

1. Cryptography and Network Security: Principles and Practice - William Stallings, Pearson Education.
2. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.

REFERENCE BOOKS:

1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
2. Network Security - Private Communication in a Public World by Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.
3. Principles of Information Security, Whitman, Thomson.
4. Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH
5. Introduction to Cryptography, Buchmann, Springer.

PAPER – II

EMBEDDED SYSTEM DESIGN

UNIT-I: Introduction

An Embedded System-Definition, Examples, Current Technologies, Integration in system Design, Embedded system design flow, hardware design concepts, software development, processor in an embedded system and other hardware units, introduction to processor based embedded system design concepts.

UNIT-II: Embedded Hardware

Embedded hardware building blocks, Embedded Processors – ISA architecture models, Internal processor design, processor performance, Board Memory – ROM, RAM, Auxiliary Memory, Memory Management of External Memory, Board Memory and performance.
Embedded board Input / output – Serial versus Parallel I/O, interfacing the I/O components, I/O components and performance, Board buses – Bus arbitration and timing, Integrating the Bus with other board components, Bus performance.

UNIT-III: Embedded Software

Device drivers, Device Drivers for interrupt-Handling, Memory device drivers, On-board bus device drivers, Board I/O drivers, Explanation about above drivers with suitable examples.
Embedded operating systems – Multitasking and process Management, Memory Management, I/O and file system management, OS standards example – POSIX, OS performance guidelines, Board support packages, Middleware and Application Software – Middle ware, Middleware examples, Application layer software examples.

UNIT-IV: Embedded System Design, Development, Implementation and Testing

Embedded system design and development lifecycle model, creating an embedded system architecture, introduction to embedded software development process and tools- Host and Target machines, linking and locating software, Getting embedded software into the target system, issues in Hardware-Software design and co-design.
Implementing the design-The main software utility tool, CAD and the hardware, Translation tools, Debugging tools, testing on host machine, simulators, Laboratory tools, System Boot-Up.

UNIT-V: Embedded System Design-Case Studies

Case studies- Processor design approach of an embedded system –Power PC Processor based and Micro Blaze Processor based Embedded system design on Xilinx platform-NiosII Processor based Embedded system design on Altera platform-Respective Processor architectures should be taken into consideration while designing an Embedded System.

TEXT BOOKS:

1. Tammy Noergaard "Embedded Systems Architecture: A Comprehensive Guide for Engineers and Programmers", Elsevier(Singapore) Pvt.Ltd.Publications, 2005.
2. Frank Vahid, Tony D. Givargis, "Embedded system Design: A Unified Hardware/Software Introduction", John Wily & Sons Inc.2002.

REFERENCE BOOKS:

1. Peter Marwedel, "Embedded System Design", Science Publishers, 2007.
2. Arnold S Burger, "Embedded System Design", CMP.
3. Rajkamal, "Embedded Systems: Architecture, Programming and Design", TMH Publications, Second Edition, 2008.

WIRELESS COMMUNICATIONS AND NETWORKS

UNIT -I:

The Cellular Concept-System Design Fundamentals:

Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies-Prioritizing Handoffs, Practical Handoff Considerations, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference , Power Control for Reducing interference, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring .

UNIT –II:

Mobile Radio Propagation: Large-Scale Path Loss:

Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle, Reflection from prefect conductors, Ground Reflection (Two-Ray) Model, Diffraction-Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering, Outdoor Propagation Models- Longley-Ryce Model, Okumura Model, Hata Model, PCS Extension to Hata Model, Walfisch and Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models-Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific Modeling.

UNIT –III:

Mobile Radio Propagation: Small –Scale Fading and Multipath

Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke‟s model for flat fading, spectral shape due to Doppler spread in Clarke‟s model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.

UNIT -IV:

Equalization and Diversity

Introduction, Fundamentals of Equalization, Training A Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Non-linear Equalization-Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity Techniques-Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration-Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity, RAKE Receiver.

UNIT -V:

Wireless Networks

Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11,IEEE 802.11 Medium Access

Control, Comparision of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, Hiper Lan, WLL.

TEXT BOOKS:

1. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2nd Ed., 2002, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. Mobile Cellular Communication – Gottapu Sasibhushana Rao, Pearson Education, 2012.

REFERENCE BOOKS:

1. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, 2002, PE
2. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
3. Wireless Communication and Networking – William Stallings, 2003, PHI.
4. Wireless Communication – Upen Dalal, Oxford Univ. Press
5. Wireless Communications and Networking – Vijay K. Gary, Elsevier.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
Electronics and Communication Engineering

IMAGE AND VIDEO PROCESSING

UNIT –I:

Fundamentals of Image Processing and Image Transforms:

Introduction, Image sampling, Quantization, Resolution, Image file formats, Elements of image processing system, Applications of Digital image processing

Introduction, Need for transform, image transforms, Fourier transform, 2 D Discrete Fourier transform and its transforms, Importance of phase, Walsh transform, Hadamard transform, Haar transform, slant transform Discrete cosine transform, KL transform, singular value decomposition, Radon transform, comparison of different image transforms.

UNIT –II:

Image Enhancement:

Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters.

Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.

Image Restoration:

Introduction to Image restoration, Image degradation, Types of image blur, Classification of image restoration techniques, Image restoration model, Linear and Nonlinear image restoration techniques, Blind deconvolution

UNIT –III:

Image Segmentation:

Introduction to image segmentation, Point, Line and Edge Detection, Region based segmentation., Classification of segmentation techniques, Region approach to image segmentation, clustering techniques, Image segmentation based on thresholding, Edge based segmentation, Edge detection and linking, Hough transform, Active contour

Image Compression:

Introduction, Need for image compression, Redundancy in images, Classification of redundancy in images, image compression scheme, Classification of image compression schemes, Fundamentals of information theory, Run length coding, Shannon – Fano coding, Huffman coding, Arithmetic coding, Predictive coding, Transformed based compression, Image compression standard, Wavelet-based image compression, JPEG Standards.

UNIT -IV:

Basic Steps of Video Processing:

Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals, Filtering operations.

UNIT –V:

2-D Motion Estimation:

Optical flow, General Methodologies, Pixel Based Motion Estimation, Block- Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.

TEXT BOOKS:

1. Digital Image Processing – Gonzaleze and Woods, 3rd Ed., Pearson.
2. Video Processing and Communication – Yao Wang, Joem Ostermann and Ya–quin Zhang. 1st Ed., PH Int.
3. S.Jayaraman, S.Esakkirajan and T.VeeraKumar, "Digital Image processing, Tata Mc Graw Hill publishers, 2009

REFRENCE BOOKS:

1. Digital Image Processing and Analysis-Human and Computer Vision Application with CVIP Tools – Scotte Umbaugh, 2nd Ed, CRC Press, 2011.
2. Digital Video Processing – M. Tekalp, Prentice Hall International.
3. Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar – TMH, 2009.
4. Multidimentional Signal, Image and Video Processing and Coding – John Woods, 2nd Ed, Elsevier.
5. Digital Image Processing with MATLAB and Labview – Vipula Singh, Elsevier.
6. Video Demystified – A Hand Book for the Digital Engineer – Keith Jack, 5th Ed., Elsevier.

OPTICAL COMMUNICATION TECHNOLOGY

UNIT –I:

Signal propagation in Optical Fibers:

Geometrical Optics approach and Wave Theory approach, Loss and Bandwidth, Chromatic Dispersion, Non Linear effects- Stimulated Brillouin and Stimulated Raman Scattering, Propagation in a Non-Linear Medium, Self-Phase Modulation and Cross Phase Modulation, Four Wave Mixing, Principle of Solitons.

UNIT –II:

Fiber Optic Components for Communication & Networking:

Couplers, Isolators and Circulators, Multiplexers, Bragg Gratings, Fabry-Perot Filters, Mach Zender Interferometers, Arrayed Waveguide Grating, Tunable Filters, High Channel Count Multiplexer Architectures, Optical Amplifiers, Direct and External Modulation Transmitters, Pump Sources for Amplifiers, Optical Switches and Wavelength Converters.

UNIT –III:

Modulation and Demodulation:

Signal formats for Modulation, Subcarrier Modulation and Multiplexing, Optical Modulations – Duobinary, Single Side Band and Multilevel Schemes, Ideal and Practical receivers for Demodulation, Bit Error Rates, Timing Recovery and Equalization, Reed-Solomon Codes for Error Detection and Correction.

UNIT -IV:

Transmission System Engineering:

System Model, Power Penalty in Transmitter and Receiver, Optical Amplifiers, Crosstalk and Reduction of Crosstalk, Cascaded Filters, Dispersion Limitations and Compensation Techniques.

UNIT –V:

Fiber Non-linearities and System Design Considerations:

Limitation in High Speed and WDM Systems due to Non-linearities in Fibers, Wavelength Stabilization against Temperature Variations, Overall System Design considerations – Fiber Dispersion, Modulation, Non-Linear Effects, Wavelengths, All Optical Networks.

TEXT BOOKS:

1. Optical Networks: A Practical Perspective - Rajiv Ramaswami and Kumar N. Sivarajan, 2nd Ed., 2004, Elsevier Morgan Kaufmann Publishers (An Imprint of Elsevier).
2. Optical Fiber Communications – Gerd Keiser, 3rd Ed., 2000, McGraw Hill.

REFERENCE BOOKS:

1. Optical Fiber Communications: Principles and Practice – John.M.Senior, 2nd Ed., 2000, PE.
2. Fiber Optics Communication – Harold Kolimbris, 2nd Ed., 2004, PEI
3. Optical Networks: Third Generation Transport Systems – Uyless Black, 2nd Ed., 2009, PEI
4. Optical Fiber Communications – Govind Agarwal, 2nd Ed., 2004, TMH.
5. Optical Fiber Communications and Its Applications – S.C.Gupta, 2004, PHI.

STATISTICAL SIGNAL PROCESSING

UNIT I

Signal models and characterization: Types and properties of statistical models for signals and how they relate to signal processing,Common second-order methods of characterizing signals including autocorrelation,partial correlation, cross-correlation, power spectral density and cross-power spectral density.

UNIT II

Spectral estimation: Nonparametric methods for estimation of power spectral density, autocorreleation, cross-correlation,transfer functions, and coherence form finite signal samples.

UNIT III

Review of signal processing: A review on random processes, Areview on filtering random processes, Examples.
Statistical parameter estimation: Maximum likehood estimation, maximum a posterior stimation, Cramer-Rao bound.

UNIT IV

Eigen structure based requency estimation: Pisarenko, MUSIC, ESPRIT their application sensor array direction finding.
Spectrum estimation: Moving average (MA), Auto Regressive (AR), Auto Regressive Moving Average (ARMA), Various non-parametirc approaches.

UNIT V

Wiener filtering: The finite impulse case, causal and non-causal infinite impulse responses cases, Least mean squares adaptation, recursive least squares adaptation, Kalman filtering.

Text books:

1. Steven M.Kay, fundamentals of statistical signal processing: estimation Theory,Pretice-Hall,1993.
2. Monsoon H. Hayes, Stastical digital signal processing and modeling, USA, Wiley,1996.

Reference books:

1. Dimitris G.Manolakis, Vinay K. Ingle, and Stephen M. Kogon, Statistical and adaptive signal processing, Artech House, Inc,2005, ISBN 1580536107

PATTERN RECOGNITION PRINCIPLES

UNIT I : Introduction:
Fundamental problems in pattern Recognition system design, Design concepts and methodologies, Simple pattern recognition model.

Decisions and Distance Functions:
Linear and generalized decision functions, Pattern space and weight space, Geometrical properties, implementations of decision functions, Minimum-distance pattern classifications.

Probability - Probability of events:
Random variables, Joint distributions and densities, Movements of random variables, Estimation of parameter from samples.

UNIT - II: Decision making - Baye‟s theorem, Multiple features, Conditionally independent features, Decision boundaries, Unequal cost of error, estimation of error rates, the leaving-one-out-techniques, characteristic curves, estimating the composition of populations. Baye‟s classifier for normal patterns.

Non Parametric Decision Making:
histogram, kernel and window estimation, nearest neighbour classification techniques. Adaptive decision boundaries, adaptive discriminant functions, Minimum squared error discriminant functions, choosing a decision making techniques.

UNIT III: Clustering and Partitioning:
Hierarchical Clustering: Introduction, agglomerative clustering algorithm, the single-linkage, complete-linkage and average-linkage algorithm. Ward‟s method Partition clustering-Forg‟s algorithm, K-means‟s algorithm, Isodata algorithm.

UNIT IV: Pattern Preprocessing and Feature selection:
distance measures, clustering transformation and feature ordering, clustering in feature selection through entropy minimization, features selection through orthogonal expansion, binary feature selection.

UNIT V: Syntactic Pattern Recognition and Application of Pattern Recognition:
Concepts from formal language theory, formulation of syntactic pattern recognition problem, syntactic pattern description, recognition grammars, automata as pattern recognizers, Application of pattern recognition techniques in bio-metric, facial recognition, IRIS scon, Finger prints, etc.,

Reference books:

1. Pattern recognition and Image Analysis, Gose. Johnsonbaugh Jost, PHI.
2. Pattern Recognition Principle, Tou. Rafael. Gonzalez, Pea.
3. Pattern Classification, Richard duda, Hart., David Strok, Wiley.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM

Syllabus for Pre-Ph. D Examination

Electronics and Communication Engineering

MOBILE COMPUTING TECHNOLOGIES

UNIT –I:

Introduction to Mobile Computing Architecture:

Mobile Computing – Dialog Control – Networks – Middleware and Gateways – Application and Services – Developing Mobile Computing Applications – Security in Mobile Computing – Architecture for Mobile Computing – Three Tier Architecture – Design considerations for Mobile Computing – Mobile Computing through Internet – Making existing Applications Mobile Enabled.

UNIT –II:

Cellular Technologies: GSM, GPS, GPRS, CDMA and 3G:

Bluetooth – Radio Frequency Identification – Wireless Broadband – Mobile IP – Internet Protocol Version 6 (IPv6) – Java Card – GSM Architecture – GSM Entities – Call Routing in GSM – PLMN Interfaces – GSM addresses and Identifiers – Network aspects in GSM – Authentication and Security – Mobile computing over SMS – GPRS and Packet Data Network – GPRS Network Architecture – GPRS Network Operations – Data Services in GPRS – Applications for GPRS – Limitations of GPRS – Spread Spectrum technology – Is-95 – CDMA Versus GSM – Wireless Data – Third Generation Networks – Applications on 3G

UNIT –III:

Wireless Application Protocol (WAP) and Wireless LAN:

WAP – MMS – Wireless LAN Advantages – IEEE 802.11 Standards – Wireless LAN Architecture – Mobility in wireless LAN

Intelligent Networks and Interworking:

Introduction – Fundamentals of Call processing – Intelligence in the Networks – SS#7 Signaling – IN Conceptual Model (INCM) – soft switch – Programmable Networks – Technologies and Interfaces for IN

UNIT –IV:

Client Programming, Palm OS, Symbian OS, Win CE Architecture:

Introduction – Moving beyond the Desktop – A Peek under the Hood: Hardware Overview – Mobile phones – PDA – Design Constraints in Applications for Handheld Devices – Palm OS architecture – Application Development – Multimedia – Symbian OS Architecture – Applications for Symbian, Different flavors of Windows CE -Windows CE Architecture

J2ME:

JAVA in the Handset – The Three-prong approach to JAVA Everywhere – JAVA 2 Micro Edition (J2ME) technology – Programming for CLDC – GUI in MIDP – UI Design Issues – Multimedia – Record Management System – Communication in MIDP – Security considerations in MIDP – Optional Packages

UNIT –V:

Voice Over Internet Protocol and Convergence:

Voice over IP- H.323 Framework for Voice over IP – Session Initiation Protocol – Comparision between H.323 and SIP – Real Time protocols – Convergence Technologies – Call Routing – Voice over IP Applications – IP multimedia subsystem (IMS) – Mobile VoIP

Security Issues in Mobile Computing:

Introduction – Information Security – Security Techniques and Algorithms – Security Protocols – Public Key Infrastructure – Trust – Security Models – Security frameworks for Mobile Environment

TEXT BOOKS:

1. Mobile Computing – Technology, Applications and Service Creation – Asoke K Talukder, Roopa R Yavagal, 2009, TATA McGraw Hill
2. Mobile Communications – Jochen Schiller – 2nd Edition – Pearson Education

REFERENCE BOOKS:

1. The CDMA 2000 System for Mobile Communications – Vieri Vaughi, Alexander Damn Jaonvic – Pearson
2. Adalestein - Fundamentals of Mobile & Parvasive Computing, 2008, TMH

PHASED ARRAY SYSTEMS

UNIT –I:

Conventional Scanning Techniques:

Mechanical versus electronic scanning, Techniques of Electronic scanning, Frequency, Phase and time delay scanning principle, Hybrid scanning techniques.

UNIT –II:

Array Theory:

Linear and Planner arrays, various grid configuration, Concept of cell and grid, Calculation of minimum number of elements, Radiation pattern, Grating lobe formation, Rectangular and triangular grid design of arrays.

UNIT –III:

Feed Networks for phased Arrays:

Corporate Feed, Lens and Reflect feed

Techniques, Optimum f/d ratio basic building block for corporate feed network, Series, Parallel feed networks, Comparison of various feeding techniques, Antenna Array Architecture, Brick/ Tile Type construction.

UNIT –IV:

Frequency Scanned Array Design:

Snake feed, Frequency-phase scanning, Phase scanning, Digital phase shifter PIN diode and Ferrite phase shifters for phased arrays, Beam pointing errors due to digitalization, Beam pointing accuracy.

UNIT –V:

Search Patterns:

Calculation of search frame time, airborne phased array design, Electronic scanning radar parameter calculation, Application of phased arrays, Phased Array Radar Systems, Active Phased Array, TR/ATR Modules.

TEXT BOOKS:

1. Olliner, A.A, and G.H. Knittel - Phased Array Antennas, Artech House, 1972.
2. Kahrilas. PJ - Electronic Scanning Radar Systems Design Handbook, Artech House, 1976.

REFERENCE BOOKS:

1. Skolnik. MI- Radar Handbook, Mcgraw Hillso, NY,McGrow Hills-2007
2. Galati,G-(editor) - Advanced Radar Technique and Systems, Peter Peregrims Ltd, London, 1993.

MICROWAVE NETWORKS

UNIT –I:

Introduction to Microwave Circuit Concept:

One port junction, Terminal voltage and currents in multipart junctions, Poynting‟s energy theorem, Normalized waves and scattering matrix. Properties of [s]matrix

UNIT –II:

Relationship between [s], [z] and [y] Parameters:

Wave amplitude transmission matrix[A], Relation between [A] and [s], [s] matrix of magic T, E and H plane tees, Directionl coupler, Applications of hybrid junction and magic tee.

UNIT –III:

Passive Microwave Devices:

Even and odd mode analysis of symmetrical 4 port networks, Analysis and design of branch line couplers, Hybrid ring coupler, Frequency response, Branching synthesis of hybrids, Applications of hybrids.

UNIT –IV:

Microwave Propagation in Ferrites:

Principles of Faraday rotation, Isolator, Gyrator, Circulator, Phase shifters, S-matrix of non reciprocal devices, Broad band matching multisection quarter wave transformers, Binomial and chebshev transformers design, Tapered transmission line exponential and triangular tapers, Synthesis of transmission line tapers.

UNIT –V:

Wave Analysis of Periodic Structures:

Image parameters method of micro wave filter design, Power loss ratio, Filter design by insertion loss method, Frequency transformation maximally flat and chebyshev filter design and characteristics.

TEXT BOOKS:

1. Altmen JL -Microwave circuit, D van Nostrand Co.,Inc.,1964.
2. Collins. RE - Foundations for microwave engineering, John Wiley & Sons, inc 2nd Edn, 2009.

REFERENCE BOOKS:

1. Ghosh.RN - Microwave Circuit Theory and Analysis, McGrew Hill.
2. Pozer.D M - Microwave Engineering, 2nd Edn., John Wiley and Sons, Inc.,1999.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
Electronics and Communication Engineering

RF CIRCUIT DESIGN

UNIT -I:

Introduction to RF Electronics:

The Electromagnetic Spectrum, units and Physical Constants, Microwave bands – RF behavior of Passive components: Tuned resonant circuits, Vectors, Inductors and Capacitors - Voltage and Current in capacitor circuits – Tuned RF / IF Transformers.

UNIT -II:

Transmission Line Analysis: Examples of transmission lines- Transmission line equations and Biasing- Micro Strip Transmission Lines- Special Termination Conditions- sourced and Loaded Transmission Lines. **Single And Multiport Networks:** The Smith Chart, Interconnectivity networks, Network properties and Applications, Scattering Parameters.

UNIT -III:

Matching and Biasing Networks:

Impedance matching using discrete components – Micro strip line matching networks, Amplifier classes of Operation and Biasing networks. **RF Passive & Active Components:** Filter Basics – Lumped filter design – Distributed Filter Design – Diplexer Filters- Crystal and Saw filters- Active Filters - Tunable filters – Power Combiners / Dividers – Directional Couplers – Hybrid Couplers – Isolators. RF Diodes – BJTs- FETs- HEMTs and Models.

UNIT -IV:

RF Transistor Amplifier Design: Characteristics of Amplifiers - Amplifier Circuit Configurations, Amplifier Matching Basics, Distortion and noise products, Stability Considerations, Small Signal amplifier design, Power amplifier design, MMIC amplifiers, Broadband High Power multistage amplifiers, Low noise amplifiers, VGA Amplifiers.

UNIT -V:

Oscillators: Oscillator basics, Low phase noise oscillator design, High frequency Oscillator configuration, LC Oscillators, VCOs, Crystal Oscillators, PLL Synthesizer, and Direct Digital Synthesizer. **RF Mixers:** Basic characteristics of a mixer - Active mixers- Image Reject and Harmonic mixers, Frequency domain considerations.

TEXT BOOKS:

1. RF Circuit design: Theory and applications by Reinhold Ludwing, Pavel Bretchko. Pearson Education Asia Publication, New Delhi 2001.
2. Radio Frequency and Microwave Communication Circuits – Analysis and Design – Devendra K. Misra, Wiley Student Edition, John Wiley & Sons

REFERENCE BOOKS:

1. Radio frequency and Microwave Electronics - Mathew M.Radmangh, 2001, PE Asia Publ.
2. RF Circuit Design – Christopher Bowick, Cheryl Aljuni and John Biyler, Elsevier Science, 2008.
3. Secrets of RF Design - Joseph Carr., 3rd Edition, Tab Electronics.
4. Complete Wireless Design - Cotter W. Sawyer, 2nd Edition, Mc-Graw Hill.
5. Practical RF Circuit Design for Modem Wireless Systems Vol.2 -Less Besser and Rowan Gilmore.

CMOS MIXED SIGNAL CIRCUIT DESIGN

UNIT-I: Switched Capacitor Circuits

Introduction to Switched Capacitor circuits- basic building blocks, Operation and Analysis, Non-ideal effects in switched capacitor circuits, Switched capacitor integrators first order filters, Switch sharing, biquad filters.

UNIT-II: Phased Lock Loop (PLL)

Basic PLL topology, Dynamics of simple PLL, Charge pump PLLs-Lock acquisition, Phase/Frequency detector and charge pump, Basic charge pump PLL, Non-ideal effects in PLLs-PFD/CP non-idealities, Jitter in PLLs, Delay locked loops, applications.

UNIT-III: Data Converter Fundamentals

DC and dynamic specifications, Quantization noise, Nyquist rate D/A converters- Decoder based converters, Binary-Scaled converters, Thermometer-code converters, Hybrid converters

UNIT-IV: Nyquist Rate A/D Converters

Successive approximation converters, Flash converter, Two-step A/D converters, Interpolating A/D converters, Folding A/D converters, Pipelined A/D converters, Time-interleaved converters.

UNIT-V: Oversampling Converters

Noise shaping modulators, Decimating filters and interpolating filters, Higher order modulators, Delta sigma modulators with multibit quantizers, Delta sigma D/A

TEXT BOOKS:

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition, 2002
2. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.
3. Analog Integrated Circuit Design- David A. Johns,Ken Martin, Wiley Student Edition, 2013

REFERENCE BOOKS:

1. CMOS Integrated Analog-to- Digital and Digital-to-Analog converters-Rudy Van De Plassche, Kluwer Academic Publishers, 2003
2. Understanding Delta-Sigma Data converters-Richard Schreier, Wiley Interscience, 2005.
3. CMOS Mixed-Signal Circuit Design - R. Jacob Baker, Wiley Interscience, 2009.

SEMICONDUCTOR MEMORY DESIGN AND TESTING

UNIT-I: Random Access Memory Technologies

SRAM – SRAM Cell structures, MOS SRAM Architecture, MOS SRAM cell and peripheral circuit operation, Bipolar SRAM technologies, SOI technology, Advanced SRAM architectures and technologies, Application specific SRAMs, DRAM – DRAM technology development, CMOS DRAM, DRAM cell theory and advanced cell structures, BICMOS DRAM, soft error failure in DRAM, Advanced DRAM design and architecture, Application specific DRAM.

UNIT-II: Non-volatile Memories

Masked ROMs, High density ROM, PROM, Bipolar ROM, CMOS PROMS, EPROM, Floating gate EPROM cell, One time programmable EPROM, EEPROM, EEPROM technology and architecture, Non-volatile SRAM, Flash Memories (EPROM or EEPROM), advanced Flash memory architecture

UNIT-III: Memory Fault Modeling Testing and Memory Design for Testability and Fault Tolerance

RAM fault modeling, Electrical testing, Pseudo Random testing, Megabit DRAM Testing, non-volatile memory modeling and testing, IDDQ fault modeling and testing, Application specific memory testing, RAM fault modeling, BIST techniques for memory

UNIT-IV: Semiconductor Memory Reliability and Radiation Effects

General reliability issues RAM failure modes and mechanism, Non-volatile memory reliability, reliability modeling and failure rate prediction, Design for Reliability, Reliability Test Structures, Reliability Screening and qualification, Radiation effects, Single Event Phenomenon (SEP), Radiation Hardening techniques, Radiation Hardening Process and Design Issues, Radiation Hardened Memory characteristics, Radiation Hardness Assurance and Testing, Radiation Dosimetry, Water Level Radiation Testing and Test structures

UNIT-V: Advanced Memory Technologies and High-density Memory Packing Technologies

Ferroelectric RAMs (FRAMs), GaAs FRAMs, Analog memories, magneto resistive RAMs (MRAMs), Experimental memory devices, Memory Hybrids and MCMs (2D), Memory Stacks and MCMs (3D), Memory MCM testing and reliability issues, Memory cards, High Density Memory Packaging Future Directions.

TEXT BOOKS:

1. Semiconductor Memories Technology – Ashok K. Sharma, 2002, Wiley.
2. Advanced Semiconductor Memories – Architecture, Design and Applications - Ashok K. Sharma- 2002, Wiley.
3. Modern Semiconductor Devices for Integrated Circuits – Chenming C Hu, 1st Ed., Prentice Hall.

DESIGN FOR TESTABILITY

UNIT-I:

Introduction to Testing

Testing Philosophy, Role of Testing, Digital and Analog VLSI Testing, VLSI Technology Trends affecting Testing, Types of Testing, Fault Modeling: Defects, Errors and Faults, Functional Versus Structural Testing, Levels of Fault Models, Single Stuck-at Fault.

UNIT-II:

Logic and Fault Simulation

Simulation for Design Verification and Test Evaluation, Modeling Circuits for Simulation, Algorithms for True-value Simulation, Algorithms for Fault Simulation.

UNIT -III:

Testability Measures

SCOAP Controllability and Observability, High Level Testability Measures, Digital DFT and Scan Design: Ad-Hoc DFT Methods, Scan Design, Partial-Scan Design, Variations of Scan.

UNIT-IV:

Built-In Self-Test

The Economic Case for BIST, Random Logic BIST: Definitions, BIST Process, Pattern Generation, Response Compaction, Built-In Logic Block Observers, Test-Per-Clock, Test-Per-Scan BIST Systems, Circular Self Test Path System, Memory BIST, Delay Fault BIST.

UNIT-V:

Boundary Scan Standard

Motivation, System Configuration with Boundary Scan: TAP Controller and Port, Boundary Scan Test Instructions, Pin Constraints of the Standard, Boundary Scan Description Language: BDSL Description Components, Pin Descriptions.

TEXT BOOKS:

1. Essentials of Electronic Testing for Digital, Memory and Mixed Signal VLSI Circuits - M.L. Bushnell, V. D. Agrawal, Kluwer Academic Pulishers.

REFERENCE BOOKS:

1. Digital Systems and Testable Design - M. Abramovici, M.A.Breuer and A.D Friedman, Jaico Publishing House.
2. Digital Circuits Testing and Testability - P.K. Lala, Academic Press.

CPLD AND FPGA ARCHITECURES AND APPLICATIONS

UNIT-I: Introduction to Programmable Logic Devices

Introduction, Simple Programmable Logic Devices – Read Only Memories, Programmable Logic Arrays, Programmable Array Logic, Programmable Logic Devices/Generic Array Logic; Complex Programmable Logic Devices – Architecture of Xilinx Cool Runner XCR3064XL CPLD, CPLD Implementation of a Parallel Adder with Accumulation.

UNIT-II: Field Programmable Gate Arrays

Organization of FPGAs, FPGA Programming Technologies, Programmable Logic Block Architectures, Programmable Interconnects, Programmable I/O blocks in FPGAs, Dedicated Specialized Components of FPGAs, Applications of FPGAs.

UNIT-III: SRAM Programmable FPGAs

Introduction, Programming Technology, Device Architecture, The Xilinx XC2000, XC3000 and XC4000 Architectures.

UNIT-IV: Anti-Fuse Programmed FPGAs

Introduction, Programming Technology, Device Architecture, The Actel ACT1, ACT2 and ACT3 Architectures.

UNIT-V: Design Applications

General Design Issues, Counter Examples, A Fast Video Controller, A Position Tracker for a Robot Manipulator, A Fast DMA Controller, Designing Counters with ACT devices, Designing Adders and Accumulators with the ACT Architecture.

TEXT BOOKS:

1. Field Programmable Gate Array Technology - Stephen M. Trimberger, Springer International Edition.
2. Digital Systems Design - Charles H. Roth Jr, Lizy Kurian John, Cengage Learning.

REFERENCE BOOKS:

1. Field Programmable Gate Arrays - John V. Oldfield, Richard C. Dorf, Wiley India.
2. Digital Design Using Field Programmable Gate Arrays - Pak K. Chan/Samiha Mourad, Pearson Low Price Edition.
3. Digital Systems Design with FPGAs and CPLDs - Ian Grout, Elsevier, Newnes.
4. FPGA based System Design - Wayne Wolf, Prentice Hall Modern Semiconductor Design Series.

MICRO ELECTRO MECHANICAL SYSTEM DESIGN

UNIT-I: Introduction

Basic structures of MEM devices – (Canti-Levers, Fixed Beams diaphragms). Broad Response of Micro electromechanical systems (MEMS) to Mechanical (Force, pressure etc.) Thermal, Electrical, optical and magnetic stimuli, compatibility of MEMS from the point of power dissipation, leakage etc.

UNIT-II: Review

Review of mechanical concepts like stress, strain, bending moment, deflection curve. Differential equations describing the deflection under concentrated force, Distributed force, distributed force, Deflection curves for canti-levers- fixed beam. Electrostatic excitation – columbic force between the fixed and moving electrodes. Deflection with voltage in C.L, Deflection Vs Voltage curve, critical fringe field – field calculations using Laplace equation. Discussion on the approximate solutions – Transient response of the MEMS.

UNIT-III: Types

Two terminal MEMS - capacitance Vs voltage Curve – Variable capacitor. Applications of variable capacitors. Two terminal MEM structures. Three terminal MEM structures – Controlled variable capacitors – MEM as a switch and possible applications.

UNIT-IV: MEM Circuits & Structures

MEM circuits & structures for simple GATES- AND, OR, NAND, NOR, Exclusive OR, simple MEM configurations for flip-flops triggering applications to counters, converters. Applications for analog circuits like frequency converters, wave shaping. RF Switches for modulation. MEM Transducers for pressure, force temperature. Optical MEMS.

UNIT-V: MEM Technologies

Silicon based MEMS- Process flow – Brief account of various processes and layers like fixed layer, moving layers spacers etc., and etching technologies.

Metal Based MEMS: Thin and thick film technologies for MEMS. Process flow and description of the processes, Status of MEMS in the current electronics scenario.

TEXT BOOKS:

1. MEMS Theory, Design and Technology - GABRIEL. M.Review, R.F.,2003, John wiley & Sons. .
2. Strength of Materials –Thimo Shenko, 2000, CBS publishers & Distributors.
3. MEMS and NEMS, Systems Devices; and Structures - Servey E.Lyshevski, 2002, CRC Press.

REFERENCE BOOKS:

1. Sensor Technology and Devices - Ristic L. (Ed) , 1994, Artech House, London.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
COMPUTER SCIENCE & ENGINEERING
Syllabus for Pre-Ph. D ExaminationCSE

PAPER – I	
S. No	**Subject**
1	Advanced Databases
2	Artificial Intelligence
3	Data Mining & Knowledge Discovery
4	Digital Image Processing
5	Distributed Operating System
6	Information Retrieval Systems
7	Object Oriented Software Engineering
8	Soft Computing
9	Cloud Computing
10	Big Data Analytics
11	Service Oriented Architecture
12	Advanced Computer Networks
13	Network Security
14	Cyber Security Essentials
15	Introduction to Data Science

PAPER – II	
S. No	**Subject**
1	Advanced Computer Architecture
2	Advanced Data Structures and Algorithms
3	Computer Communication
4	Machine Learning
5	Parallel Computing and Algorithms
6	Pattern Recognition
7	Natural Language Processing
8	Malware Analysis
9	Adhoc and Sensor Networks
10	Computer Vision
11	Speech Processing
12	Grid Computing
13	Software Process and project Management
14	Internet of Things (IoT)
15	Block Chain Technologies

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
COMPUTER SCIENCE & ENGINEERING
Syllabus for Pre-Ph. D ExaminationCSE

ADVANCED DATABASES

UNIT I: Introduction:
Distributed Data Processing, Distributed Databases System, promises of DDBS, Problem areas.
Overview of Relational DBMS: Relational Databases Concepts, Normalization, Integrity rules, Relational data languages.

UNIT II: Distributed DBMS Architecture:
Architectural Models for Distributed DBMS, DDMBS Architecture.
Distributed Database Design:
Alternative Design Strategies, Distribution Design issues, Fragmentation, Allocation.

UNIT III: Query Processing and Decomposition:
Query processing Objectives, Characterization of query processors, layers of query of query processing, query decomposition, Localization of distributed data.

UNIT IV: Distributed query Optimization:
Query optimization, centralized query optimization, Distributed query optimization algorithms.

UNIT V: Distributed object Database Management Systems:
Fundamental object concepts and Models, Object Distributed Design, Architectural Issues, Object Management, Distributed Object storage, Object query Processing.
Object Oriented Data Model: Inheritance, object identity, persistent programming languages, persistence of objects, comparing ODDBMS and ORDBMS.

REFERENCE BOOKS

1. Principles of Distributed Database Systems, 2/e, OZSU, Valduriez, Sridhar, Pearson, 2001
2. Distributed Databases, Stefan Seri, Pelagatti Willipse, TMH
3. Database System Concepts, 5/e, Korth, Silberschatz, Sudershan, TMH
4. Database Management Systems, 3/e, Raghuramakrishnan, Johhanes Gehrke, TMH
5. Data Base Principles, Programming, and Performance, 2/e, P O' Neil, E O'Neil, Elsevier

ARTIFICIAL INTELLIGENCE

UNIT- I: Introduction: History, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends.

UNIT -II: Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening A*, constraint satisfaction. Problem reduction and game playing: Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games.

UNIT –III: Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic.

UNIT -IV: Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames. Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, CYC theory, case grammars, semantic web

UNIT–V: Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-shafer theory ,Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems.

Text Books:

1. Artificial Intelligence- Saroj Kaushik, CENGAGELearning
2. Artificial intelligence, A modern Approach, 2nded, Stuart Russel, Peter Norvig,PEA

References:

1. Artificial Intelligence- Deepak Khemani, TMH,2013
2. Introduction to Artificial Intelligence, Patterson,PHI
3. Atificial intelligence, structures and Strategies for Complex problem solving,-George F Lugar, 5thed, PEA

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105077/
2.http://aima.cs.berkeley.edu/

DATA MINING & KNOWLEDGE DISCOVERY

Unit I: Introduction to Data Mining: Types of Data, Data Quality, Data Processing, Measures of Similarity and Dissimilarity Exploring Data: Data Set, Summary Statistics, Visualization, OLAP and multi-dimensional data Analysis

Unit II: Classification: Basic Concepts, Decision Trees, and model evaluation: General approach for solving a classification problem, Decision Tree induction, Model over fitting: Due to presence of noise, due to lack of representation samples, Evaluating the performance of classifier. Classification-Alternative techniques: Nearest Neighborhood classifier, Bayesian Classifier, Support Vector Machines: Linear SVM, Separable and Non-Separable case.

Unit III: Association Analysis: Problem Definition, Frequent Item-set generation, Rule generation, compact representation of frequent item sets, FP-Growth Algorithms, Handling categorical, continuous attributes, concept hierarchy, sequential, sub-graph patterns

Unit IV: Clustering: Overview, K-means, Agglomerative Hierarchical clustering, DBSCAN Cluster Evaluation: Overview, Unsupervised Cluster evaluation using cohesion and separation, using the proximity matrix, Scalable clustering algorithms.

Unit V: Web Data mining: Introduction, Web terminology and characteristics, web content mining, web usage mining, web structure mining, Search Engines: Characteristics, Functionality, Architecture, Ranking of web pages, Enterprise search

REFERENCE BOOKS:

1. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, Vipin Kumar, PEA.
2. Introduction to Data Mining with Case Studies, GK Gupta , Prentice Hall.
3. Data Mining: Introductory and Advanced Topics, Margaret H Dunham, PEA, 2008.
4. Fundamentals of data warehouses, 2/e, Jarke, Lenzerini, Vassiliou, Vassiliadis, Springer.
5. Data Mining Theory and Practice, Soman, Diwakar, Ajay, PHI, 2006.
6. Data Mining, Concepts and Techniques, 2/e, Jiawei Han , Micheline Kamber , Elsevier,2006.

DIGITAL IMAGE PROCESSING

Unit I: **Digital Image fundaments:**
Introduction, An image model, sampling & quantization, basic relationships between Pixels, imaging geometry.

Unit II: **Image Transforms:**
Properties of 2 – D Fourier transform FFT algorithm and other separable image transforms. Walsh transforms. Hadamard, Cosine, Haar, Slant transforms, KL transforms and their properties.

Unit III: **Image Enhancement and restoration:**
Background, enhancement by point processing, histogram processing, spatial filtering and enhancement in frequency domain, color image processing, Degradation model, Algebraic approach to restoration, inverse filtering, least mean squares and interactive restoration, geometric transformations

Unit IV: **Image Representation and compression:**
Various schemes for representation, boundary descriptors, and regional descriptors , Fundamentals of image compression modes, error free compression, lossy compression,image compression standards.

Unit V: **Image segmentation and reconstruction:**
Detection of discontinuities, edge linking and boundary detection thresholding, region – oriented segmentation, Image reconstruction from Projections, Radon Transforms; Convolution/Filter back – Project Algorithms.

REFERENCE BOOKS

1. Fundamentals of Digital Image Processing, A.K.JAIN, PHI
2. Fundamentals of Digital Image Processing, Anna durai, shanmuga lakshmi,Pearson
3. Introduction to Digital Image Processing, Alasdair, McAndrew, Cengage
4. Digital Image Processing, 3/e, GONZALEX, WOODS, Addison Wesley
5. Digital Image Processing, Castleman, Pearson
6. Digital Image Processing, S Jayaraman, SEsakkirajan, T Veerakumar,TMH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
COMPUTER SCIENCE & ENGINEERING
Syllabus for Pre-Ph. D ExaminationCSE

DISTRIBUTED OPERATING SYSTEMS

Unit I: Processes
THREADS: Introduction to Threads, Threads in Distributed Systems; CLIENTS: User Interfaces, Client-Side Software for Distribution Transparency SERVERS: General Design Issues, Object Servers; CODE MIGRATION: Approaches to Code Migration, Migration and Local Resources, Migration in Heterogeneous Systems, Example: D'Agents
SOFTWARE AGENTS: Software Agents in Distributed Systems, Agent Technology

Unit II: Naming Systems
NAMING ENTITIES: Names, Identifiers, and Addresses, Name Resolution, The Implementation of a Name Space, Example: DNS, X.500
LOCATING MOBILE ENTITIES: Naming versus Locating Entities, Simple Solutions, Home-Based Approaches, Hierarchical Approaches
REMOVING UNREFERENCED ENTITIES: The Problem of Unreferenced Objects, Reference Counting, Reference Listing, Identifying Unreachable Entities

Unit III: Synchronization
Clock synchronization, logical clocks, global state, election algorithms, mutual exclusion, distributed transactions

Unit IV: Consistency and Replication
Introduction, Data-Centric Consistency Models, Client-Centric Consistency Models, Distribution Protocols, Consistency Protocols, Examples: Orca and Causally-Consistent Lazy Replication

Unit V: Fault Tolerance
Introduction to Fault Tolerance, Process Resilience, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit, Recovery

REFERENCE BOOKS:

1. Distributed Systems, Principles and Paradigms, 2/e, Tanenbaum, Maarten Van Steen, PHI.
2. Advanced concepts in Operating Systems, Mukesh Singhal, Niranjan G. Shivaratri, TMH, 2005.
3. Distributed Operating Systems and Algorithm Analysis, Chow, Johnson, PEA
4. Distributed Systems Concepts and Design, 4/e, George Coulouris, Dollimore, Kindberg, PEA.
5. Distributed Operating Systems, Pradeep K. Sinha, PHI,2009.
6. Operating Systems, Internals & Design Principles, 6/e, William Stallings, PEA.
7. Distributed Systems Computing over Networks, Joel M.Crichlow, PHI.

INFORMATION RETRIEVAL SYSTEMS

UNIT I Introduction: Definition, Objectives, Functional Overview, Relationship to DBMS, Digital libraries and Data Warehouses, Information Retrieval System Capabilities - Search, Browse, Miscellaneous.

UNIT II Cataloging and Indexing: Objectives, Indexing Process, Automatic Indexing, Information Extraction, **Data Structures:** Introduction, Stemming Algorithms, Inverted file structures, N-gram data structure, PAT data structure, Signature file structure, Hypertext data structure - **Automatic Indexing:** Classes of automatic indexing, Statistical indexing, Natural language, Concept indexing, Hypertext linkages

UNIT III Document and Term Clustering: Introduction, Thesaurus generation, Item clustering, Hierarchy of clusters - **User Search Techniques:** Search statements and binding, Similarity measures and ranking, Relevance feedback, Selective dissemination of information search, Weighted searches of Boolean systems, Searching the Internet and hypertext - **Information Visualization:** Introduction, Cognition and perception, Information visualization technologies.

UNIT IV Text Search Algorithms: Introduction, Software text search algorithms, Hardware text search systems. **Information System Evaluation:** Introduction, Measures used in system evaluation, Measurement example – TREC results.

UNIT V Multimedia Information Retrieval – Models and Languages – Data Modeling, Query Languages, Indexing and Searching - **Libraries and Bibliographical Systems** – Online IR Systems, OPACs, Digital Libraries.

TEXT BOOKS:

1. Information Storage and Retrieval Systems: Theory and Implementation By Kowalski, Gerald, Mark T Maybury Kluwer Academic Press, 2000.

2. Modern Information Retrival By Ricardo Baeza-Yates, Pearson Education, 2007.

3. Information Retrieval: Algorithms and Heuristics By David A Grossman and Ophir Frieder, 2nd Edition, Springer International Edition, 2004.

REFERENCES:

1. Information Retrieval Data Structures and Algorithms By William B Frakes, Ricardo Baeza-Yates, Pearson Education, 1992.

2. Information Storage & Retieval By Robert Korfhage – John Wiley & Sons.

3. Introduction to Information Retrieval By Christopher D. Manning and Prabhakar Raghavan, Cambridge University Press, 2008.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
COMPUTER SCIENCE & ENGINEERING
Syllabus for Pre-Ph. D ExaminationCSE

OBJECT ORIENTED SOFTWARE ENGINEERING

Unit I: Introduction to Classical Software Engineering:
Introduction to OO Paradigm. Different phases in structured paradigm and OO Paradigm. Software Process and different life cycle models and corresponding strengths andweaknesses.

Unit II: Planning and Estimation:
Estimation of Duration and Cost – COCOMO components of software. Project Management plan – one case Study.

Unit III: Modules to objects:
Cohesion and Coupling, Data Encapsulation and Information hiding aspects of Objects. Inheritance, polymorphism and Dynamic Binding aspects. Cohesion and coupling of objects. Reusability, Portability and Interoperability aspects.

Unit IV: Requirement phase:
Rapid Prototyping method, Specification phase - Specification Document- Formal methods of developing specification document
Analysis phase:
Use case Modeling - Class Modeling - Dynamic Modeling, Testing during OO Analysis.

Unit V: Design phase:
Data oriented design – Object Oriented design – Formal techniques for detailed design. One case study. Challenges in design phase.

REFERENCE BOOKS

1. Object oriented and Classical Software Engineering, 7/e, Stephen R. Schach, TMH
2. Object oriented and classical software Engineering, Timothy Lethbridge, Robert Laganiere, TMH

SOFT COMPUTING

Unit I: Introduction: Uncertainty and Evidence, Shafer Dumpster belief and possibility Theory, Random sets and mass assignments, Dumpsters Rule, Fuzzy Measures and aggregation operators, Bayesian Networks. Graphical methods**.**

Unit II: Automated Learning-1 and 2 Automated Learning-1: Supervise vs. unsupervised learning, Decision Tree induction, rule induction algorithms. Automated Learning-2: Bayesian network learning algorithms, Evolutionary algorithms.

Unit III: Neural Networks and Fuzzy Methods: Neural Networks: Adaptive Networks, Supervised Learning NN, Reinforcement Learning, Unsupervised Learning. Fuzzy set theory, fuzzy control (including model based control), and Fuzzy Decision trees.

Unit IV: Hybrid systems: Neuro Fuzzy Systems, Back propagation Network supported by Fuzzy, GA based weight determination applications.

Unit V: Genetic Algorithms and Applications Encoding, Fitness functions, reproduction, Fuzzy Genetic Algorithms. Applications: Practical Examples from areas such as Medical, Management, and control, GA in fuzzy logic controller design**.**

REFERENCE BOOKS

1. Neuro Fuzzy and Soft Computing, A Computational approach to learning and Machine, Jyh-Shing Roger Jang, Cuen Tsai Sun, Eiji Mizurani, PEA.

2. Machine Learning, Tom Mitchell, MGH, 1997.

3. Soft Computing Techniques and Applications, Robert John, R. Birkenhead, Ralph Birkenhead.

4. Neural Networks, Fuzzy logic and genetic algorithms, S Rakasekharan, GA Vijayalakshmi, PHI.

5. Principles of Soft Computing, Sivanandam, Deepa, Wiley India, 2008. 6. Soft Computing and Intelligent Systems Design, Karry, De Silva, PEA, 2004.

CLOUD COMPUTING

UNIT-I: Introduction: Introduction to Cloud Computing, Definition of Cloud, Evolution of Cloud Computing, Underlying Principles of Parallel and Distributed Computing, Cloud Characteristics, Elasticity in Cloud – On-Demand Provisioning.

UNIT-II: Cloud Enabling Technologies: Service Oriented Architecture, REST and Systems of Systems, Web Services, Publish-Subscribe Model, Basics of Virtualization, Types of Virtualization, Implementation Levels of Virtualization, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices, Virtualization Support and Disaster Recovery.

UNIT-III: Cloud Architecture, Services And Storage: Layered Cloud Architecture Design, NIST Cloud Computing Reference Architecture, Public, Private and Hybrid Clouds, laaS, PaaS, SaaS, Architectural Design Challenges, Cloud Storage, Storage-as-a-Service, Advantages of Cloud Storage, Cloud Storage Providers, S3.

UNIT-IV: Resource Management And Security In Cloud: Inter Cloud Resource Management, Resource Provisioning and Resource Provisioning Methods, Global Exchange of Cloud Resources, Security Overview, Cloud Security Challenges, Software-as-a-Service Security, Security Governance, Virtual Machine Security, IAM, Security Standards.

UNIT-V: Cloud Technologies And Advancements: Hadoop, MapReduce, Virtual Box, Google App Engine, Programming Environment for Google App Engine, Open Stack, Federation in the Cloud, Four Levels of Federation, Federated Services and Applications, Future of Federation.

Text Books:

1. Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, Morgan KaufmannPublishers.

2. Cloud Computing: Implementation, Management and Security, Rittinghouse, John W., and James F. Ransome, CRCPress.

References:

1. Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Tata McgrawHill.

2. Cloud Computing - A Practical Approach, Toby Velte, Anthony Velte, Robert Elsenpeter, Tata McGrawHill.

3. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), George Reese, O'Reilly.

BIG DATA ANALYTICS

UNIT-I: Introduction: Introduction to big data: Introduction to Big Data platform, Challenges of conventional systems, Intelligent data analysis, Nature of data, Analytic processes and tools, Analysis vs Reporting.

UNIT - II: Stream Processing: Mining data streams: Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Oneness in a Window, Decaying Window, Real time Analytics Platform (RTAP) Applications, Case Studies - Real Time Sentiment Analysis - Stock Market Predictions.

UNIT - III: Introduction to Hadoop: Hadoop: History of Hadoop, the Hadoop Distributed File System, Components of Hadoop Analysing the Data with Hadoop, Scaling Out, Hadoop Streaming, Design of HDFS, Java interfaces to HDFS Basics, Developing a Map Reduce Application, How Map Reduce Works, Anatomy of a Map Reduce Job run, Failures, Job Scheduling, Shuffle and Sort, Task execution, Map Reduce Types and Formats, Map Reduce Features Hadoop environment.

UNIT - IV: Frameworks and Applications: Frameworks: Applications on Big Data Using Pig and Hive, Data processing operators in Pig, Hive services, HiveQL, Querying Data in Hive, fundamentals of HBase and ZooKeeper.

UNIT - V: Predictive Analytics and Visualizations: Predictive Analytics, Simple linear regression, Multiple linear Regressions, Interpretation of regression coefficients, Visualizations, Visual data analysis techniques, interaction techniques, Systems and application

Text Books:

1. Tom White, “Hadoop: The Definitive Guide”, Third Edition, O’reilly Media, Fourth Edition,2015.

2. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGrawHill Publishing,2012.

3. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, CUP, 2012

References:

1. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley& sons,2012.

2. Paul Zikopoulos, DirkdeRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, “Harness the Power of Big Data:The IBM Big Data Platform”, Tata McGraw Hill Publications,2012.

3. ArshdeepBahga and Vijay Madisetti, “Big Data Science & Analytics: A Hands On Approach “, VPT,2016.

4. Bart Baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)”, John Wiley & Sons,2014.

E-resources:

1. https://www.edx.org/course/big-data-fundamentals

2. https://hadoop.apache.org/

3. https://pig.apache.org/

4. https://hive.apache.org

SERVICE ORIENTED ARCHITECTURE

Unit I: SOA and Web Services Fundamentals

Introducing SOA- Fundamental SOA, Common Characteristics of Contemporary SOA, Common tangible benefits of SOA, Common pitfalls of adopting SOA.The Evolution of SOA – An SOA timeline, The continuing evolution of SOA,The roots of SOA.Web Services and primitive SOA The Web Services frame work,Services,Service descriptions, Messaging.

Unit II: SOA and WS-* Extensions

Web Services and Contemporary SOA (Part I-Activity management and Composition)-Message exchange patterns, Service Activity Coordination, Atomic transactions, Business Activities,Orchestration,Choreography.Web Services and Contemporary SOA(Part-II-Advanced Messaging , Metadata , and Security) – Addressing , Reliable messaging,Correlation,Policies,Metadata exchange,Security,Notification and eventing.

Unit III: SOA and Services - Orientation

Principles of Service-Orientation – Service – Orientation and the enterprise, Anatomy of SOA,Common Principles of Service – Orientation,interrelation between Principles of ServiceOrientation,Service Orientation and Object Orientation,Native Web Services support for Principles of Service-Orientation.Service Layers- Service-Orientation and Contemporary SOA , Service Layer abstraction , Application Service Layer , Business Service Layer,Orchestration Service Layer,Agnostic Services,Service Layer Configuration Scenarios.

Unit IV: Building SOA (Planning and Analysis)

SOA Delivery Strategies-SOA delivery lifecycle phases,The top-down strategy,The bottom-up strategy,The agile strategy.Service Oriented Analysis(Part I-Introduction)-Introduction to Service Oriented Analysis,Benefits of a Business Centric SOA,Deriving Business Services. Service Oriented Analysis(Part-II-Service Modelling)-Service Modelling,Service Modelling guidelines,Classifying Service model logic,Contrasting Service modelling approaches.

Unit V: Building SOA(Technology and Design)

Service Oriented Design(Part I-Introduction)-Introduction to Service-Oriented design,WSDL related XML Schema language basics,WSDL language basics,Service interface design tools. Service Oriented Design(Part II-SOA Composition Guidelines)-SOA Composing steps,Considerations for choosing service layers,Considerations for positioning core SOA standards,Considerations for choosing SOA extensions. Service Oriented Design(Part III-Service Design)-Service Design overview,Entity-centric business Service Design,Application Service Design,Task-centric business Service Design, Service Design guidelines. Service Oriented Design(Part IV-Business Process Design)-WS-BPEL language basics,WS- Coordination overview, Service Oriented Business process Design.Fundamental WS-* Extensions-WSAddressing language basics,WS-Reliable Messaging language basics,WS-Policy language basics,WS-MetadataExchange language basics,WS-Security language basics.SOA PlatformsSOA platform basics,SOA support in J2EE and .NET,Integration considerations.

TEXT BOOKS:

1. Service-Oriented Architecture-Concepts,Technology,and Design,Thomas Erl,Pearson Education.

2. Understanding SOA with Web Services,Eric Newcomer,Greg Lomow,Pearson Education.

REFERENCE BOOKS:

1. The Definitive guide to SOA,Jeff Davies&others,Apress,Dreamtech.

2. Java SOA Cook book,E.Hewitt,SPD.

3. SOA in Practice,N.M.Josuttis,SPD.

4. Applied SOA,M.Rosen and others,Wiley India pvt. Ltd.

5. Java Web Services Architecture,J.Mc Govern,and others,Morgan Kaufmann Publishers,Elsevier.

6. SOA for Enterprise Applications,Shankar.K,Wiley India Edition.

7. SOA-Based Enterprise Integration,W.Roshen,TMH.

8. SOA Security,K.Rama Rao,C.Prasad,dreamtech press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
COMPUTER SCIENCE & ENGINEERING
Syllabus for Pre-Ph. D ExaminationCSE

ADVANCED COMPUTER NETWORKS

UNIT I Review Computer Networks and the Internet:

What is the Internet, The Network edge, The Network core, Access Networks and Physical media, ISPs and Internet Backbones, Delay and Loss in Packet-Switched Networks, History of Computer Networking and the Internet - Foundation of Networking Protocols: 5-layer TCP/IP Model, 7-Layer OSI Model, Internet Protocols and Addressing, Equal-Sized Packets Model: ATM - Networking Devices: Multiplexers, Modems and Internet Access Devices, Switching and Routing Devices, Router Structure.

UNIT II The Link Layer and Local Area Networks:

Link Layer: Introduction and Services, Error Detection and Error-Correction techniques, Multiple Access Protocols, Link Layer Addressing, Ethernet, Interconnections: Hubs and Switches, PPP: The Point-to-Point Protocol, Link Virtualization - Routing and Internetworking: Network–Layer Routing, Least-Cost-Path algorithms, Non-Least-Cost-Path algorithms, Intradomain Routing Protocols, Interdomain Routing Protocols, Congestion Control at Network Layer

UNIT III Logical Addressing:

IPv4 Addresses, IPv6 Addresses - Internet Protocol: Internetworking, IPv4, IPv6, Transition from IPv4 to IPv6 – Multicasting Techniques and Protocols: Basic Definitions and Techniques, Intradomain Multicast Protocols, Interdomain Multicast Protocols, Node-Level Multicast algorithms - Transport and End-to-End Protocols: Transport Layer, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), Mobile Transport Protocols, TCP Congestion Control – Application Layer: Principles of Network Applications, The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, Domain Name System (DNS), P2P File Sharing, Socket Programming with TCP and UDP, Building a Simple Web Server

UNIT IV Wireless Networks and Mobile IP:

Infrastructure of Wireless Networks, Wireless LAN Technologies, IEEE 802.11 Wireless Standard, Cellular Networks, Mobile IP, Wireless Mesh Networks (WMNs) - Optical Networks and WDM Systems: Overview of Optical Networks, Basic Optical Networking Devices, Large-Scale Optical Switches, Optical Routers, Wavelength Allocation in Networks, Case Study: An All-Optical Switch

UNIT V VPNs, Tunneling and Overlay Networks: Virtual Private Networks (VPNs), Multiprotocol Label Switching (MPLS), Overlay Networks – VoIP and Multimedia Networking: Overview of IP Telephony, VoIP Signaling Protocols, Real-Time Media Transport Protocols, Distributed Multimedia Networking, Stream Control Transmission Protocol - Mobile A-Hoc Networks: Overview of Wireless Ad-Hoc Networks, Routing in Ad-Hoc Networks, Routing Protocols for Ad-Hoc Networks – Wireless Sensor Networks: Sensor Networks and Protocol Structures, Communication Energy Model, Clustering Protocols, Routing Protocols

TEXT BOOKS:

1. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, Keith W.Ross, Third Edition, Pearson Education, 2007

2. Computer and Communication Networks, Nader F. Mir, Pearson Education, 2007

REFERENCES:

1. Data Communications and Networking, Behrouz A. Forouzan, Fourth Edition, Tata McGraw Hill, 2007

2. Guide to Networking Essentials, Greg Tomsho,Ed Tittel, David Johnson,Fifth Edition, Thomson.

3. An Engineering Approach to Computer Networking , S.Keshav, Pearson Education. 4. Campus Network Design Fundamentals, Diane Teare, Catherine Paquet, Pearson Education (CISCO Press)

5. Computer Networks, Andrew S. Tanenbaum, Fourth Edition, Prentice Hall. 6. The Internet and Its Protocols, A. Farrel, Elsevier.

NETWORK SECURITY

Unit I: **Introduction to Network Security:**
Attacks, services, Security. A model of Inter network Security, Principles of Symmetric and public key cryptography, Steganography, One-time PADS.

Unit II: Crypto Graphic Algorithms (Block Cipher):
RC2, GOST, CAST, BLOW FISH, SAFEER, RC5, NEWDES, CRAB, Theory of Block Cipher design.

Unit III: Key Management and digital Signature Algorithms:
Key lengths, Generating Keys, Transferring, Verification, Updating, Storing, Backup, Compromised, Lifetime of, Destroying Keys, key Exchange Protocols, Secure multiparty Communication, Public key Management. Authentication, Formal Analysis of Authentication, Digital Signature, DSA, DSA variants,One – Schnorr – Shamir digital Signatures, Esign,

Unit IV: IP and Web security:
IP Security Architecture, Authentication Header, Encapsulating Security, Pay load Key Management Issues. Web Security Web Security requirements, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction

Unit V: Mail Security:
PGP, SNMP,SMIME, Intruders, Viruses and Related Threats, Firewall Design Principles, Trusted Systems.

REFERENCE BOOKS:

1. Applied Cryptography, 7/e, Bruce SCHNEIER John Wiley & Sons Inc.
2. Cryptography and Network Security, William Stallings, PHI.
3. Introduction to cryptography with coding Theory, 7/e, Wade Trappe, C. Washington, PEA.
4. Cryptography and Information Security, V.K. Pachghare, PHI.
5. Cryptography and Network Security, Forouzan, TMH, 2007.
6. Cryptography and Network Security, 2/e, Kahate , TMH.
7. Modern Cryptography, Wenbo Mao, PEA

CYBER SECURITY ESSENTIALS

UNIT-I: Introduction to Security:

Challenges of Securing Information, Definition of Information Security, Attackers, Attacks and Defenses. Systems Threats and Risks: Software-Based Attacks, Hardware-Based Attacks, Attacks on Virtualized Systems, Hardening the Operating System, Preventing Attacks that Target the Web Browser, Hardening Web Servers, Protecting Systems from Communications-Based Attacks, Applying Software Security Applications.

UNIT-II: Network Vulnerabilities and Attacks:

Network Vulnerabilities, Categories of Attacks, Methods of Network Attacks. Network Defenses: Crafting a Secure Network, Applying Network Security Devices, Host and Network Intrusion Prevention Systems (HIPS/NIPS), Protocol Analyzers, Internet Content Filters, Integrated Network Security Hardware.

UNIT-III: Access Control: Access Control Models and Practices, Logical Access Control Methods, Physical Access Control. Authentication: Definition of Authentication, Authentication Credentials, Extended Authentication Protocols, Remote Authentication and Security.

UNIT-IV: Vulnerability Assessment: Risk Management, Assessment, and Mitigation, Identifying Vulnerabilities. Security Audit: Privilege Auditing, Usage Auditing, Monitoring Methodologies and Tools.

UNIT-V: Cryptography: Introduction to Cryptography, Cryptographic Algorithms, Using Cryptography on Files and Disks, Digital Certificates, Public Key Infrastructure, Key Management.

Text Book:

Security+ Guide to Network Security Fundamentals, Third Edition, Mark Ciampa, Cengage Learning.

References:

i. Principles of Information Security, Michael E. Whitman and Herbert J. Mattord, Cengage Learning.

ii. Information Security: The Complete Reference, Rhodes-Ousley, Mark, Second Edition, McGraw-Hill.

iii. Information Security: Principles and Practices, Mark S. Merkow, Jim Breithaupt, 2nd Edition, Pearson Education.

INTRODUCTION TO DATA SCIENCE

UNIT – I: INTRODUCTION: Introduction to Data Science – Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields – Data Security Issues.

UNIT – II: DATA COLLECTION AND DATA PRE-PROCESSING Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization.

UNIT – III: EXPLORATORY DATA ANALYTICS Descriptive Statistics – Mean, Standard Deviation, Skewness and Kurtosis – Box Plots – Pivot Table – Heat Map – Correlation Statistics – ANOVA.

UNIT – IV: MODEL DEVELOPMENT Simple and Multiple Regression – Model Evaluation using Visualization – Residual Plot – Distribution Plot – Polynomial Regression and Pipelines – Measures for In-sample Evaluation – Prediction and Decision Making.

UNIT – V: MODEL EVALUATION Generalization Error – Out-of-Sample Evaluation Metrics – Cross Validation – Overfitting – Under Fitting and Model Selection – Prediction by using Ridge Regression – Testing Multiple Parameters by using Grid Search.

Text Books:

1. Data Science for Beginners, by Andrew Park

2. The Art of Data Science — A Guide for Anyone Who Works With Data, by Roger D. Peng and Elizabeth Matsui.

References:

1. JojoMoolayil, “Smarter Decisions : The Intersection of IoT and Data Science”,PACKT, 2016.

2. Cathy O’Neil and Rachel Schutt , “Doing Data Science”, O'Reilly, 2015.

3. David Dietrich, Barry Heller, Beibei Yang, “Data Science and Big data Analytics”,EMC 2013

4. Raj, Pethuru, “Handbook of Research on Cloud Infrastructures for Big DataAnalytics”, IGI Global.

PART- II

ADVANCED COMPUTER ARCHITECTURE

Unit I: Parallel Computer Models, Program and Network Properties:
Parallel Computer Models: Multiprocessors and Multicomputers, Multivector and SIMD Computers,
Program and Network Properties: Conditions of Parallelism, Program Partitioning and Scheduling, Program Flow Mechanisms, System Interconnect Architectures

Unit II: Principles of Scalable Performance:
Performance Metrics and Measures, Parallel Processing Applications, Speedup Performance Laws, Scalability Analysis and Approaches

Unit III: Processors and Memory Hierarchy:
Advanced Processor Technology, Superscalar and Vector Processors, Memory Hierarchy Technology, Virtual Memory Technology

Unit IV: Bus, Cache, and Shared Memory:
Backplane Bus Systems, Cache Memory Organizations, Shared-Memory Organizations, Sequential and Weak Consistency Models

Unit V: Pipelining and Superscalar Techniques:
Linear Pipeline Processors, Nonlinear Pipeline Processors, Instruction Pipeline Design, Arithmetic Pipeline Design, Superscalar and Super pipeline Design
Multiprocessors and Multicomputers:
Multiprocessor System Interconnects, Cache Coherence and Synchronization Mechanisms, Three Generations of Multicomputers, Message-Passing Mechanisms

REFERENCE BOOKS

1. Kai Hwang, Advanced computer Architecture: Parallelism, Scalability, Programmability, TMH, 2000.
2. Computer Architecture – A quantitative approach, 4/e, John L. Hennessey, David A. Patterson, Morgan Kaufmann / Elsevier, 2007.
3. Parallel Computing Architecture: A hardware/ software approach, David E. Culler, Jaswinder Pal Singh, Morgan Kaufmann / Elsevier, 1997.
4. Computer Organization and Architecture – Designing for Performance, 7/e, William Stallings, PEa, 2006.
5. Computer Organization and Design, 4/e, Patterson, Elsevier, 2008.
6. Computer Architecture & Parallel Processing, Kai Hwang, Faye A. Briggs, TMH

ADVANCED DATA STRUCTURES AND ALGORITHMS

Unit I: Lists, Stacks, Queues and Trees:
Lists, Stacks and Queues: Abstract Data Types (ADTs), The List ADT, vector and list in theSTL, Implementation of vector, Implementation of list, The Stack ADT, The Queue ADT. Trees: The Search Tree ADT - Binary Search Trees, AVL Trees, Splay Trees, B-Trees.

Unit II: Hashing and Priority Queues:
Hashing: General Idea, Hash Function, Separate Chaining, Hash Tables Without Linked Lists, Rehashing, Extendible Hashing
Priority Queues: Implementations, Binary Heap, Applications of Priority Queues, *d*-Heaps, Leftist Heaps, Skew Heaps, Binomial Queues.

Unit III: Sorting:
Sorting: A Lower Bound for Simple Sorting Algorithms, Shellsort, Heapsort, Mergesort, Quicksort, Indirect Sorting, A General Lower Bound for Sorting, Bucket Sort, External Sorting.
The Disjoint Set Class: Equivalence Relations, the Dynamic Equivalence Problem, Basic Data Structure, Smart Union Algorithms, Path Compression, Worst Case for Union-by-Rankand Path Compression, an Application.

Unit IV: Graph Algorithms:
Definitions, Topological Sort, Shortest-Path Algorithms, Network Flow Problems, Minimum Spanning Tree, Applications of Depth-First Search, Introduction to NP-Completeness.
Algorithm Design Techniques: Greedy Algorithms, Divide and Conquer, Dynamic Programming, Randomized Algorithms, Backtracking Algorithms.

Unit V: Amortized Analysis:
An Unrelated Puzzle, Binomial Queues, Skew Heaps, Fibonacci Heaps, Splay Trees. Advanced Data Structures and Implementation:Top-Down Splay Trees, Red-Black Trees, Deterministic Skip Lists, AA-Trees, Treaps, *k*-d Trees, Pairing Heaps.

REFERENCE BOOKS

1. C & Data structures, N.B. Venkateswarulu, EV Prasad, S.Chand.
2. Data Structures and Algorithm Analysis in C++, 3/e, Mark Allen Weiss, PEA , 2007.
3. Data Structures Algorithms and Applications, 2/e, Sartaj Sahni, Universities Press, 2007.
4. Fundamentals of computer Algorithms, 2/e, Ellis Horowitz, Sartaj Sahni, Rajasekharan, Universities Press, 2008.
5. Data Structures and Algorithms, Aho, Ullman, PEA.
6. Data Structures and Algorithms in JAVA, Adam drozdek, Cengage .
7. Data Structures with JAVA™, Hubbard, Huray, PHI,2009.
8. Data Structures, Gilberg, Forouzan, Thomson.
9. Fundamentals of Data structures algorithms and application Sartaj Sahni, University Press.

COMPUTER COMMUNICATIONS

Unit I: Introduction:
Network Hardware reference model – Transmission media – Narrowband ISDN – Broad band ISDN – ATM.

Unit II: Data Link Layer and Channel allocation Methods:
The data Link layer – Design Issues – Error detection and correction – Elementary Data Link Protocols – Sliding window protocols – Data link layer in HDLC, Internet and ATM. Channel allocation methods – TDM, FDM, ALOHA, Carrier sense Multiple access protocols,Collision Free protocols – IEEE standard BO2 for LANS – Ethernet, Token Bus, Token ring – Bridges.

Unit III: Network Layer and internetworking:
NETWORK LAYER Routing Algorithms – Shortest path, Flooding, Flow based Distance vector, Link state, Hierarchical, Broadcast routing, Congestion Control algorithms-General principles of congestion control, Congestion prevention polices, Choke packets and Load shedding.
Tunneling, internetworking, Fragmentation, network layer in the internet – IP protocols, IP address, Subnets, Internet control protocols, DSPF, BOP, Internet multicasting, Mobile IP. Network layer in the ATM Networks – cell formats, connection setup, routing and switching, service categories, and quality of service, ATM LANs.

Unit IV: Transport Layer: The Transport Layer Elements of transport protocols – addressing, establishing a connection, releasing connection, flow control and buffering and crash recovery, END TO END PROTOCOLS – UDP, reliable Byte Stream (TCP) end to end format, segment format, connection establishment and termination, sliding window revisited, adaptive retransmission, TCP extension, Remote Procedure Call – BLAST, CHAN, SELECT, DCE.

Unit V: Application Layer: Application Layer – Network Security – Cryptographic Algorithms – DES, RSA. Security Mechanisms – Authentication Protocols, Firewalls, Name service (DNS) Domains Hierarchy, Name servers. Traditional Applications – SMTP, MIME, World Wide Web – HTTP, Network Management – SNMP.

REFERENCE BOOKS

1. COMPUTER NETWORKS, Andrew Tanenbaum, 3/e, PHI.
2. COMPUTER NETWORKS – A SYSTEM APPROACH – Larry L. Peterson, Bruce S. Davie, 2/e, Harcourt Asia PTE LTD.
3. Data Communication and Networking, 4/e, Forouzan, TMH
4. An engineering approach to computer networking, Kesav, PEA
5. Data and Computer Communications, 8/e, Stallings, PHI
6. Computer communication and networking technologies, Gallo, Hancock, Cengage
7. Understanding data communications, 7/e, Held, PEA
8. Communication Networks, 2/e, Leon-Garcia, TMH

MACHINE LEARNING

UNIT I: Introduction:
Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning
Concept learning and the general to specific ordering – Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Versionspaces and the candidate elimination algorithm, Remarks on version spaces and candidateelimination, Inductive bias.

UNIT II: Decision Tree learning:
Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Issues in decision tree learning

UNIT III: Artificial Neural Networks:
Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition
Advanced topics in artificial neural networks
Evaluation Hypotheses : Motivation, Estimation hypothesis accuracy, Basics of sampling theory, A general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms

UNIT IV: Bayesian learning:
Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve bayes classifier, An example learning to classify text, Bayesian belief networks The EM algorithm

UNIT V: Computational learning theory :
Introduction, Probability learning an approximately correct hypothesis, Sample complexity for Finite Hypothesis Space, Sample Complexity for infinite Hypothesis Spaces - **Instance- Based Learning**- Introduction, k -Nearest Neighbor Learning, Locally Weighted Regression,Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning **Genetic Algorithms** :
Motivation, Genetic Algorithms, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms

REFERENCE BOOK:
1. Machine Learning ,Tom M. Mitchell, MGH
2. Machine Learning, An Algorithmic Perspective, Stephen Marsland, Taylor & Francis(CRC)
3. Introduction to Machine Learning, Ethem Alpaydin, PHI, 2004

PARALLEL COMPUTING & ALGORITHMS

UNIT I: **Introduction:**
Computational demand in various application areas, advent of parallel processing, terminology-pipelining, Data parallelism and control parallelism-Amdahl's law. Basic parallel random-access Machine Algorithms-definitions of P, NP and NP-Hard, NP-complete classes of sequential algorithms-NC –class for parallel algorithms.

UNIT II:
Organizational features of Processor Arrays, Multi processors and multicomputer. Mapping and scheduling aspects of algorithms. Mapping into meshes and hyper cubes-Load balancing-List scheduling algorithm

UNIT III:
Elementary Parallel algorithms on SIMD and MIMD machines, Analysis of these algorithms.

UNIT IV:
Matrix Multiplication algorithms on SIMD and MIMD models
Fast Fourier Transform algorithms. Implementation on Hyper cube architectures

UNIT V:
Parallel sorting methods---Odd-even transposition Sorting on processor arrays. Biotonic – merge sort on shuffle –exchange ID –Array processor,2D-Mesh processor and Hypercube Processor Array
Parallel Quick-sort on Multi processors. Hyper Quick sort on hypercube multi computers. Parallel search operations.

REFERENCE BOOKS:
1. Parallel computing theory and practice, MICHAEL J. QUINN
2. Programming Parallel Algorithms, Guy E. Blelloch, Communications of the ACM
3. Algorithms for Parallel processing, Michael T Heath, Abhiram Ranade, Schreiber (Ed), Springer.
4. Handbook of Parallel Computing Models, algorithms and applications, Samgithevar Rajasekharan, John Reif(Ed), Taylor and Franics group.
5. Parallel Processing and Parallel Algorithms: Theory and Computation, Seyed H. Roosta, Springer

PATTERN RECOGNITION

UNIT I: Introduction:
Fundamental problems in pattern Recognition system design, Design concepts and methodologies, Simple pattern recognition model.

Decisions and Distance Functions:
Linear and generalized decision functions, Pattern space and weight space, Geometrical properties, implementations of decision functions, Minimum-distance pattern classifications.

Probability - Probability of events:
Random variables, Joint distributions and densities, Movements of random variables, Estimation of parameter from samples.

UNIT - II: DECISION MAKING - Baye's theorem, Multiple features, Conditionally independent features, Decision boundaries, Unequal cost of error, estimation of error rates, the leaving-one-out-techniques, characteristic curves, estimating the composition of populations. Baye's classifier for normal patterns.

Non-Parametric Decision Making:
histogram, kernel and window estimation, nearest neighbour classification techniques. Adaptive decision boundaries, adaptive discriminant functions, Minimum squared error discriminant functions, choosing a decision making techniques.

UNIT III: Clustering and Partitioning:
Hierarchical Clustering: Introduction, agglomerative clustering algorithm, the single-linkage, complete-linkage and average-linkage algorithm. Ward's method Partition clustering-Forg's algorithm, K-means's algorithm, Isodata algorithm.

UNIT IV: Pattern Preprocessing and Feature selection:
distance measures, clustering transformation and feature ordering, clustering in feature selection through entropy minimization, features selection through orthogonal expansion, binary feature selection.

UNIT V: Syntactic Pattern Recognition and Application of Pattern Recognition: Concepts from formal language theory, formulation of syntactic pattern recognition problem,syntactic pattern description, recognition grammars, automata as pattern recognizers,Application of pattern recognition techniques in bio-metric, facial recognition, IRIS scon,Finger prints, etc.,

REFERENCES BOOKS:

1. Pattern recognition and Image Analysis, Gose. Johnsonbaugh Jost, PHI.
2. Pattern Recognition Principle, Tou. Rafael. Gonzalez, Pea.
3. Pattern Classification, Richard duda, Hart., David Strok, Wiley.

NATURAL LANGUAGE PROCESSING

UNIT I

Introduction and Overview: What is Natural Language Processing, hands-on demonstrations. Ambiguity and uncertainty in language. The Turing test. **Regular Expressions** Chomsky hierarchy, regular languages, and their limitations. Finite-state automata. Practical regular expressions for finding and counting language phenomena. A little morphology. Exploring a large corpus with regex tools. **Programming in Python** An introduction to programming in Python. Variables, numbers, strings, arrays, dictionaries, conditionals, iteration. The NLTK (Natural Language Toolkit) **String Edit Distance and Alignment** Key algorithmic tool: dynamic programming, a simple example, use in optimal alignment of sequences. String edit operations, edit distance, and examples of use in spelling correction, and machine translation.

UNIT II Context Free Grammars Constituency, CFG definition, use and limitations. Chomsky Normal Form. Top-down parsing, bottom-up parsing, and the problems with each. The desirability of combining evidence from both directions **Non-probabilistic Parsing** Efficient CFG parsing with CYK, another dynamic programming algorithms. Earley parser. Designing a little grammar, and parsing with it on some test data.**Probability** Introduction to probability theory Joint and conditional probability, marginals, independence, Bayes rule, combining evidence. Examples of applications in natural language. **Information Theory** The "Shannon game"--motivated by language! Entropy, cross-entropy, information gain. Its application to some language phenomena.

UNIT III Language modeling and Naive Bayes Probabilistic language modeling and its applications. Markov models. N-grams. Estimating the probability of a word, and smoothing. Generative models of language. Part of Speech Tagging and Hidden Markov Models, Viterbi Algorithm for Finding Most Likely HMM Path , Dynamic programming with Hidden Markov Models, and its use for part-of-speech tagging, Chinese word segmentation, prosody, information extraction, etc.

UNIT IV Probabilistic Context Free Grammars Weighted context free grammars. Weighted CYK. Pruning and beam search.

Parsing with PCFGs A treebank and what it takes to create one. The probabilistic version of CYK. Also: How do humans parse? Experiments with eye-tracking. Modern parsers.

Maximum Entropy Classifiers The maximum entropy principle, and its relation to maximum likelihood. Maximum entropy classifiers and their application to document classification, sentence segmentation, and other language tasks

UNIT V Maximum Entropy Markov Models & Conditional Random Fields

Part-of-speech tagging, noun-phrase segmentation and information extraction models that combine maximum entropy and finite-state machines. State-of-the-art models for NLP.

Lexical Semantics Mathematics of Multinomial and Dirichlet distributions, Dirichlet as a smoothing for multinomial.

Information Extraction & Reference Resolution- Various methods, including HMMs. Models of anaphora resolution. Machine learning methods for coreference.

Text Books:

1. "Speech and Language Processing": Jurafsky and Martin, Prentice Hall
2. "Statistical Natural Language Processing"- Manning and Schutze, MIT Press
3. “Natural Language Understanding”. James Allen. The Benajmins/Cummings Publishing Company

References Books:

1. Cover, T. M. and J. A. Thomas: Elements of Information Theory. Wiley.
2. Charniak, E.: Statistical Language Learning. The MIT Press.
3. Jelinek, F.: Statistical Methods for Speech Recognition. The MIT Press.
4. Lutz and Ascher - "Learning Python", O'Reilly

MALWARE ANALYSIS

UNIT–I: Malware Basics- General Aspect of Computer infection program, Non Self Reproducing Malware, How does Virus Operate, Virus Nomenclature, Worm Nomenclature, Recent Malware Case Studies.

UNIT– II: Basic Analysis- Antivirus Scanning, x86 Disassembly, Hashing, Finding Strings, Packed Malware, PE File Format, Linked Libraries & Functions, PE Header File &Section.

UNIT–III: Advanced Static & Dynamic Analysis-IDA Pro, Recognizing C code constructs, analyzing malicious windows program, Debugging, OllyDbg, Kernel Debugging with WinDbg, Malware Focused Network Signatures.

UNIT–IV: Malware Functionalities-Malware Behavior, Covert Malware Launch, Data Encoding, Shell code Analysis.

UNIT–V: Reverse Engineering Malware (REM): REM Methodology, Resources for Reverse Engineering Malware (REM) Understanding Malware Threats, Malware indicators, Malware Classification, Examining Clam AV-Signatures.

Text books:

1. Michael Sikorski, Andrew Honig “Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software” publisher William pollock

References:

1. ErciFiliol, “Computer Viruses: from theory to applications”, Springer, 1st edition, 2005.

ADHOC AND SENSOR NETWORKS

UNIT I Introduction to Ad Hoc Networks:

Characteristics of MANETs, Applications of MANETs and challenges of MANETs - Routing in MANETs: Criteria for classification, Taxonomy of MANET routing algorithms, Topology based routing algorithms, Position based routing algorithms, Other routing algorithms.

UNIT II Data Transmission:

Broadcast storm problem, Broadcasting, Multicasting and Geocasting - TCP over Ad Hoc: TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

UNIT III Basics of Wireless, Sensors and Applications:

Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer.

UNIT IV Data Retrieval in Sensor Networks:

Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots - Security: Security in Ad Hoc networks, Key management, Secure routing, Cooperation in MANETs, Intrusion Detection systems.

UNIT V Sensor Network Platforms and Tools:

Sensor Network Hardware, Berkeley motes, Sensor Network Programming Challenges, Node-Level Software Platforms - Operating System: TinyOS - Imperative Language: nesC, Dataflow style language: TinyGALS, Node-Level Simulators, ns-2 and its sensor network extension, TOSSIM

TEXT BOOKS:

1.Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P.Aggarwal, World Scientific Publications, March 2006, ISBN – 981-256-681-3

2.Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman)

COMPUTER VISION

UNIT – I: Introduction to Deep Learning, Tensor flow and Keras: What is Deep learning? Why Deep learning, Advantages, and limitations of Deep learning. Tensor flow basics, how to build Deep learning models with Keras and Tensor flow as back end.Tensor board for visualizations.

UNIT - II: CNN for Vision Tasks: Introduction to CNN, Deep Convolutional networks, LeNet,VGG16Net,Classification of MNIST hand written digits by CNN and FCNN models.

UNIT - III: Generative AdversalNetworks (GAN's): What is GAN?DGAN,Some interesting GAN structures,SRGAN,Cycle GAN, info GAN.MNIST using GAN in Tensorflow.

UNIT - IV: Recurrent Neural Networks: The basic RNN, RNN Cell,RNN variants, RNN topologes,Example applications of RNN. Image captioning and Annotation.

UNIT - V: Deep Dream and Neural Style Transfer: How the Deep dream algorithm works,Deepdeam implementation in keras and tensor flow. Neural Style Tranfer:Contentloss,Styleloss,Totalvarianlosss, network training.

Text Books:

1.Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systemsby AurélienGéron,Orielly.

2.Deep Learning with Python 1st Edition by François Chollet,MannigPublicatons.

3.Mastering Computer Vision with TensorFlow 2.x: Build advanced computer vision applications using machine learning and deep learning techniquesby Krishnendu Kar ,Packt Publications.

4.Deep Learning with TensorFlow 2 and Keras: Regression, ConvNets, GANs, RNNs,NLP, and more with TensorFlow 2 and the Keras API, 2nd Edition

References:

1. Richard Szeliksy "Computer Vision: Algorithms and Applications" (http://szeliski.org/Book/)

2. Haralick& Shapiro, "Computer and Robot Vision", Vol II

3. G_erardMedioni and Sing Bing Kang "Emerging topics in computer vision"

4. Emanuele Trucco and AllessandroVerri "Introductory Techniques for 3-D Computer Vision", Prentice Hall, 1998.

5. Olivier Faugeras, "Three-Dimensional Computer Vision", The MIT Press, 1993

SPEECH PROCESSING

UNIT - I

Fundamentals of Digital Speech Processing: Anatomy & Physiology of Speech Organs, The process of Speech Production, Acoustic Phonetics, Articulatory Phonetics, The Acoustic Theory of Speech Production- Uniform Lossless Tube Model, Effect of Losses In Vocal Tract, Effect of Radiation at Lips, Digital Models for Speech Signals.

UNIT - II

Time Domain Models for Speech Processing: Introduction, Window Considerations, Short-TimeEnergy and Average Magnitude Short Time Average Zero Crossing Rate, Speech Vs Silence Discrimination Using Energy and Zero Crossing, Pitch Period Estimation using a Parallel Processing Approach, The Short Time Autocorrelation Function, The Short Time Average Magnitude Difference Function, Pitch Period Estimation using The Autocorrelation Function.

UNIT - III

Linear Predictive Coding (LPC) Analysis: Basic Principles of Linear Predictive Analysis, The Autocorrelation Method, The Covariance Method, Solution of LPC Equations: Cholesky Decomposition Solution for Covariance Method, Durbin's Recursive Solution for the Autocorrelation Equations, Comparison between the Methods of Solution of the LPC Analysis Equations, Applications of LPC Parameters: Pitch Detection Using LPC Parameters, Formant Analysis Using LPC Parameters.

UNIT - IV

Automatic Speech & Speaker Recognition: Basic Pattern Recognition Approaches, Parametric Representation of Speech, Evaluating the Similarity of Speech Patterns, Isolated Digit Recognition System, Continuous Digit Recognition System Hidden Markov Model (HMM) For Speech: Hidden Markov Model (HMM) for Speech Recognition, Viterbi algorithm, Training and Testing using HMMS.

UNIT - V

Speaker Recognition: Recognition techniques, Features that Distinguish Speakers, Speaker Recognition Systems: Speaker Verification System, Speaker Identification System. Overview of speech Enhancement, speech synthesis.

Textbooks:

1. Digital Processing of Speech Signals: L.R Rabinar and R W Jhaung, Pearson Education.
2. Digital Processing of Speech Signals: L.R. Rabiner and S. W. Schafer, Pearson Education.
3. Speech Communications: Human & Machine - Douglas O'Shaughnessy, 2nd Ed., WileyIndia.

References:

1. Discrete Time Speech Signal Processing: Principles and Practice, Thomas F. Quateri, 1st Edition, Pearson Education.
2. Speech & Audio Signal Processing: Ben Gold & Nelson Morgan, 1st Edition, Wiley.

GRID COMPUTING

UNIT-I INTRODUCTION

Grid Computing values and risks – History of Grid computing – Grid computing model and protocols – overview of types of Grids

UNIT-II TYPES OF GRIDS Desktop Grids:

Background – Definition – Challenges – Technology – Suitability – Grid server and practical uses; Clusters and Cluster Grids; HPC Grids; Scientific in sight – application and Architecture – HPC application development environment and HPC Grids; Data Grids; Alternatives to Data Grid – Data Grid architecture.

UNIT-III ARCHITECTURE AND MANAGEMENT The open Grid services Architecture – Analogy – Evolution – Overview – Building on the OGSA platform – implementing OGSA based Grids – Creating and Managing services – Services and the Grid – Service Discovery – Tools and Toolkits – Universal Description Discovery and Integration (UDDI)

UNIT-IV NATIVE PROGRAMMING AND SOFTWARE APPLICATIONS: Desktop supercomputing – parallel computing – parallel programming paradigms – problems of current parallel programming paradigms – Desktop supercomputing programming paradigms – parallelizing existing applications – Grid enabling software applications – Needs of the Grid users – methods of Grid deployment – Requirements for Grid enabling software – Grid enabling software applications.

UNIT-V APPLICATIONS, SERVICES AND ENVIRONMENTS

Application integration – application classification – Grid requirements – Integrating applications with Middleware platforms – Grid enabling Network services – managing Grid environments – Managing Grids – Management reporting – Monitoring – Data catalogs and replica management – portals – Different application areas of Grid computing.

Text Books:

1.Ahmar Abbas, " Grid Computing , A Practical Guide to Technology and Applications", Firewall media , 2004.

2.Joshy Joseph , Craig Fellenstein , "Grid Computing", Pearson Education , 2004.

3. Fran Berman, Geoffrey Fox, Tony Hey, "Grid Computing-Making -The Global Infrastructure A Reality",John Wiley & Sons Ltd, 2003.

4.Rajkumar Buyya,High Performance Cluster Computing: Architectures and Systems, Vol. 1,PHI,1999.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
COMPUTER SCIENCE & ENGINEERING
Syllabus for Pre-Ph. D ExaminationCSE

SOFTWARE PROCESS AND PROJECT MANAGEMENT

UNIT I: Software Process Maturity

Software maturity Framework, Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The Optimizing Process.

Process Reference Models Capability Maturity Model (CMM), CMMi, PCMM, PSP, TSP.

UNIT II: Software Project Management Renaissance

Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way.

UNIT III: Life-Cycle Phases and Process artifacts

Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model-based software architectures. Workflows and Checkpoints of process Software process workflows, Iteration workflows, Major milestones, minor milestones, periodic status assessments.

UNIT IV: Process Planning and Project Organizations

Work breakdown structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning, line-of- business organizations, project organizations, evolution of organizations, process automation.

UNIT V: Project Control and process instrumentation

The seven-core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic software metrics, metrics automation. CCPDS-R Case Study and Future Software Project Management Practices Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions

TEXT BOOKS:

1. Managing the Software Process,Watts S. Humphrey, Pearson Education,1999

2. Software Project Management,Walker Royce,Pearson Education,1998

REFERENCE BOOKS:

1. An Introduction to the Team Software Process, Watts S. Humphrey, Pearson Education,2000

2. Process Improvement essentials, James R. Persse, O'Reilly,2006

3. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition,Tata McGraw Hill,2006

4. Applied Software Project Management, Andrew Stellman & Jennifer Greene, O'Reilly, 2006.

5. Head First PMP, Jennifer Greene & Andrew Stellman, O'Reilly,2007

6. Software Engineering Project Managent, Richard H. Thayer & Edward Yourdon, second edition, Wiley India, 2004.

7. Agile Project Management, Jim Highsmith, Pearson education, 2004.

8. Quality Software Project Management,R.F.Futrell ,D.F.Shafer,L.I.Shafer,Pearson

INTERNET OF THINGS (IoT)

UNIT - I: Introduction to IOT

Understanding IoT fundamentals, IOT Architecture and protocols, Various Platforms for IoT, Real time Examples of IoT , Overview of IoT components and IoT Communication Technologies ,Challenges in IOT.

UNIT - II: Arduino Simulation Environment Arduino Uno Architecture

Setup the IDE, Writing Arduino Software, Arduino Libraries, Basics of Embedded C programming for Arduino, Interfacing LED, push button and buzzer with Arduino, Interfacing Arduino with LCD. Sensor & Actuators with Arduino Overview of Sensors working, Analog and Digital Sensors, Interfacing of Temperature, Humidity, Motion, Light and Gas Sensor with Arduino, Interfacing of Actuators with Arduino. Interfacing of Relay Switch and Servo Motor with Arduino.

UNIT - III: Raspberry Pi Programming

Installing and Configuring the Raspberry Pi,Getting Started with the Raspberry Pi,Using the Pi as a Media Centre, Productivity Machine and Web Server,Remote access to the Raspberry Pi. Preaparing

Raspberry Pi for IoT Projects. Creating the Sensor Projects,Creating the actuator Projects, Creating a IoT controller, creating a camera and working with HTTP protocol.

UNIT - IV: Basic Networking with ESP8266 WiFi module

Basics of Wireless Networking ,Introduction to ESP8266 Wi-Fi Module ,Various Wi-Fi library , Web server- introduction, installation, configuration ,Posting sensor(s) data to web server .IoT Protocols ,M2M vs. IOT Communication Protocols.

UNIT - V: Cloud Platforms for IOT Virtualization

Concepts and Cloud Architecture , Cloud computing, benefits ,Cloud services -- SaaS, PaaS, IaaS , Cloud providers & offerings ,Study of IOT Cloud platforms , ThingSpeak API and MQTT , interfacing ESP8266 with Web services

Text Books:

i. Simon Monk, Programming Arduino: Getting Started with Sketches, Second Edition McGraw- Hill Education

ii. Peter Waher,Learning Internet of Things,Packt publishing. iii.OvidiuVermesan,PeterFriess, IoT-From Research and Innovation to Market deployment,River Publishers

Reference Books:

i. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.

ii. Peter Waher, “Learning Internet of Things”, PACKT publishing, BIRMINGHAM – MUMBAI

iii. Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN 978-3- 642-19156-5 e-ISBN 978-3-642-19157-2, Springer.

BLACK CHAIN TECHNOLOGY

UNIT-I: Introduction:

History and basics, Types of Blockchain, Consensus, CAP Theorem. Cryptographic Hash Functions: Properties of hash functions, Secure Hash Algorithm, Merkle trees, Patricia trees.

UNIT-II: Decentralization: Decentralization using Blockchain, Methods of decentralization, decentralization framework, Blockchain and full ecosystem decentralization, Smart contracts, Decentralized Organizations, Platforms for decentralization.

UNIT-III: Bitcoin: Introduction to Bitcoin, Digital keys and addresses, Transactions, Blockchain, The Bitcoin network, Bitcoin payments, Bitcoin Clients and APIs, Alternatives to Proof of Work, Bitcoin limitations.

UNIT-IV: Etherium: Smart Contracts, Introduction to Ethereum, The Ethereum network, Components of the Ethereum ecosystem, Blocks and Blockchain, Fee schedule, Ethereum Development Environment, Solidity.

UNIT-V: Hyperledger: Introduction, Hyperledger Projects, Protocol, Architecture, Hyperledger Fabric, Sawtooth Lake, Corda. Challenges and Opportunities: Scalability, Privacy, Blockchain for IoT, Emerging trends

Text Book:

i. Mastering Blockchain, Imran Bashir, Second Edition, Packt Publishing.

References:

i. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, Andrea Antonopoulos, and O'Reilly.

ii. Blockchain Blueprint for a New Economy, Melanie Swan, O'Reilly.

iii. Mastering Bitcoin: Programming the Open Blockchain, Antonopoulos, Andreas M. O'Reilly.

iv. Blockchain Technology: Cryptocurrency and Applications, S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, Oxford University Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

PAPER – I		Subject Code
S. No	**Subject**	
1	Advanced Databases	**1305101**
2	Artificial Intelligence and Soft Computing	**1305102**
3	Code Optimization	**1305103**
4	Data Mining and Knowledge Discovery	**1305104**
5	Digital Image Processing	**1305105**
6	Distributed Computing	**1305106**
7	Distributed Databases	**1305107**
8	Distributed Operating System	**1305108**
9	Big Data Analytics	**1305109**
10	Human Computer Interaction	**1305110**
11	Information Retrieval	**1305111**
12	Multi-Media and Application Development	**1305112**
13	Network Security	**1305113**
14	Internet of Things	**1305114**
15	Soft Computing	**1305115**

PAPER – II		Subject Code
S. No	**Subject**	
1	Advanced Computer Architecture	**1305201**
2	Advanced Data Structures and Algorithms	**1305202**
3	Advanced Unix Programming	**1305203**
4	Advanced Computer Networks	**1305204**
5	Bio-Informatics	**1305205**
6	Cyber Security	**1305206**
7	Computer Communication	**1305207**
8	Deep Learning	**1305208**
9	Machine Learning	**1305209**
10	Mobile Computing	**1305210**
11	Parallel Computing & Algorithms	**1305211**
12	Pattern Recognition	**1305212**
13	Scalable Parallel Computing Architectures	**1305213**
14	Secured DataBase Application Development	**1305214**
15	Wireless Networks and Mobile Computing	**1305215**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

PAPER – I

ADVANCED DATABASES

UNIT I: Introduction:
Distributed Data Processing, Distributed Databases System, promises of DDBS, Problem areas.
Overview of Relational DBMS: Relational Databases Concepts, Normalization, Integrity rules, Relational data languages.

UNIT II: Distributed DBMS Architecture:
Architectural Models for Distributed DBMS, DDMBS Architecture.
Distrubuted Database Design:
Alternative Design Strategies, Distribution Design issues, Fragmentation, Allocation.

UNIT III: Query Processing and Decomposition:
Query processing Objectives, Characterization of query processors, layers of query of query processing, query decomposition, Localization of distributed data.

UNIT IV: Distributed query Optimization:
Query optimization, centralized query optimization, Distributed query optimization algorithms.

UNIT V: Distributed object Database Management Systems:
Fundamental object concepts and Models, Object Distributed Design, Architectural Issues, Object Management, Distributed Object storage, Object query Processing.
Object Oriented Data Model: Inheritance, object identity, persistent programming languages, persistence of objects, comparing ODDBMS and ORDBMS.

REFERENCE BOOKS

1. Principles of Distributed Database Systems, 2/e, OZSU, Valduriez, Sridhar, Pearson, 2001
2. Distributed Databases, Stefan Seri, Pelagatti Willipse, TMH
3. Database System Concepts, 5/e, Korth, Silberschatz, Sudershan, TMH
4. Database Management Systems, 3/e, Raghuramakrishnan, Johhanes Gehrke, TMH
5. Data Base Principles, Programming, and Performance, 2/e, P O' Neil, E O'Neil, Elsevier

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

ARTIFICIAL INTELLIGENCE AND SOFT COMPUTING

UNIT I

Introduction:

AI problems, AI technique, Problem as state space search, problem characteristics, production systems, types of production systems, Design of Search programsbHeuristic search techniques: Generate and test, Hill climbing, Best first search, Problem reduction, Constraint satisfaction, Means-Ends Analysis.

UNIT II

Game Playing: Minimax search procedure, adding alpha-beta cut-offs, additionalrefinements, Iterative deepening, Statistical Reasoning: Probability & Bayes theorem, Certainty factors and Rules based systems, Bayesian Networks.

Knowledge Representation Theorem proving using Predicate logic, Resolution, Natural Deduction, Knowledge representation using Rules, Forward versus Backward Reasoning, Matching, Control Artificial Knowledge , **Knowledge Structures**

UNIT III

Planning: Components of planning system, goal stack planning, nonlinear planning using constraint posting, Hierarchical planning, Reactive systems

Natural Language Processing: Steps in NLP, Syntactic processing, Semantic analysis, Discourse and Pragmatic processing, Statistical NLP, Spell checking.

UNIT IV

Learning: Rote learning-by example, Explanation based learning, Discovery, Analogy, Formal learning theory, NN learning and Genetic learning.

Genetic Algorithms: survival of the fittest principle in Biology, Genetic Algorithms, Significance of Genetic operators, termination parameters, Evolving Neural nets, Ant Algorithms

UNIT V

Fuzzy Set & Logic Theory**:** Classical & Fuzzy set theory, Interval Arithmetic's, Operations on Fuzzy sets

Classical logic theory, Boolean Logic, Multi valued Logic.

Applications of Fuzzy Logic: PQE – Decision Making Investment – Examples

Fuzzy Rule base and Fuzzy Modelling: If-Then Rules, System modelling, Static fuzzy systems, Parameter Identification PLC, closed loop, fuzzy controllers, examples, Fuzzy PID controllers – type1 and type 2 .

REFERENCE BOOKS:

1. Intelligence, 3/e, E.Rich, K.Knight, TMH.
2. Introduction to Fuzzzy Systems, Guanrong Chen, Trung Tat Pham, Chapman & Hall/CRC, 2009.
3. Artificial Intelligence , A Modern Approach, 2/e, Stuart Russel, Peter Norvig, PHI/PEA.
4. Artificial Intelligence, 5/e, George F Luger, PEA.
5. Artificial Intelligence, 3/e, Patrick Henry Winston, PEA.
6. Artificial Intelligence and Expert Systems, Patterson, PHI .
7. Artificial Intelligence,A Systems Approach, Tim Jones, Infinity Science Press .

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

CODE OPTIMIZATION

Unit I: Introduction:
Review of Compiler Structure, Advanced Issues in Elementary Topics, The Importance of Code Optimization, Structure of Optimizing Compilers, Placement of Optimizations in Aggressive Optimizing Compilers

Compiler Internal Representations and Run time support:
Intermediate Representations, Intermediate Languages, Representing intermediate languages in ICAN, ICAN Naming of Data Structures and Routines that Manipulate Intermediate Code, Other Intermediate-Language Forms, Run-Time Support: Data Representations and Instructions, Register Usage, The Local Stack Frame, The Run-Time Stack, Parameter-Passing Disciplines, Procedure Prologues, Epilogues, Calls, and Returns, Code Sharing and Position-Independent Code, Symbolic and Polymorphic Language Support

Unit II: Control Flow Analysis:
Approaches to Control-Flow Analysis, Depth-First Search, Preorder Traversal, Postorder Traversal, and Breadth-First Search, Dominators, Loops and Strongly Connected Components, Reducibility, Interval Analysis and Control Trees, Structural Analysis

Unit III: Data-Flow Analysis:
Reaching Definitions, Basic Concepts: Lattices, Flow Functions, and Fixed Points, Iterative Data-Flow Analysis, Lattices of Flow Functions, Control-Tree-Based Data-Flow Analysis, Structural Analysis, Interval Analysis, Other Approaches, Du-Chains, Ud-Chains, and Webs, Dealing with Arrays, Structures, and Pointers, Automating Construction of Data-Flow Analyzers

Unit IV: Dependence Analysis and Optimization:
Dependence Analysis and Dependence Graph: Dependence Relations, Basic-Block Dependence DAGs, Dependences in Loops, Dependence Testing, Program-Dependence Graphs
Introduction to Optimization: Importance of Individual Optimizations, Order and Repetition of Optimizations, Early Optimizations: Constant-Expression Evaluation, Scalar Replacement of Aggregates, Algebraic Simplifications and Reassociation, Value Numbering, Copy Propagation, Sparse Conditional Constant Propagation

Unit V: Procedural/Inter-procedural Analysis and Optimizations
Tail-Call Optimization and Tail-Recursion Elimination, Procedure Integration, In-Line Expansion, Leaf-Routine Optimization and Shrink Wrapping, Interprocedural Control-Flow Analysis: The Call Graph, Interprocedural Data-Flow Analysis, Interprocedural Constant Propagation, Interprocedural Alias Analysis, Interprocedural Optimizations, Interprocedural Register Allocation

REFERENCE BOOKS :

1. Advanced Compiler Design and Implementation, Muchnick, Elsevier, 2008.
2. Engineering a Compiler, Keith D Cooper, Linda Torczon, Elsevier.
3. Compiler Design in C, Allen Holub, PHI, 1990.
4. Compilers Principles, Techniques and Tools, Aho, Sethi, Ullman, PEA, 2006.

5. Crafting a compiler with C, Charles N. Fischer, Richard J. Leblanc, Benjamin Cummings, Wesley.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

DATA MINING AND KNOWLEDGE DISCOVERY

Unit I: **Introduction to Data Mining:**
Types of Data, Data Quality, Data Processing, Measures of Similarity and Dissimilarity
Exploring Data: Data Set, Summary Statistics, Visualization, OLAP and multi dimensional data Analysis

Unit II: Classification:
Basic Concepts, Decision Trees, and model evaluation: General approach for solving a classification problem, Decision Tree induction, Model over fitting: Due to presence of noise, due to lack of representation samples, Evaluating the performance of classifier.
Classification-Alternative techniques:
Nearest Neighbourhood classifier, Bayesian Classifier, Support Vector Machines: LinearSVM, Separable and Non Separable case.

Unit III: Association Analysis:
Problem Definition, Frequent Item-set generation, Rule generation, compact representation of frequent item sets, FP-Growth Algorithms, Handling categorical, continuous attributes, concept hierarchy, sequential, sub-graph patterns

Unit IV: Clustering: Overview, K-means, Agglomerative Hierarchical clustering, DBSCAN
Cluster Evaluation: Overview, Unsupervised Cluster evaluation using cohesion and separation, using the proximity matrix, Scalable clustering algorithms.

Unit V: Web Data mining:
Introduction, Web terminology and characteristics, web content mining, web usage mining, web structure mining, Search Engines: Characteristics, Functionality, Architecture, Ranking of web pages, Enterprise search

REFERENCE BOOKS:

1. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, Vipin Kumar, PEA.
2. Introduction to Data Mining with Case Studies, GK Gupta , Prentice Hall.
3. Data Mining: Introductory and Advanced Topics, Margaret H Dunham, PEA, 2008.
4. Fundamentals of data warehouses, 2/e, Jarke, Lenzerini, Vassiliou, Vassiliadis, Springer.
5. Data Mining Theory and Practice, Soman, Diwakar, Ajay, PHI, 2006.
6. Data Mining, Concepts and Techniques, 2/e, Jiawei Han , Micheline Kamber , Elsevier,2006.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

DIGITAL IMAGE PROCESSING

Unit I: **Digital Image fundaments:**
Introduction, An image model, sampling & quantization, basic relationships between Pixels, imaging geometry.

Unit II: **Image Transforms:**
Properties of 2 – D Fourier transform FFT algorithm and other separable image transforms. Walsh transforms. Hadamard, Cosine, Haar, Slant transforms, KL transforms and their properties.

Unit III: **Image Enhancement and restoration:**
Background, enhancement by point processing, histogram processing, spatial filtering and enhancement in frequency domain, color image processing, Degradation model, Algebraic approach to restoration, inverse filtering, least mean squares and interactive restoration, geometric transformations

Unit IV: **Image Representation and compression:**
Various schemes for representation, boundary descriptors, and regional descriptors , Fundamentals of image compression modes, error free compression, lossy compression,image compression standards.

Unit V: **Image segmentation and reconstruction:**
Detection of discontinuities, edge linking and boundary detection thresholding, region – oriented segmentation, Image reconstruction from Projections, Radon Transforms; Convolution/Filter back – Project Algorithms.

REFERENCE BOOKS

1. Fundamentals of Digital Image Processing, A.K.JAIN, PHI
2. Fundamentals of Digital Image Processing, Anna durai, shanmuga lakshmi, Pearson
3. Introduction to Digital Image Processing, Alasdair, McAndrew, Cengage
4. Digital Image Processing, 3/e, GONZALEX, WOODS, Addison Wesley
5. Digital Image Processing, Castleman, Pearson
6. Digital Image Processing, S Jayaraman, SEsakkirajan, T Veerakumar,TMH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

DISTRIBUTED COMPUTING

Unit I: Introduction to distributed programming:
Anatomy of a Distributed Application, Requirements for Developing Distributed Applications, What Does Java Provide?
Introduction to sockets programming: Sockets and Streams, URLs, URLConnections, and ContentHandlers, The ClassLoader

Unit II: Distributing Objects:
Why Distribute Objects?, What's So Tough About Distributing Objects?, Features of Distributed Object Systems, Distributed Object Schemes for Java, CORBA, Java RMI, RMI vs. CORBA
Threads: Thread and Runnable, Making a Thread, Managing Threads at Runtime, Networked Threads

Unit III: **Message-Passing Systems**:
Messages Defined, Why Do We Need Messages?, Message Processing, Fixed Protocols, Adaptable Protocols, Message Passing with Java Events, Using Remote Objects
Databases: An Overview of JDBC, Remote Database Applications, Multi-Database Applications

Unit IV: RMI:
The Basic Structure of RMI, The Architecture Diagram Revisited, Implementing the Basic Objects, The Rest of the Server, The Client Application
The RMI Registry: Why Use a Naming Service? The RMI Registry, The RMI Registry Is an RMI Server, Examining the Registry, Limitations of the RMI Registry, Security Issues
Naming Services: Basic Design, Terminology, and Requirements, Requirements for Our Naming Service, Federation and Threading, The Context Interface, The Value Objects, ContextImpl, Switching Between Naming Services, The Java Naming and Directory Interface (JNDI)
The RMI Runtime: Reviewing the Mechanics of a Remote Method Call, Distributed Garbage Collection, RMI's Logging Facilities, Other JVM Parameters

Unit V: Service Oriented Architecture:
Introduction, Defining a Service, Defining SOA, Identifying Service Candidates, Identifying Different Kinds of Services, Modeling Services, Making a Service Composable, Supporting Your SOA Efforts, Selecting a Pilot Project, Establishing Governance

REFERENCE BOOKS:

1. Java Distributed Computing, Jim Farley, O'Reilly.
2. Java RMI Designing and Building,The Basics of RMI Applications, William Grosso, O'Reilly.
3. Java SOA Cookbook SOA Implementation Recipes, Tips, Techniques, Eben Hewitt, O'Reilly, 2009.
4. Service Oriented Architecture With Java, Malhar Barai, Vincenzo Caselli, Binildas A. Christudas, Packt Publishing, 2008.
5. Distributed Programming with Java, Qusay H. Mahmoud, Manning Publisher 2000.
6. Java in Distributed Systems, Concurrency, Distribution and Persistence, Marko Boger, 2001.

7. Developing Distributed and E-commerce Applications, Darrel Ince, 2/e, Wesly, 2004.
8. Java Message Service (O'Reilly Java Series), Richard Monson-Haefel, David Chappell.
9. Sun SL 301 Distributed Programming with Java.
10. Java Tutorial, http://java.sun.com/docs/books/tutorial/index.html

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

DISTRIBUTED DATABASES

Unit I: **Introduction :**
Features of distributed databases, features of Centralized databases, level of distributed transparency - Reference Architecture, types of Data Fragmentation, distribution Transparency, Access primitives, and Integrity constraints.

Unit II: **Distributed Database design** :
A frame work, the design of database fragmentation, the allocation of fragments.

Unit III: **Query Processing :**
Translation of global queries into fragment queries, query optimization.
Distributed Transaction Management : A framework, transaction atomicity, 2-phase commit.

Unit IV: **Concurrency control:**
Foundations, distributed deadlocks, timestamps.
Reliability: Basic concepts, commit protocols, consistent view of Network, Detection and Resolution of Inconsistencies, check points and cold restart.

Unit V: **Commercial Systems:**
Tranclem's ENCOMPASS Distributed database systems, IBM's Inter system communication, feature of distributed ingress and Oracle.
Heterogeneous databases: General problems – brief study of multi base.

REFERENCE BOOKS:

1. Distributed Database systems Principles and Systems, Ceri S. Pelagatti. G, MGH.
2. Principles of Distributed Database Systems, 2/e, M. Tamer Ozsu, Sridhar, PEA.
3. Database system Concepts, 5/e,Silberschatz, F.Korth, Sundrashan,MGH,2006.
4. Modern database Management, 7/e, Hoffer, Prescott, McFadden, PEA,2007.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

DISTRIBUTED OPERATING SYSTEMS

Unit I: Processes
THREADS: Introduction to Threads, Threads in Distributed Systems; CLIENTS: User Interfaces, Client-Side Software for Distribution Transparency SERVERS: General Design Issues, Object Servers; CODE MIGRATION: Approaches to Code Migration, Migration and Local Resources, Migration in Heterogeneous Systems, Example: D'Agents
SOFTWARE AGENTS: Software Agents in Distributed Systems, Agent Technology

Unit II: Naming Systems
NAMING ENTITIES: Names, Identifiers, and Addresses, Name Resolution, The Implementation of a Name Space, Example: DNS, X.500
LOCATING MOBILE ENTITIES: Naming versus Locating Entities, Simple Solutions, Home-Based Approaches, Hierarchical Approaches
REMOVING UNREFERENCED ENTITIES: The Problem of Unreferenced Objects, Reference Counting, Reference Listing, Identifying Unreachable Entities

Unit III: Synchronization
Clock synchronization, logical clocks, global state, election algorithms, mutual exclusion, distributed transactions

Unit IV: Consistency and Replication
Introduction, Data-Centric Consistency Models, Client-Centric Consistency Models, Distribution Protocols, Consistency Protocols, Examples: Orca and Causally-Consistent Lazy Replication

Unit V: Fault Tolerance
Introduction to Fault Tolerance, Process Resilience, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit, Recovery

REFERENCE BOOKS:

1. Distributed Systems , Principles and Paradigms, 2/e, Tanenbaum, Maarten Van Steen, PHI.
2. Advanced concepts in Operating Systems, Mukesh Singhal, Niranjan G. Shivaratri, TMH, 2005.
3. Distributed Operating Systems and Algorithm Analysis, Chow, Johnson, PEA
4. Distributed Systems Concepts and Design, 4/e, George Coulouris, Dollimore, Kindberg, PEA.
5. Distributed Operating Systems, Pradeep K. Sinha, PHI,2009.
6. Operating Systems, Internals & Design Principles, 6/e, William Stallings, PEA.
7. Distributed Systems Computing over Networks, Joel M.Crichlow, PHI.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

BIG DATA ANALYTICS

UNIT – I:
Data structures in Java: Linked List, Stacks, Queues, Sets, Maps; Generics: Generic classes and Type parameters, Implementing Generic Types, Generic Methods, Wrapper Classes, Concept of Serialization

UNIT – II:
Working with Big Data: Google File System, Hadoop Distributed File System (HDFS) – Building blocks of Hadoop (Namenode, Datanode, Secondary Namenode, Job Tracker, Task Tracker), Introducing and Configuring the Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.

UNIT – III:
Writing MapReduce Programs: A Weather Dataset, Understanding Hadoop API for MapReduce Framework (Old and New), Basic programs of Hadoop MapReduce: Driver code,Mapper code, Reducer code, Record Reader, Combiner, Partitioner

UNIT – IV:
Hadoop I/O: The Writable Interface, Writable Comparable and comparators, Writable Classes:Writable wrappers for Java primitives, Text, Bytes Writable, Null Writable, Object Writableand Generic Writable, Writable collections, Implementing a Custom Writable: Implementing a Raw Comparator for speed, Custom comparators

UNIT – V:
Pig: Hadoop Programming Made Easier Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin
Applying Structure to Hadoop Data with Hive:
Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data.

TEXT BOOKS:
1. Big Java 4th Edition, Cay Horstmann, Wiley John Wiley & Sons, INC
2. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly
3. Hadoop in Action by Chuck Lam, MANNING Publ.
4. Hadoop for Dummies by Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk,Bruce Brown, Rafael Coss
REFERENCE BOOKS:
1. Hadoop in Practice by Alex Holmes, MANNING Publ.
2. Hadoop MapReduce Cookbook, Srinath Perera, Thilina Gunarathne

HUMAN COMPUTER INTERACTION

UNIT I: Introduction:
Importance of user Interface – definition, importance of good design. Benefits of gooddesign. A brief history of Screen design
The graphical user interface: Popularity of graphics, direct manipulation, graphical system, Characteristics, Web user –interface popularity, characteristics- Principles of user interface.

UNIT II: Design process:
Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.

UNIT III: Screen Designing :
Design goals, Screen planning and purpose, organizing screen elements, ordering of screen data and content, screen navigation and flow, Visually pleasing composition, amount of information, focus and emphasis, presentation information simply and meaningfully, information retrieval on web, statistical graphics, Technological consideration in interface design.

UNIT IV: Windows:
Windows new and Navigation schemes selection of window, selection of devices based and screen based controls.

UNIT V: Components :
Components text and messages, Icons and increases, Multimedia, colors, uses problems, choosing colors.
Interaction Devices:
Keyboard and function keys, pointing devices, speech recognition digitization and generation, image and video displays, drivers.

REFERENCE BOOKS :

1. The Essential guide to user interface design, Wilbert O Galitz, Wiley DreamaTech.
2. Designing the user interface. 3/e, Ben Shneidermann , PEA.
3. Human Computer Interaction. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, PEA.
4. Interaction Design PRECE, ROGERS, SHARPS, Wiley Dreamtech.
5. User Interface Design, Soren Lauesen , PEA.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

INFORMATION RETRIEVAL

Unit I : Introduction to Information storage and retrieval systems:
Domain Analysis of IR systems, IR and other types of Information Systems, IR System Evaluation
Introduction to Data structures and algorithms related to Information Retrieval: Basic Concepts, Data structures, Algorithms.

Unit II: Inverted Files and Signature Files:
Introduction, Structures used in Inverted Files, Building an Inverted file using a sorted array, Modifications to the Basic Techniques.
Signature Files: Concepts of Signature files, Compression, Vertical Partitioning, Horizontal Partitioning.

Unit III: New Indices for Text, Lexical Analysis and Stoplists:
PAT Trees and PAT Arrays: Introduction, PAT Tree structure, Algorithms on the PAT Trees, Building PAT Trees as PATRICA Trees, PAT representation as Arrays. Lexical Analysis, Stoplists.

Unit IV: Stemming Algorithms and Thesaurus Construction:
Types of Stemming algorithms, Experimental Evaluations of Stemming, Stemming to Compress Inverted Files.
Thesaurus Construction: Features of Thesauri, Thesaurus Construction, Thesaurus construction from Texts, Merging existing Thesauri.

Unit V: String Searching Algorithms:
Introduction, Preliminaries, The Naive Algorithm, The Knutt-Morris-Pratt Algorithm, The Boyer-Moore Algorithm, The Shift-Or Algorithm, The Karp-Rabin Algorithm.

REFERENCE BOOKS

1. Modern Information Retrieval,Ricardo Baeza-Yates, Neto, PEA,2007.
2. Information Storage and Retrieval Systems: Theory and Implementation, Kowalski, Gerald, Mark Academic Press, 2000.
3. Information Retrieval: Algorithms and Heuristics , Grossman, Ophir Frieder, 2/e, Springer, 2004.
4. Information Retrieval Data Structures and Algorithms , Frakes, Ricardo Baeza-Yates, PEA
5. Information Storage and Retieval, Robert Korfhage, John Wiley & Sons.
6. Introduction to Information Retrieval, Manning, Raghavan, Cambridge University Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

MULTIMEDIA AND APPLICATION DEVELOPMENT

UNIT I : Fundamental concepts in Text and Image:
Multimedia and hypermedia, world wide web, overview of multimedia software tools. Graphics and image data representation graphics/image data types, file formats, Color in image and video: color science, color models in images, color models in video.

UNIT II: Fundamental Concepts in Cideo and Digital Audio:
Types of video signals, analog video, digital video, digitization of sound, MIDI, quantization and transmission of audio.

UNIT III: Application Development:
An OOP Application Frame work, Using Components with ActionScript MovieClip Subclasses.

UNIT IV: Multimedia Data Compression:
Lossless compression algorithm: Run-Length Coding, Variable Length Coding, Dictionary Based Coding, Arithmetic Coding, Lossless Image Compression, Lossy compression algorithm: Quantization, Transform Coding, Wavelet-Based Coding, Embedded Zerotree of Wavelet Coefficients Set Partitioning in Hierarchical Trees (SPIHT). **Basic Video Compression Techniques:** Introduction to video compression, video compression based on motion compensation, search for motion vectors, MPEG, Basic Audio Compression Techniques.

UNIT V: Multimedia Networks:
Basics of Multimedia Networks, Multimedia Network Communications and Applications: Quality of Multimedia Data Transmission, Multimedia over IP, Multimedia over ATM Networks, Transport of MPEG-4, Media-on-Demand (MOD).

REFERENCE BOOKS :

1. Fundamentals of Multimedia , Ze-Nian Li , Mark S. Drew, PHI/PEA.
2. Essentials ActionScript 2.0, Colin Moock, SPD O,REILLY.
3. Digital Multimedia, Nigel chapman & jenny chapman, Wiley-Dreamtech.
4. Macromedia Flash MX Professional 2004 Unleashed, PEA.
5. Multimedia & Communications Technology, Steve Heath, Elsevier (Focal Press).
6. Multimedia Applications, Steinmetz, Nahrstedt, Springer.
7. Multimedia Basics, Weixel Thomson.
8. Multimedia Technology & Applications, David Hilman , Galgotia.
9. Multimedia Technologies, Banerji, Mohan Ghosh, MGH.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

NETWORK SECURITY

Unit I: **Introduction to Network Security:**
Attacks, services, Security. A model of Inter network Security, Principles of Symmetric and public key cryptography, Steganography, One time PADS.

Unit II: Crypto Graphic Algorithms (Block Cipher):
RC2, GOST, CAST, BLOW FISH, SAFEER, RC5, NEWDES, CRAB, Theory of Block Cipher design.

Unit III: Key Management and digital Signature Algorithms :.
Key lengths, Generating Keys, Transferring, Verification, Updating, Storing, Backup, Compromised, Lifetime of, Destroying Keys, key Exchange Protocols, Secure multiparty Communication, Public key Management. Authentication, Formal Analysis of Authentication, Digital Signature, DSA, DSA variants,One – Schnorr – Shamir digital Signatures, Esign,

Unit IV: IP and Web security:
IP Security Architecture, Authentication Header, Encapsulating Security, Pay load Key Management Issues. Web Security Web Security requirements, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction

Unit V: Mail Security:
PGP, SNMP,SMIME, Intruders, Viruses and Related Threats, Firewall Design Principles, Trusted Systems.

REFERENCE BOOKS:

1. Applied Cryptography, 7/e, Bruce SCHNEIER John Wiley & Sons Inc.
2. Cryptography and Network Security, William Stallings, PHI.
3. Introduction to cryptography with coding Theory, 7/e, Wade Trappe, C. Washington, PEA.
4. Cryptography and Information Security, V.K. Pachghare, PHI.
5. Cryptography and Network Security, Forouzan, TMH, 2007.
6. Cryptography and Network Security, 2/e, Kahate , TMH.
7. Modern Cryptography, Wenbo Mao, PEA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

INTERNET OF THINGS

UNIT- I

Introduction to Internet of Things, Definition & Characteristics of IoT, Physical Design of IoT Logical Design of IoT, IoT Enabling Technologies, IoT Levels & Deployment Templates Domain Specific IoTs: Home, Cities, Environment, Energy systems, Logistics, Agriculture, Health & Lifestyle

UNIT- II

IOT & M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT, 1 Need for IoT Systems Management , Simple Network Management Protocol (SNMP) , Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IoT Systems Management with NETCONF-YANG, NETOPEER

UNIT- III

IoT Platforms Design Methodology IoT Design Methodology, Case Study on IoT System for Weather Monitoring , Motivation for Using Python , IoT Systems - Logical Design using Python ,Installing Python , Python Data Types & Data Structures ,Control Flow , Functions, Modules, Packages , File Handling l, Date/Time Operations , Classes ,Python Packages of Interest for IoT

UNIT -IV

IoT Physical Devices & Endpoints, Raspberry Pi , About the Board , Linux on Raspberry Pi , Raspberry Pi Interfaces , Programming Raspberry Pi with Python , Other IoT Devices, IoT Physical Servers & Cloud Offerings , Introduction to Cloud Storage Models & Communication APIs , WAMP - AutoBahn for IoT , Xively Cloud for IoT , Python Web Application Framework - Django , Designing a RESTful Web API , Amazon Web Services for ,SkyNet IoT Messaging Platform

UNIT -V

Case Studies Illustrating IoT Design, Introduction, Home Automation, Cities, Environment, Agriculture, Productivity Applications

Data Analytics for IoT , Introduction , Apache Hadoop, Using Hadoop MapReduce for Batch Data Analysis , Apache Oozie , Apache Spark , Apache Storm , Using Apache Storm for Realtime Data Analysis , Structural Health Monitoring Case Study , Tools for IOT, Chef Case Studies, NETCONF-YANG Case Studies.

TEXTBOOKS:

1. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015

REFERENCE BOOKS:

1.Fundamentals of Python, K.A.Lambert and B.L.Juneja, Cengage Learning, 2012.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

SOFT COMPUTING

Unit I: **Introduction:**
Uncertainty and Evidence, Shafer Dumpster belief and possibility Theory, Random sets and mass assignments, Dumpsters Rule, Fuzzy Measures and aggregation operators, Bayesian Networks. Graphical methods.

Unit II: **Automated Learning-1 and 2**
Automated Learning-1: Supervise vs. unsupervised learning, Decision Tree induction, rule induction algorithms.
Automated Learning-2: Bayesian network learning algorithms, Evolutionary algorithms.

Unit III: **Neural Networks and Fuzzy Methods:**
Neural Networks**:** Adaptive Networks, Supervised Learning NN, Reinforcement Learning, Unsupervised Learning.
Fuzzy set theory, fuzzy control (including model based control), and Fuzzy Decision trees.

Unit IV: **Hybrid systems:**
Neuro Fuzzy Systems, Back propagation Network supported by Fuzzy, GA based weight determination applications.

Unit V: **Genetic Algorithms and Applications**
Encoding, Fitness functions, reproduction, Fuzzy Genetic Algorithms.
Applications: Practical Examples from areas such as Medical, Management, and control, GA in fuzzy logic controller design.

REFERENCE BOOKS

1. Neuro Fuzzy and Soft Computing, A Computational approach to learning and Machine, Jyh-Shing Roger Jang, Cuen Tsai Sun, Eiji Mizurani, PEA.
2. Machine Learning, Tom Mitchell, MGH, 1997.
3. Soft Computing Techniques and Applications, Robert John, R. Birkenhead, Ralph Birkenhead.
4. Neural Networks, Fuzzy logic and genetic algorithms, S Rakasekharan, GA Vijayalakshmi, PHI.
5. Principles of Soft Computing, Sivanandam, Deepa, Wiley India, 2008.
6. Soft Computing and Intelligent Systems Design, Karry, De Silva, PEA, 2004.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

PAPER – II

ADVANCED COMPUTER ARCHITECTURE

Unit I: Parallel Computer Models, Program and Network Properties:
Parallel Computer Models: Multiprocessors and Multicomputers, Multivector and SIMD Computers,
Program and Network Properties: Conditions of Parallelism, Program Partitioning and Scheduling, Program Flow Mechanisms, System Interconnect Architectures

Unit II: Principles of Scalable Performance:
Performance Metrics and Measures, Parallel Processing Applications, Speedup Performance Laws, Scalability Analysis and Approaches

Unit III: Processors and Memory Hierarchy:
Advanced Processor Technology, Superscalar and Vector Processors, Memory Hierarchy Technology, Virtual Memory Technology

Unit IV: Bus, Cache, and Shared Memory:
Backplane Bus Systems, Cache Memory Organizations, Shared-Memory Organizations, Sequential and Weak Consistency Models

Unit V: Pipelining and Superscalar Techniques:
Linear Pipeline Processors, Nonlinear Pipeline Processors, Instruction Pipeline Design, Arithmetic Pipeline Design, Superscalar and Super pipeline Design
Multiprocessors and Multicomputers:
Multiprocessor System Interconnects, Cache Coherence and Synchronization Mechanisms, Three Generations of Multicomputers, Message-Passing Mechanisms

REFERENCE BOOKS

1. Kai Hwang, Advanced computer Architecture: Parallelism, Scalability, Programmability, TMH, 2000.
2. Computer Architecture – A quantitative approach, 4/e, John L. Hennessey , David A. Patterson, Morgan Kaufmann / Elsevier, 2007.
3. Parallel Computing Architecture: A hardware/ software approach , David E. Culler, Jaswinder Pal Singh, Morgan Kaufmann / Elsevier, 1997.
4. Computer Organization and Architecture – Designing for Performance, 7/e, William Stallings, PEa, 2006.
5. Computer Organization and Design, 4/e, Patterson , Elsevier, 2008.
6. Computer Architecture & Parallel Processing, Kai Hwang, Faye A. Briggs, TMH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

ADVANCED DATA STRUCTURES AND ALGORITHMS

Unit I: Lists, Stacks, Queues and Trees:
Lists, Stacks and Queues: Abstract Data Types (ADTs), The List ADT, vector and list in the STL, Implementation of vector, Implementation of list, The Stack ADT, The Queue ADT.
Trees: The Search Tree ADT - Binary Search Trees, AVL Trees, Splay Trees, B-Trees.

Unit II: Hashing and Priority Queues:
Hashing: General Idea, Hash Function, Separate Chaining, Hash Tables Without Linked Lists, Rehashing, Extendible Hashing
Priority Queues: Implementations, Binary Heap, Applications of Priority Queues, *d*-Heaps, Leftist Heaps, Skew Heaps, Binomial Queues.

Unit III: Sorting:
Sorting: A Lower Bound for Simple Sorting Algorithms, Shellsort, Heapsort, Mergesort, Quicksort, Indirect Sorting, A General Lower Bound for Sorting, Bucket Sort, External Sorting.
The Disjoint Set Class: Equivalence Relations, the Dynamic Equivalence Problem, Basic Data Structure, Smart Union Algorithms, Path Compression, Worst Case for Union-by-Rank and Path Compression, an Application.

Unit IV: Graph Algorithms:
Definitions, Topological Sort, Shortest-Path Algorithms, Network Flow Problems, Minimum Spanning Tree, Applications of Depth-First Search, Introduction to NP-Completeness.
Algorithm Design Techniques: Greedy Algorithms, Divide and Conquer, Dynamic Programming, Randomized Algorithms, Backtracking Algorithms.

Unit V: Amortized Analysis:
An Unrelated Puzzle, Binomial Queues, Skew Heaps, Fibonacci Heaps, Splay Trees.
Advanced Data Structures and Implementation:Top-Down Splay Trees, Red-Black Trees, Deterministic Skip Lists, AA-Trees, Treaps, *k*-d Trees, Pairing Heaps.

REFERENCE BOOKS

1. C & Data structures, N.B. Venkateswarulu, EV Prasad, S.Chand.
2. Data Structures and Algorithm Analysis in C++, 3/e, Mark Allen Weiss, PEA , 2007.
3. Data Structures Algorithms and Applications, 2/e, Sartaj Sahni, Universities Press, 2007.
4. Fundamentals of computer Algorithms, 2/e, Ellis Horowitz, Sartaj Sahni, Rajasekharan, Universities Press, 2008.
5. Data Structures and Algorithms, Aho, Ullman, PEA.
6. Data Structures and Algorithms in JAVA, Adam drozdek, Cengage .
7. Data Structures with JAVA™, Hubbard, Huray, PHI,2009.
8. Data Structures, Gilberg, Forouzan, Thomson.
9. Fundamentals of Data structures algorithms and application Sartaj Sahni, University Press.

ADVANCED UNIX PROGRAMMING

UNIT I: Review of Unix Utilities and Shell Programming:
File handling utilities, security by file permissions, process utilities, disk utilities, networking commands, backup utilities, text processing utilities, Working with the Bourne shell, What is a shell, shell responsibilities, pipes and input redirection, output redirection, here documents, the shell as a programming language, shell meta characters, shell variables, shell commands, the environment, control structures, shell script examples.

UNIT II: Unix Files:
Unix file structure, directories, files and devices, System calls, library functions, low level file access, usage of open, creat, read, write, close, lseek, stat, fstat, octl, umask, dup, dup2. The standard I/O (fopen, fclose, fflush, fseek, fgetc, getc, getchar, fputc, putc, putchar, fgets, gets), formatted I/O, stream errors, streams and file descriptors, file and directory maintenance (chmod, chown, unlink, link, symlink, mkdir, rmdir, chdir, getcwd), Directory handling system calls (opendir, readdir, closedir, rewinddir, seekdir, telldir)

UNIT III: Unix Process: Threads and Signals: What is process, process structure, starting new process, waiting for a process, zombie process, process control, process identifiers, system call interface for process management, fork, vfork, exit, wait, waitpid, exec, system, Threads, Thread creation, waiting for a thread to terminate, thread synchronization, condition variables, cancelling a thread, threads vs. processes, Signals, Signal functions, unreliable signals, interrupted system calls, kill and raise functions, alarm, pause functions, abort, sleep functions.

UNIT IV: Data Management: Management Memory (simple memory allocation, freeing memory) file and record locking (creating lock files, locking regions, use of read/ write locking, competing locks, other commands, deadlocks).

Interprocess Communication: Introduction to IPC, IPC between processes on a single computer system, IPC between processes on different systems, pipes, FIFOs, streams and messages, namespaces, introduction to three types of IPC (systemV) message queues, semaphores and shared memory.

Message Queues: message structure, working message queues, Unix systemV messages, Unix kernel support for messages, Unix APIs for messages, client/server example.

UNIT V: Semaphores: Unix systemV semaphores, Unix kernel support for semaphores, Unix APIs for semaphores, file locking with semaphores.

Shared Memory: Unix systemV shared memory, working with a shared memory segment, Unix kernel support for shared memory, Unix APIs for shared memory, semaphore and shared memory example.

Sockets: Berkeley sockets, socket system calls for connection oriented protocol and connectionless protocol, example client/server program, advanced socket system calls, socket options.

REFERENCE BOOKS

1. Advanced Programming in the UNIX Environment, Stevens , PEA/PHI.
2. Unix Network Programming, Stevens PEA/PHI.
3. Advanced Unix programming, N.B. Venkateswarlu, BSP.
4. Unix Concepts and Applications, 3/e, Sumitabha Das, TMH.
5. Practical UNIX and Internet Security, 2/e, Simson Garfinkel, Gene Spafford, O'Reilly.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

ADVANCED COMPUTER NETWORKS

UNIT-I

Network layer: Network Layer design issues: store-and-forward packet switching, services provided transport layers, implementation connection less services, implementation connection oriented services, comparison of virtual –circuit and datagram subnets. Routing Algorithm –shortest path routing, flooding, distance vector routing, link state routing, Hierarchical routing, Broadcast routing, Multicasting routing, routing for mobiles Hosts, routing in Adhoc networks- congestion control algorithms-Load shedding, Congestion control in Data gram Subnet.

UNIT-II

IPV4 Address address space, notations, classful addressing, classless addressing network addressing translation (NAT) , IPV6 Address structure address space, Internetworking need for network layer internet as a data gram, internet as connection less network. IPV4 datagram, Fragmentation, checksum, options. IPV6 Advantages, packet format, extension Headers, Transition form IPV4 to IPV6

UNIT–III

Process to process delivery: client/server paradigm, multiplexing and demultiplexing, connectionless versus connection-oriented services, reliable versus reliable.
UDP: Well-known ports for UDP, user datagram, check sum, UDP operation, and uses of UDP
TCP: TCP services, TCP features, segment, A TCP connection, Flow control, error control, congestion control.
SCTP: SCTP services SCTP features, packet format, An SCTP association, flow control, error control.
Congestion control: open loop congestion control, closed-loop congestion control, Congestion control in TCP, frame relay, QUALITY OF SERVICE: flow characteristics, flow classes TECHNIQUES TO IMPROVE QOS: scheduling, traffic shaping, resource reservation, admission control.

UNIT –IV

Domain name system: The name space, resource records, name servers E-mail: architecture and services, the user agent, message formats, message transfer, final delivery www: architecture overview, static web documents, dynamic web documents, Hypertext transfer protocol, performance elements, the wireless web.
Multimedia: introduction digital a audio , Audio compression, streaming audio, internet radio, voice over IP, introduction to video, video compression, video on demand, the MBone-the multicast back bone

UNIT –V

Emerging trends Computer Networks:
Mobile Adhoc networks : applications of Adhoc networks, challenges and issues in MANETS,MAC layers issues, routing protocols in MANET, transport layer issues, Adhoc networks security.
Wireless sensors networks: WSN functioning, operation system support in sensor devices, WSN Characteristics, sensor network operation, sensor Architecture: cluster management; Wireless mesh networks WMN design, Issues in WMNs;

TEXT BOOKS:

1. Data communications and networking 4th edtion Behrouz A Fourzan, TMH
2. Computer networks 4th editon Andrew S Tanenbaum, Pearson
3. Computer networks, Mayank Dave, CENGAGE

REFERENCE BOOKS:

1. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Computer%20networks/New_index1.html
2. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Computer%20networks/New_index1.html
3. Computer networks, A system Approach, 5th ed, Larry L Peterson and Bruce S Davie, Elsevier

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

BIO-INFORMATICS

UNIT I: INTRODUCTION:

The Central Dogma, The Killer Application, Parallel Universes – Watson's Definition – Top Down Versus Bottom up – Information Flow , Convergence Databases , Data Management , Data Life Cycle , Database Technology , Interfaces , Implementation
Networking: Geographical Scope, Communication Models, Transmissions Technology, Protocols, Bandwidth, Topology ,

UNIT II: NETWORKS AND SEARCH ENGINES

Networks: Networks, Hardware , Contents , Security , Ownership , Implementation , Management
Search Engine process: The search process, Search Engine Technology, Searching and Information Theory, Computational methods, Search Engines and Knowledge Management

UNIT III: DATA VISUALIZATION AND STATISTICS

Data Visualization, sequence visualization, structure visualization, Animation Versus simulation, General Purpose Technologies.
Statistic Information: Statistical concepts , Microarrays , Imperfect Data , Variability , Approximation , Interface Noise , Assumptions , Sampling and Distributions , Hypothesis Testing , Quantifying Randomness , Data Analysis , Tool selection statistics of Alignment

UNIT IV: DATA MINING AND PATTERN MATCHING

Clustering and Classification , Selection and Sampling , Preprocessing and Cleaning , Transformation and Reduction , Data Mining Methods , Evaluation , Visualization , Designing new queries , Pattern Recognition and Discovery , Machine Learning , Text Mining .
Pattern matching: Pair wise and Multiple sequence alignment , Local versus global alignment , Multiple sequence alignment , Computational methods , Dot Matrix and Substitution matrices , Dynamic Programming , Bayesian methods , Dynamic Programming , Progressive and Iterative strategies , Tools , Nucleotide and Polypeptide pattern matching ,

UNIT - V: MODELING AND SIMULATION:

Drug Discovery , components , Numeric considerations , Algorithms ,Protein structure , AbInitio Methods , Heuristic methods , Systems Biology , Tools , Collaboration and Communications , standards , Security , Intellectual property.

REFERENCE BOOKS

1. Bio Informatics Computing, Bryan Bergeron, PHI, 2003.
2. Introduction to Bio Informatics, Attwood, Smith, Longman, 1999.
3. Bio-Informatics, D Srinivasa Rao, Biotech.
4. Bio Informatics Computing, Bergeron, PHI
5. Bio Informatics, Managing scientific Data, Lacroix, Terence Critchlow, Elsevier
6. Bio Informatics Methods and Applications, Rastogi, Mendiratta, Rastogi, PHI

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

CYBER SECURITY

UNIT- I:

Introduction to Cybercrime:

Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, who are Cybercriminals? Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens

UNIT -II:

Cyber offenses:

How Criminals Plan Them –Introduction, How Criminals Plan the Attacks, Social Engineering, Cyberstalking, Cybercafe, Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Cloud Computing.

UNIT -III:

Cybercrime Mobile and Wireless Devices:

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT -IV:

Tools and Methods Used in Cybercrime:

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Viruses and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Phishing and Identity Theft: Introduction, Phishing, Identity Theft (ID Theft)

UNIT -V:

Cybercrimes and Cyber security: Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Information Security Planning and Governance, Information Security Policy Standards, Practices, The Information Security Blueprint, Security Education, Training and Awareness program, Continuing Strategies.

TEXTBOOKS:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole, Sunit Belapure, Wiley.
2. Principles of Information Security, Micheal E.Whitman and Herbert J.Mattord, Cengage Learning.

REFERENCES:

1. Information Security, Mark Rhodes, Ousley, MGH.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

COMPUTER COMMUNICATIONS

Unit I: Introduction:
Network Hardware reference model – Transmission media – Narrowband ISDN – Broad band ISDN – ATM.

Unit II: Data Link Layer and Channel allocation Methods:
The data Link layer – Design Issues – Error detection and correction – Elementary Data Link Protocols – Sliding window protocols – Data link layer in HDLC, Internet and ATM. Channel allocation methods – TDM, FDM, ALOHA, Carrier sense Multiple access protocols,Collision Free protocols – IEEE standard BO2 for LANS – Ethernet, Token Bus, Token ring – Bridges.

Unit III: Network Layer and internetworking:
NETWORK LAYER Routing Algorithms – Shortest path, Flooding, Flow based Distance vector, Link state, Hierarchical, Broadcast routing, Congestion Control algorithms-General principles of congestion control, Congestion prevention polices, Choke packets and Load shedding.
Tunneling, internetworking, Fragmentation, network layer in the internet – IP protocols, IP address, Subnets, Internet control protocols, DSPF, BOP, Internet multicasting, Mobile IP. Network layer in the ATM Networks – cell formats, connection setup, routing and switching, service categories, and quality of service, ATM LANs.

Unit IV: Transport Layer : The Transport Layer Elements of transport protocols – addressing, establishing a connection, releasing connection, flow control and buffering and crash recovery, END TO END PROTOCOLS – UDP, reliable Byte Stream (TCP) end to end format, segment format, connection establishment and termination, sliding window revisited, adaptive retransmission, TCP extension, Remote Procedure Call – BLAST, CHAN, SELECT, DCE.

Unit V: Application Layer : Application Layer – Network Security – Cryptographic Algorithms – DES, RSA. Security Mechanisms – Authentication Protocols, Firewalls, Name service (DNS) Domains Hierarchy, Name servers. Traditional Applications – SMTP, MIME, World Wide Web – HTTP, Network Management – SNMP.

REFERENCE BOOKS

1. COMPUTER NETWORKS, Andrew Tanenbaum, 3/e, PHI.
2. COMPUTER NETWORKS – A SYSTEM APPROACH – Larry L. Peterson, Bruce S. Davie, 2/e, Harcourt Asia PTE LTD.
3. Data Communication and Networking, 4/e, Forouzan, TMH
4. An engineering approach to computer networking, Kesav, PEA
5. Data and Computer Communications, 8/e, Stallings, PHI
6. Computer communication and networking technologies, Gallo, Hancock, Cengage
7. Understanding data communications, 7/e, Held, PEA
8. Communication Networks, 2/e, Leon-Garcia, TMH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

DEEP LEARNING

UNIT I:
Basics- Biological Neuron, Idea of computational units, McCulloch–Pitts unit and Thresholding logic, Linear Perceptron, Perceptron Learning Algorithm, Linear separability, Convergence theorem for Perceptron Learning Algorithm.

UNIT II:
Feedforward Networks- Multilayer Perceptron, Gradient Descent, Backpropagation, Empirical Risk Minimization, regularization, auto encoders.
Deep Neural Networks: Difficulty of training deep neural networks, Greedy layer-wise training.

UNIT III:
Better Training of Neural Networks- Newer optimization methods for neural networks (Adagrad, adadelta, rms prop, adam, NAG), second order methods for training, Saddle point problem in neural networks, Regularization methods (dropout, drop connect, batch normalization).

UNIT IV:
Recurrent Neural Networks- Backpropagation through time, Long Short Term Memory, Gated Recurrent Units, Bidirectional LSTMs, Bidirectional RNNs.
Convolutional Neural Networks: LeNet, AlexNet, Generative models: Restrictive Boltzmann Machines (RBMs), Introduction to MCMC and Gibbs Sampling, gradient computations in RBMs, Deep Boltzmann Machines.

UNIT V:
Recent trends- Variational Autoencoders, Generative Adversarial Networks, Multi-task Deep Learning, Multi-view Deep Learning
Applications: Vision, NLP, Speech

Textbooks
1. Deep Learning, Ian Good fellow and Yoshua Bengio and Aaron Courville, MIT Press, 2016.
Reference Books:
1. Neural Networks: A Systematic Introduction, Raúl Rojas, 1996
2. Pattern Recognition and Machine Learning, Christopher Bishop, Springer, 2007
3. Deep Learning with Python, François Chollet, Manning Publications, 2017.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

MACHINE LEARNING

UNIT I: Introduction:
Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning
Concept learning and the general to specific ordering – Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias.

UNIT II: Decision Tree learning:
Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Issues in decision tree learning

UNIT III: Artificial Neural Networks:
Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition
Advanced topics in artificial neural networks
Evaluation Hypotheses: Motivation, Estimation hypothesis accuracy, Basics of sampling theory, A general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms

UNIT IV: Bayesian learning:
Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve bayes classifier, An example learning to classify text, Bayesian belief networks The EM algorithm

UNIT V: Computational learning theory:
Introduction, Probability learning an approximately correct hypothesis, Sample complexity for Finite Hypothesis Space, Sample Complexity for infinite Hypothesis Spaces - **Instance- Based Learning**- Introduction, k -Nearest Neighbor Learning, Locally Weighted Regression,Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning **Genetic Algorithms**:
Motivation, Genetic Algorithms, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms.

TEXTBOOK:
1. Machine Learning, Tom M. Mitchell, MGH

REFERENCE BOOKS:

1. Machine Learning, An Algorithmic Perspective, Stephen Marsland, Taylor & Francis (CRC)
2. Introduction to Machine Learning, Ethem Alpaydin, PHI, 2004

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

MOBILE COMPUTING

Unit 1: Introduction to Mobile Communications and Computing:
Mobile Computing (MC): Introduction to MC, novel applications, limitations, andarchitecture GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services.
(Wireless) Medium Access Control:
Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.

Unit II: Mobile Network Layer:
Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).
Mobile Ad hoc Networks (MANETs):
Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs

Unit III: Mobile Transport Layer:
Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

Unit IV: Database Issues:
Hoarding techniques, caching invalidation mechanisms, client server computing with adaptation, power-aware and context-aware computing, transactional models, query processing, recovery, and quality of service issues.
Data Dissemination:
Communications asymmetry, classification of new data delivery mechanisms, push-based mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques.

Unit V: Protocols and Tools:
Wireless Application Protocol-WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) and J2ME.

REFERENCE BOOKS:

1. Mobile Communications, 2/e, Jochen Schiller, 2004, *Addison-Wesley*.
2. Handbook of Wireless Networks and Mobile Computing, Stojmenovic , Cacute, *Wiley*, 2002
3. Mobile Computing Principles, Designing and Developing Mobile Applications with UML and XML, Reza Behravanfar, Cambridge, University Press, 2004.
4. Fundamentals of Mobile and Pervasive Computing, Adelstein, Frank, Gupta, Sandeep KS. Richard Golden , Schwiebert, Loren, TMH , 2005.
5. Principles of Mobile Computing, 2/e, Hansmann, Merk, Nicklous, Stober, *Springer*, 2003.
6. Mobile and Wireless Design Essentials, Martyn Mallick, Wiley *DreamTech*, 2003
7. Mobile Computing, Rajkamal, Oxford, 2008
8. Adhoc Wireless Networks, 2/e, Sivaram murthy, manoj, PEA, 2009

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

PARALLEL COMPUTING & ALGORITHMS

UNIT I: **Introduction:**
Computational demand in various application areas, advent of parallel processing, terminology-pipelining, Data parallelism and control parallelism-Amdahl's law. Basic parallel random access Machine Algorithms-definitions of P, NP and NP-Hard, NP-complete classes of sequential algorithms-NC –class for parallel algorithms.

UNIT II:
Organizational features of Processor Arrays, Multi processors and multicomputers. Mapping and scheduling aspects of algorithms. Mapping into meshes and hyper cubes-Load balancing-List scheduling algorithm

UNIT III:
Elementary Parallel algorithms on SIMD and MIMD machines, Analysis of these algorithms.

UNIT IV:
Matrix Multiplication algorithms on SIMD and MIMD models
Fast Fourier Transform algorithms. Implementation on Hyper cube architectures

UNIT V:
Parallel sorting methods---Odd-even transposition Sorting on processor arrays. Biotonic – merge sort on shuffle –exchange ID –Array processor,2D-Mesh processor and Hypercube Processor Array
Parallel Quick-sort on Multi processors. Hyper Quick sort on hypercube multi computers. Parallel search operations.

REFERENCE BOOKS:

1. Parallel computing theory and practice, MICHAEL J.QUINN
2. Programming Parallel Algorithms, Guy E. Blelloch, Communications of the ACM
3. Algorithms for Parallel processing, Michael T Heath, Abhiram Ranade, Schreiber(Ed), Springer.
4. Handbook of Parallel Computing Models, algorithms and applications, Samgithevar Rajasekharan, John Reif(Ed), Taylor and Franics group.
5. Parallel Processing and Parallel Algorithms: Theory and Computation, Seyed H. Roosta, Springer

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

PATTERN RECOGNITION

UNIT I : Introduction:
Fundamental problems in pattern Recognition system design, Design concepts and methodologies, Simple pattern recognition model.

Decisions and Distance Functions:
Linear and generalized decision functions, Pattern space and weight space, Geometrical properties, implementations of decision functions, Minimum-distance pattern classifications.

Probability - Probability of events:
Random variables, Joint distributions and densities, Movements of random variables, Estimation of parameter from samples.

UNIT - II: DECISION MAKING - Baye's theorem, Multiple features, Conditionally independent features, Decision boundaries, Unequal cost of error, estimation of error rates, the leaving-one-out-techniques, characteristic curves, estimating the composition of populations. Baye's classifier for normal patterns.

Non Parametric Decision Making:
histogram, kernel and window estimation, nearest neighbour classification techniques. Adaptive decision boundaries, adaptive discriminant functions, Minimum squared error discriminant functions, choosing a decision making techniques.

UNIT III: Clustering and Partitioning:
Hierarchical Clustering: Introduction, agglomerative clustering algorithm, the single-linkage, complete-linkage and average-linkage algorithm. Ward's method Partition clustering-Forg's algorithm, K-means's algorithm, Isodata algorithm.

UNIT IV: Pattern Preprocessing and Feature selection:
distance measures, clustering transformation and feature ordering, clustering in feature selection through entropy minimization, features selection through orthogonal expansion, binary feature selection.

UNIT V: Syntactic Pattern Recognition and Application of Pattern Recognition:
Concepts from formal language theory, formulation of syntactic pattern recognition problem, syntactic pattern description, recognition grammars, automata as pattern recognizers, Application of pattern recognition techniques in bio-metric, facial recognition, IRIS scon, Finger prints, etc.,

REFERENCES BOOKS:

1. Pattern recognition and Image Analysis, Gose. Johnsonbaugh Jost, PHI.
2. Pattern Recognition Principle, Tou. Rafael. Gonzalez, Pea.
3. Pattern Classification, Richard duda, Hart., David Strok, Wiley.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

SCALABLE PARALLEL COMPUTING ARCHITECTURES

Unit I: Parallel Computer Models, Program and Network Properties: Parallel Computer Models: Multiprocessors and Multicomputer, Multivector and SIMD Computers, PRAM and VLSI Models, Architectural Development Tracks
Program and Network Properties: Conditions of Parallelism, Program Partitioning and Scheduling, Program Flow Mechanisms, System Interconnect Architectures.

Unit II: Principles of Scalable Performance, Parallel Models, Languages and Compilers : Principles of Scalable Performance: Performance Metrics and Measures, Parallel Processing Applications, Speedup Performance Laws, Scalability Analysis and Approaches.
Parallel Models, Languages and Compilers: Parallel Programming Models, Parallel Languages and Compilers, Dependence Analysis of Data Arrays, Code Optimization and Scheduling, Loop Parallelization and Pipelining.

Unit III: Processors and Memory Hierarchy: Advanced Processor Technology, Superscalar and Vector Processors, Memory Hierarchy Technology, Virtual Memory Technology.
Bus, Cache, and Shared Memory: Backplane Bus Systems, Cache Memory Organizations, Shared-Memory Organizations, Sequential and Weak Consistency Models.

Unit IV: Pipelining and Superscalar Techniques:
Linear Pipeline Processors, Nonlinear Pipeline Processors, Instruction Pipeline Design, Arithmetic Pipeline Design, Superscalar and Super pipeline Design

Unit V: Multiprocessors and Multicomputers:
Multiprocessor System Interconnects, Cache Coherence and Synchronization Mechanisms, Three Generations of Multicomputers, Message-Passing Mechanisms.
Multivector and SIMD Computers: Vector Processing Principles, Multivector Multiprocessors, Compound Vector Processing, SIMD Computer Organizations: BSP and CM2 Architectures, The Connection Machine CM-5: CM5 Architecture and Inter process communication.

REFERENCE BOOKS:

1. Advanced computer Architecture,Parallelism, Scalability, Programmability. Kai Hwang, TMH
2. Computer Architecture,A quantitative approach, 4/e, John L. Hennessey , David A. Patterson, Morgan Kaufmann / Elsevier, 2007.
3. Parallel Computing Architecture, A hardware/ software approach , David E. Culler, Jaswinder Pal Singh, Morgan Kaufmann / Elsevier, 1997.
4. Computer Organization and Architecture, Designing for Performance, 7/e, William Stallings, Pearson, 2006.
5. Computer Organization and Design, 4/e, Patterson , Hennessy Elsevier India, 2008.
6. Computer Architecture & Parallel Processing, Kai Hwang, Faye A. Briggs, TMH.
7. Parallel programming, 2/e, Wikinson, Allen, Pea.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

SECURED DATABASE APPLICATIONS DEVELOPMENT

Unit I: Security Architecture:
Introduction, Security, Information Systems, Database management systems, Information security, Information security Architecture, database security, Asset types and their value, Security methods.

Operating System Security Fundamentals:
Introduction, operating systems overview, security environment, components, Authentication methods, user administration, password policies, Vulnerabilities of operating systems, E-Mail security.

Unit II: Administration of Users :
Introduction, user authentication, operating system authentication, creating/removing/modifying users, default/remote users, Database links, Linked servers, remote servers.

Profiles, Password Policies, Privileges, and Roles: Introduction, Defining and using profiles, Designing and implementing password policies, Granting and revoking user privileges, creating, Assigning and revoking user roles.

Unit III: Database Application Security Models :
Introduction, Types of users, security models, application types, application security models and Data encryption.

Unit IV: Virtual Private Databases (VPD):
Introduction, Overview, implementing a VPD using views and application context. Implementing oracle VPD, Viewing VPD policies and application context using: data dictionary, policy manager, implementing row and column level security with SQL server.

Unit V: Database Auditing Models, Application Data Auditing:
Database Auditing Models: Introduction, Auditing overview, environment, process, objectives, classification and types, benefits and side effects of auditing.
Application Data Auditing: Introduction, DML auction auditing architecture. Triggers, fine grained auditing, DML statement audit trail and auditing application errors with Oracle.

REFERENCE BOOKS:

1. Database Security and Auditing, Hassan Afyouni, Cengage Learning, 2007
2. Database Security, S. Castano, M. Fugini, G. Martella, P. Samarati, Addison-Wesley, 1994
3. Implementing Database Security and Auditing, RonBen Natan: Elsevier, Indian reprint, 2006
4. Principles of Distributed Database Systems, Prentice Hall,2/e, M.TamerÖzsu, Patrick Valdureiz
5. Database Security, Castano, Fugini, Addison Wesley
6. The security Audit and control of Databases, Clark, Holloway, List, UK:Ashgate.
7. Security and Audit of Database System, Douglas, Blackwell(UK)
8. Database security and Integrity, Fernandez, Summers, Wood, Addison Wesley

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
Syllabus for Pre-Ph. D Examination
INFORMATION TECHNOLOGY

WIRELESS NETWORKS AND MOBILE COMPUTING

UNIT I : INTRODUCTION TO MOBILE AND WIRELESS LANDSCAPE: Definition of Mobile and Wireless, Components of Wireless Environment, Challenges, Overview of Wireless Networks, Categories of Wireless Networks, Wireless LAN : Infra red Vs radio transmission, Infrastructure and Ad-hoc Network, IEEE 802.11, HIPERLAN, Bluetooth.

UNIT III: MOBILE NETWORK LAYER & TRANSPORT LAYER: MOBILE NETWORK LAYER: Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunnelling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP), Mobile Ad-hoc networks : Routing, destination Sequence Distance Vector, Dynamic Source Routing.
MOBILE TRANSPORT LAYER: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission/time-out freezing, Selective retransmission, Transaction oriented TCP.

UNIT III: GSM: GLOBAL SYSTEM FOR MOBILE COMMUNICATIONS (GSM): GSM Architecture, GSM Entities, Call Routing in GSM, PLMN Interfaces, GSM Addresses and Identifiers, Network Aspects in GSM, GSM Frequency Allocation, Authentication and Security.

UNIT IV : PROTOCOLS AND TOOLS: Wireless Application Protocol-WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) and J2ME.

UNIT - V: WIRELESS LANGUAGE AND CONTENT – GENERATION TECHNOLOGIES: WIRELESS LANGUAGE AND CONTENT – GENERATION TECHNOLOGIES: Wireless Content Types, Markup Languages: HDML, WML, HTML, cHTML, XHTML, VoiceXML.
Content- Generation Technologies: CGI with Perl, Java Servlets, Java Server Pages, Active Server Pages, XML with XSL Stylesheets, XML Document, XSL Stylesheet
MOBILE AND WIRELESS SECURITY: Creating a Secure Environment, Security Threats, Security Technologies, Other Security Measures, WAP Security, Smart Client Security

REFERENCE BOOKS:

1. Mobile Communications, 2/e, Jochen Schiller, PEA, 2008.
2. Mobile and Wireless Design Essentials, Martyn Mallick, Wiley, 2008.
3. Mobile Computing, Asoke K Talukder, et al,, MGH, 2008.
4. Mobile Computing,Raj Kamal,Oxford .
5. Wireless Communications & Networks, 2/e, William Stallings, PEA, 2007.
6. Fundamentals of Mobile and Pervasive Computing, Frank Adelstein et al, TMH, 2005.
7. Wireless Networks first-step, Jim Geier, PEA, 2005.
8. 2.5G Mobile Networks: GPRS and EDGE, Sumit Kasera et al, TMH, 2008.
9. 802.11 Wireless Networks,2/e, Matthew S.Gast, O'Reilly, 2006.
10. Handbook of Wireless Networks and Mobile Computing, Ivan Stojmenovic , Wiley, 2007.

Metallurgical Engineering syllabus

Subjects for Pre-PhD

Paper-1

1. Advances in Metal Casting
2. Advances in Metal Forming
3. Advances in Welding
4. Advances in Heat Treatment
5. Phase transformations

Paper-2

1. Powder Metallurgy
2. Failure Analysis
3. Corrosion Engineering
4. Composite Materials
5. Nano Technology

ADVANCES IN METAL CASTING

UNIT-I
PATTERN PREPARATION AND MOULDING
Introduction to foundry operations, moulding practice, ingredients of moulding sand and core sand, Testing of Moulding sands. Sand preparation, Sand moulding: green sand moulding, dry sand moulding, skin dry sand moulding, core sand moulding, loam moulding, fluid sand process, shell moulding, pit and floor moulding, carbon-di-oxide process.

UNIT-II
MELTING PRACTICE
Melting practice and special precautions for steels, alloy steels, cast irons, aluminium alloys, copper alloys and magnesium alloys, safety considerations, fluxing, degassing and inoculation

UNIT-III
CASTING TECHNIQUES
Sand casting, permanent mould casting, die casting, centrifugal casting, plaster mould casting, investment casting, continuous casting, squeeze casting, full mould process.

UNIT-IV
DESIGN OF CASTINGS AND FOUNDRY METALLURGY
Elements of gating system, types, design of gating system with examples, functions of risers, types of risers, Chvorinov's rule, design and positioning of riser with examples, directional solidification, use of chills, exothermic compounds etc., riser efficiency, yield calculations. Concepts of pouring, solidification and shrinkage, inoculation and modification of cast irons and Al-Si systems.

UNIT-V
INSPECTION AND AUTOMATION
Cleaning and repair of castings. Casting defects and remedies. Heat treatment of castings. Inspection of casting. Principles of mechanisation, automation and foundry layout. Pollution control and safety considerations in foundries. Functional design,simplification of foundry practices, metallurgical design

TEXT BOOKS
1. Heine. R.W., Loper. C.R.,Rosenthal, P.C. "Principles of Metal Casting", Tata McGraw-Hill Publishing Co., Ltd., New Delhi, 1995.
2. Jain.P.L., "Principles of Foundry Technology", Tata McGraw-Hill Publishing Co., Ltd., New Delhi, 1995.

REFERENCES
1. Ramana Rao.T.V. "Metal Casting Principles and Practice", New Age Pub. Co., New Delhi, 1996.
2. Beeley.P.R., "Foundry Technology", Butterworths, London, 1982.
3. Srinivasan.N.K, "Foundry Engineering", Khanna Tech Publications, New Delhi, 1994.
4. ASM Metals hand Book. Vol. 15. "Casting", ASM International, 10th Edition, 1991.

ADVANCES IN METAL FORMING

UNIT I:

Description of stress at a point. State of stress in two dimensions.Mohrs circle of stress in two dimensions,state of stress in three dimensions. Mohrs circle of stress in three dimensions. Description of strain at point. The flow curve, True stress and true strain. Von Mises distortion energy criterion, maximum shear stress or Tresca criterion. Octahedral shear stress and shear strain. Basics of the theories of plasticity.

UNIT II

Classification of forming processes, Mechanics of metal working for slab method and uniform deformation energy method. Cold working,Recovery, recrystallisation and grain growth, hot working, Strain-Rate effects, Work of plastic deformation.

UNIT III

Classification of forging processes, forging equipment. Forging in plane strain. Open-die forging, closed-die forging, Forging of a cylinder in plane-strain. Forging defects, powder metallurgy forging.

UNIT IV

Classification of rolling process, rolling mills. Hot rolling, cold rolling, rolling of bars and shapes, forging and geometrical relationships in rolling. rolling variables, problems and defects in rolled products. Theories of hot rolling, torque and horsepower, theories of cold rolling, torque and horsepower.

UNIT V

Classification of extrusion processes, Determination of ideal force and frictional force in direct extrusion, Extrusion variables, extrusion defects, Extrusion of tubing and production of seamless pipe and tubing. Deep drawing, defects in deep drawing, Rod and wire drawing, tube drawing processes, residual stresses in rod, wire and tubes.

TEXT BOOK:

1. Mechanical Metallurgy by GE Dieter (3rd edition)

REFERENCES:

1. Kurt Lange "Handbook of Metal Forming", Society of Manufacturing Engineers. Michigan, USA, 1988

2. Avitzur, "Metal Forming - Processes and Analysis", Tata McGraw-Hill Co., New Delhi,

3. ASM Metals Handbook. Vol.14, "Forming and Forging", Metals Park, Ohio, USA, 1990.

4. Taylor Altan, Soo I.K. Oh, Harold.L.Gegel. "Metal Forming: Fundamentals and Applications", ASM, Metals Park, Ohio, USA, 1983.

ADVANCES IN WELDING

UNIT-I

GAS AND ARC WELDING PROCESSES

Classification of welding processes- heat sources and shielding methods- fusion welding processes, oxy-acetylene welding, arc welding-manual, submerged arc welding, gas tungsten arc and gas metal arc welding, electro slag and electro gas welding.

UNIT - II

PRESSURE WELDING PROCESSES

Cold and hot pressure welding, friction, friction stir welding, ultrasonic, induction pressure, explosive and diffusion welding.

UNIT - III

SPECIAL WELDING PROCESSES

Principle, equipment, process variables, merits, limitations and applications of Electron beam, plasma arc and laser beam welding processes.

UNIT - IV

PERIPHERAL JOINING AND CUTTING PROCESSES

Principle, techniques, joint design, materials, merits, limitations and applications of Brazing, soldering and cutting processes. Hard facing techniques.

UNIT-V

WELDING METALLURGY

Weld thermal cycles and their effects, structural changes in different materials, effects of pre and post heat treatments, concept of weldability and its assessment, Welding of mild, high tensile and stainless steels, cast irons and non-ferrous alloys based on aluminium, titanium and copper. Defects in welds, their causes and remedies.

TEXT BOOKS

1 Parmar, R.S., "Welding Processes And Technology", 2nd edn. Khanna Pub., New Delhi, 2001
2 Srinivasan.N.K.. "Welding Technology", Khanna Publications, Delhi, 1995.
3 Nadkarni.S V. "Modern Arc Welding Technology", Oxford & IBH, New Delhi, 1988.

REFERENCES

1. ASM Metals Handbook. Vol.6. "Welding Brazing & Soldering", ASM International, Metals Park, Ohio, USA, 1993.
2. AWS Welding Handbooks, AWS, New York, 1995
3. Davies-A C. "Welding", 10th edition, Cambridge University Press, UK, 1996.
4. Howard B Cary., "Modern Welding Technology", 4th edn., Prentice Hall, New Jersey, USA, 1997.
5. Lancaster.J.F., "Metallurgy of Welding", George Allen Co, Boston, 1980.

ADVANCES IN HEAT TREATMENT

UNIT-I

PRINCIPLES OF HEAT TREATMENT: Austenitic Transformation, Pearlitic Transformation, Bainitic Transformation, Martensitic Transformation, Annealing, Normalizing, Hardening, mechanism of heat removal during quenching, quenching media, size and mass effect, hardenability, tempering, austempering, manufacturing, deep freezing.

UNIT-II

Surface heat treatment, carburizing, cyaniding, flame and induction hardening, residual stresses, deep freezing, thermo mechanical treatments: HTMT, LTMT, Ausforming, Isoforming, Cryoformy.

UNIT-III

Effect of alloying elements on ferrite, cementite, Fe-Fe3C system, tempering and TTT Curves.

UNIT-IV

Heat treatment of Structural and constructional steels, tool and die steels, Corrosion and heat resistant steels, Hadfield steels, Heat treatment of cast irons.

UNIT-V

Precipitation hardening, aging treatment, study of copper and its alloys, aluminum and its alloys, nickel and its alloys.

TEXT BOOK:

1. Heat Treatment Principle and Techniques-Rajan & Sharma

REFERENCES:

1. Physical Metallurgy Lakhtin-Mir Publishers
2. Physical Metallurgy - Clark and Varney
3. Physical Metallurgy Principles - Reed Hill
4. Physical metallurgy-Ragavan
5. Heat Treat ment of metals-Zakharv-Mir Publishers

PHASE TRANSFORMATIONS

UNIT-I

DIFFUSION CONTROLLED PHASE TRANSFORMATION

Nucleation and growth - Types of nucleation - Concept of free energy during solidification - Thermodynamics of homogeneous nucleation - critical nucleus size and critical free energy change - Constitutional supercooling - Extension to heterogeneous nucleation - Nucleation rate and Growth rate - Overall Transformation rate. Concept of Activation energy - Arrhenius equation - Johnson Mehl - Avrami equation. Pearlitic transformations.

UNIT-II

DIFFUSIONLESS TRANSFORMATIONS

Martensite transformation - Definition - characteristic features of Martensitic transformation in steels - Morphology of Martensite - lath and acicular Martensite - Crystallography of Martensitic transformation - Martensite in Non-Ferrous systems - Thermo Elastic Martensite - Shape Memory effect - Examples and applications of shape memory alloys.

UNIT-III

STRENGTHENING MECHANISMS

Elementary discussion of cold working, grain size strengthening. Solid solution strengthening. martensitic strengthening, dispersion strengthening, fibre strengthening, examples of above strengthening mechanisms from ferrous and non- ferrous systems, simple problems. Yield point phenomenon, strain aging and dynamic strain aging

UNIT-IV

PRECIPITATION HARDENING

Precipitation from solid solutions, thermodynamic considerations, structure and property during ageing, sequence of ageing, formation of G-P zones and intermediate precipitates, theories of precipitation hardening, effect of time, temperature and alloy compositions, precipitation free zones, crystallographic aspects of transformation, coarsening kinetics.

UNIT-V

ANNEALING

Cold working and hot working. Recovery - polygonization and dislocation movements in polygonization. Recrystallisation - effect of time, temperature, strain and other variables, mechanism of nucleation and growth. Grain growth – Grain growth law, geometrical collisions, preferred orientation, secondary recrystallisation.

TEXT BOOKS

1. Raghavan.V., “Phase Transformations”, Prentice - Hall of India, New Delhi, 1990.
2. Dieter, G.E., “ Mechanical Metallurgy”, McGraw-Hill, New York, 1995.

REFERENCES

1. Reed Hill. R.E. “Physical Metallurgy Principles”, Affiliated East West Press. New Delhi. 1992.
2. Thomas H Courtney, “Mechanical Behaviour of Materials”, McGraw-Hill Co., NY. 1990.
3. Romesh C. Sharma, “Phase transformation in Materials”, CBS Publishers & Distributors, New Delhi, 2002.

POWDER METALLURGY

UNIT – I

Characterization and production of powders: General characteristics of metal powders, particle shape flow rate, apparent density, and specific surface are, particle size distribution.Different methods of production of metal powders: influence of manufacturing process on powder characteristics.

UNIT – II

Consolidation of Metal Powders by Compaction: Theory of consolidation: Pressure transimission in powders; compressibility and compactibility of powders; Green strength; Hot isostatic pressing; Powder rolling.

UNIT – III

Consolidation of Metal Powders by Sintering: Mechanisms of Sintering; Factorsaffecting sintering; Activated sintering; Liquid phase sintering; Sintering atmospheres; Properties of sintered parts.

UNIT – IV

Applications: Porous parts: Self-lubricating bearings, filters: Dispersion strengthened materials: Cu / Al2O3, Sintered Aluminum Powder.

UNIT –V

Electrical and Magnetic materials, Tungsten lamp filaments, electrical contacts, welding electrodes. Soft magnetic materials (Fe, Fe-N); Permanent magnets (Alnico, SnCo5), Cemented carbides; Cermets.

TEXT BOOK:

Powder Metallurgy: Anish Upadhya and GS Upadhya- University Press

REFERENCES:

1. Powder metallurgy – A.K. Sinha
2. Introduction to powder metallurgy – J.S. Hirshhorn
3. Treatise on Powder metallurgy – C. Goetzel Vol 1& II
4. Powder Metallurgy principles – F.V. Lenel

FAILURE ANALYSIS

UNIT-I

SOURCES OF FAILURES

Deficiencies in Design, Material, Processing, Service and Maintenance. Stages of Failure Analysis, classification and Identification of Various Types of Fracture - Overview of Fracture Mechanics Concepts, Ductile and Brittle Fracture, Fracture Origin, Initiators, characteristics of Ductile and Brittle Fracture.

UNIT-II

FATIGUE AND CREEP FAILURES

General Concepts, Fracture Characteristics Revealed By Microscopy, Factors Affecting Fatigue Life Some Case Studies of Fatigue Failures. Creep, Stress Rupture, Elevated Temperature Fatigue, Metallurgical Instabilities, Environmental Induced Failure, Elevated Temperature Effects on Certain Gas Turbine Components And Petroleum Refinery Components.

UNIT-III

WEAR AND CORROSION FAILURES

Types of Wear, Role of Friction in Wear, Lubricated and Non-Lubricated Wear, Analyzing Wear Failure. Corrosion Failures- Factors Influencing Corrosion Failures, Analysis of Corrosion Failures, overview of Various types of Corrosion Stress Corrosion Cracking, Sources, characteristics of Stress Corrosion Cracking. Procedure for Analyzing Stress Corrosion Cracking, various Types of Hydrogen Damage Failures.

UNIT-IV

FAILURE OF FORGING, CASTING AND WELDMENTS

Causes of Failure in Forging like material characteristics, Deficiencies in design, Improper Processing / Fabrication or Deterioration resulting from service conditions, Failure of Iron and Steel Castings, effect of Surface Discontinuities, Internal Discontinuities, Microstructure, Improper Composition, Improper Heat Treatment, Stress Concentration and Service Conditions. Failure of Weldments - Reasons for Failure procedure for Weld Failure Analysis.

UNIT-V

RELIABILITY

Reliability Concept and Hazard Function, Life Prediction, Condition Monitoring, Application of Poisson. Exponential and Weibull Distribution for Reliability, Bath Rub Curve, Parallel and Series System, Mean Time Between Failures and Life Testing.

TEXT BOOKS

1. ASM Metals Handbook "Failure Analysis and Prevention", ASM Metals Park. Ohio, Vol.10, 10th Edition, 1995.
2. Colangelo.V.J. and Heiser.F.A., "Analysis of Metallurgical Failures", John Wiley and Sons Inc. New York, USA, 1974.

REFERENCES

1. Charlie R Brooks, Ashok Choudhury "Metallurgical Failure Analysis", McGraw -Hill Publishing Co. USA, 1993.
2. Das.A K "Metallurgy of Failure Analysis", Tata McGraw-Hill Publishing Co., New Delhi, 1996.

CORROSION ENGINEERING

UNIT-I
CORROSION PRINCIPLES
Electrochemical and thermodynamic principles, electrode potential of metals, EMF and galvanic series, merits and demerits, Pourbaix diagram and its importance to iron, aluminium and magnesium metals, corrosion rate expressions. Exchange current density, polarization - concentration, activation and resistance, Tafel equation, passivity, electrochemical behaviour of active-passive metals, factors governing metals exhibiting passivity, mixed potential theory and its application.

UNIT - II
FORMS OF CORROSION
Atmospheric, galvanic, crevice, pitting, stress corrosion cracking, intergranular corrosion, corrosion fatigue, hydrogen damage, cavitation, fretting corrosion and high temperature oxidation-description, causes and remedial measures.

UNIT -III
CORROSION TESTING
Purpose of testing, laboratory, semi-plant and field tests, susceptibility tests of IGC, stress corrosion cracking and pitting, sequential procedure for laboratory and on site corrosion investigations, ASTM standards for corrosion testing; polarization methods to measure corrosion rate.

UNIT - IV
CORROSION PREVENTION
Corrosion prevention by design improvements, anodic and cathodic protection, metallic, non-metallic and inorganic coatings, mechanical and chemical methods and various corrosion inhibitors

UNIT-V
CORROSION IN INDUSTRIES
Corrosion in fossil fuel power plants, automotive industry, chemical processing industries, corrosion in petroleum production operations and refining, corrosion of pipelines.

TEXT BOOKS

1. Denny A. Jones, "Principles and Prevention of Corrosion", 2nd edition, Prentice Hall, USA, 1996.
2. Fontana, M.G., Greene, N.D., "Corrosion Engineering", 2nd edition, McGraw-Hill, USA, 1983

REFERENCES

1. Raj Narayan, "An Introduction to Metallic Corrosion and its Prevention", 1st edition, Oxford & IBH, New Delhi, 1983
2. ASM Metals Handbook, Vol. 13, "Corrosion", Metals Park, Ohio, USA, 1994.
3. Uhlig Hebert H, "Corrosion and Corrosion Control", 2nd edition, John Wiley, USA 1971.

COMPOSITE MATERIALS

UNIT-I
Classification of composite materials based on structure-based on matrix, applications of composites-functional requirements of reinforcement and matrix.

UNIT-II
Fibers: Preparation, properties and applications of glass fibers, carbon fibers, Kavlar fibers and metal fibers-properties and application of whiskers, particle reinforcements.

UNIT-III
Manufacturing of advanced composites: Polymer matrix composites: Preparation of Moulding compounds and – hand lay up method – Autoclave method - Filament winding method - compression moulding – Reaction injection moulding.

UNIT-IV
Manufacturing of Metal Matrix Composites: Casting-Solid state diffusion technique. Cladding – Hot isostatic pressing. Manufacturing of Ceramic Matrix Composites: Liquid Metal infiltration-Liquid phase sintering, Manufacturing of Carbon – Carbon composites: Knitting, Brading, Weaving

UNIT-V
Response of Composites to Stress: (a) Iso strain condition (b) Iso Stress condition (c)Load friction shared by the fibers

Text Books:
1. Material Sciences and Technology – Vol 13 – Composites by Cahn – VCH, West Germany
2. Composite Materials-K.K.Chawla

Reference:
1. Hand Book of Composite Materials-ed-Lubin

NANOTECHNOLOGY

UNIT-I
General Introduction: Basics of Quantum Mechanics, Harmonic oscillator, magnetic Phenomena, band structure in solids, Mossbauer and Spectroscopy, optical phenomena bonding in solids, Anisotropy.

UNIT-II
Silicon Carbide: Application of Silicon carbide, nano materials preparation, Sintering of SiC, X-ray Diffraction data, electron microscopy sintering of nano particles,
Nano particles of Alumina and Zirconia: Nano materials preparation, Characterization, Wear materials and nano composites,

UNIT-III
Mechanical properties: Strength of nano crystalline SiC, Preparation for strength measurements, Mechanical properties, Magnetic properties,

Unit -IV
Electrical properties: Switching glasses with nanoparticles,Electronic conduction with nano particles **Optical properties**: Optical properties, special properties and the coloured glasses

UNIT-V
Process of synthesis of nano powders, Electro deposition, Important naon materials

UNIT-VI:
Investigaing and manipulating materials in the nanoscale: Electron microscopics, scanning probe microscopics, optical microscopics for nano science and technology, X-ray diffraction.

UNIT-VII
Nano-biology : Interaction between bimolecules and naoparticle surface, Different types of inorganic materials used for the synthesis of hybrid nano-bio assemblies, Application of nano in biology, naoprobes for Analytical Applications-A new Methodology in medical diagnostics and Biotechnology, Current status of nano Biotechnology, Future perspectives of Nanobiology, Nanosensors.

UNIT-VIII
Nano-medicines : Developing of Nanomedicens Nanosytems in use,Protocols for nanodrug Administration, Nanotechnology in Diagnostics applications, materials for used in Diagnostics and Therapeutic applications, Molecular Nanomechanics, Molecular devices, Nanotribology, studying tribology at nanoscale, Nanotribology applications.

TEXT BOOKS:
1. Nano Materials- A.K.Bandyopadhyay/ New Age Publishers.
2. Nano Essentials- T.Pradeep/TMH

List of Pre-Ph.D. Courses: Mathematics subject:

S.No	Pre-Ph.D Course-1	S.No	Pre-Ph.D Course-2
1	Real Analysis	11	Topology
2	Complex Analysis	12	Nonlinear Functional Analysis
3	Algebra	13	Fuzzy Algebra
4	Ordinary differential equations	14	Mathematical modelling and chaotic dynamics
5	Partial differential equations	15	Elements of Elasticity and Fluid Dynamics
6	Tensor calculus	16	Boundary value problems
7	Probability & statistics	17	Operations Research
8	Numerical analysis	18	Relativity and cosmology
9	Number Theory	19	Linear Algebra
10	Discrete Mathematics	20	Boolean Algebra

Syllabus

1-Real Analysis

UNIT–I

Basic Topology: Finite, Countable, and Uncountable Sets, Metric spaces, Compact sets, Connected sets. (Chapter 2 of the text book)

UNIT–II

Numerical Sequences and Series: Convergent sequences, Subsequences, Cauchy sequences, Upper and Lower limits, Some special sequences, Series, Series of non-negative terms, number e , The Root and Ratio tests, Power series , Summation by parts , Absolute Convergence , Addition and Multiplication of series, Rearrangements. (Chapter 3 of the text book)

UNIT–III

Continuity: Limits of Functions, Continuous Functions, Continuity and Compactness, Continuity and Connectedness, Discontinuities, Monotone Functions, Infinite Limits and Limits at Infinity. (Chapter 4 of the text book)

UNIT–IV

Differentiation: The Derivative of a Real Function, Mean Value Theorems, The Continuity of Derivatives, L' Hospital's Rule, Derivatives of Higher order, Taylor's theorem, Differentiation of Vector- valued Functions. (Chapter 5 of the text book)

UNIT–V

Riemann-Stieltjes Integral: Definition and existence of the Riemann Stieltjes Integral, Properties of the Integral, Integration and Differentiation, the fundamental theorem of calculus – Integral of Vector- valued Functions, Rectifiable curves. (Chapter 6 of the prescribed text book)

Text Book: Principles of Mathematical Analysis by Walter Rudin, International Student Edition, 3rd Edition, 1985.

Reference: Mathematical Analysis by Tom M. Apostal, Narosa Publishing House, 2nd Edition, 1985.

2-Complex Analysis

UNIT-I
Elementary properties and examples of analytic functions: Power series- Analytic functions- Analytic functions as mappings, Mobius transformations. (prescribed text book-1)

UNIT-II
Complex Integration: Riemann - Stieltjes integrals - Power series representation of analytic functions- zeros of an analytic function -The index of a closed curve. (prescribed text book-1)

UNIT-III
Cauchy's theorem and integral formula - the homotopic version of cauchy's theorem and simple connectivity- Counting zeros; the open mapping theorem. (prescribed text book-1)

UNIT-IV
Singularities: Classifications of singularities- Residues- The argument principle. (prescribed text book-1)

UNIT-V
Conformal mapping-Bilinear Transforms-Argument Principle-Modulus theorem- Rouche's theorem (prescribed text book-2)

Prescribed text book:
1.Functions of one complex variable by J.B.Conway : Second edition, Springer International student Edition, Narosa Publishing House, New Delhi.
2.Complex Variable and Applications by R.V. Churchill and J. W. Brown, Tata McGraw Hill, 2008.
3.Complex Analysis by L.V.Ahlfors, Tata McGraw Hill, 1979. 3. Foundation of Complex Analysis by S. Ponnuswamy,Narosa Publishing House, 2007.
4.Complex Variables: Theory and Applications by H.S. Kasana, PHI, 2006.

3- Algebra

UNIT I:Normal Subgroups: Normal subgroups and Quotient groups - Isomorphism theorems – Auto morphisms -Conjugacy and G-Sets Cyclic Decomposition - Alternating group A_n – Simplicity of A_n.(Chapters 5 and 7) .

UNIT II: Direct Products - finitely generated abelian groups - Invariants of a finite abelian group - Sylow theorems - Groups of orders p^2, pq. (Chapter 8).

UNIT III: Ideals, Homomorphisms, Sum and direct sum of ideals, Maximal and Prime Ideals.(Sections 10.1, 10.2, 10.3, 10.4 of Chapter 10)

UNIT IV: Nilpotent and Nil Ideals, Zorn's Lemma, unique factorization domains, Principal ideal domains, Euclidean domains, Polynomial rings over UFD (Sections 10.5 and 10.6 of Chapter 10 and Chapter 11).

UNIT V: Algebraic extension of fields: Irreducible polynomials and Eisenstein's criterion-Adjunction of roots-Algebraic extensions- Algebraically closed fields. (Chapter 15 – sections 15.1 – 15.4)

Prescribed Book: Basic Abstract Algebra: P. B. Bhattacharya, S. K. Jain and S. R. Nagapaul, Second edition, reprinted in India 1997, 2000, 2001.

Reference Books:

1. Topics in Algebra : I. N. Herstein, 2nd Edition, John Wiley &Sons
2. Algebra : Thomas W. Hungerford, Springer
3. Algebra : Serge Lang, Revised Third Edition, Springer
4. Modern Algebra: Qazi Zameeruddin & Surjeet Singh , Eighth Edition, Vikas Publications

4- ORDINARY DIFFERENTIAL EQUATIONS

UNIT-I: Essential concepts from Real Function Theory – The basic problem -The fundamental existence and uniqueness theorem –examples to demonstrate the theory-continuation of solutions (Sections 10.1, 10.2 of the prescribed text book)

UNIT-II: Dependence of solutions on initial conditions – dependence of solutions on parameters (causal function f) - Existence and Uniqueness theorems for systems – existence and uniqueness theorems for Higher order equations – examples (Sections 10.3, 10.4 of the prescribed text book)

UNIT-III: Introduction to the theory of Linear differential systems – Theory and properties of Homogeneous linear systems (Sections 11.1 - 11.3 of the prescribed text book)

UNIT-IV: Theory of non-homogeneous linear systems – Theory and properties of the nth order homogeneous linear differential equations (Sections 11.4 - 11.6 of the prescribed text book)

UNIT-V: Theory of nth order Non homogeneous Linear equations – Sturm theory – Sturm Liouville Boundary value problems (Sections 11.7, 11.8, 12.1 of the prescribed text book)

Prescribed Text Book: Shepley L. Ross (2007). Differential Equations (3rd edition), Wiley India

Reference book: George F. Simmons (2017). Differential Equations with Applications and Historical Notes (3rd edition). CRC Press. Taylor & Francis.

5-Partial Differential Equations

Unit I : First Order Partial Differential Equations – Quasi linear PDEs – Pfaff's Equations (Sections 2.1, 2.2 of the prescribed text book)

Unit II :Nonlinear first order PDEs-Classification of the second order PDEs in two independent variables – wave, potential and Heat equations (Sections 2.3, 3.1 and 3.3 of the prescribed text book)

Unit III :Hyperbolic Equations – Cauchy problem for one dimensional wave equation – The Fourier method of Separation of variables (Sections 4.1, 4.3 of the prescribed text book)

Unit IV :Elliptic equations – Dirichlet problems involving Cartesian coordinates (Section 5.1 of the prescribed text book)

Unit V :Parabolic Equations – Cauchy problem – Mixed type problems (Sections 6.1, 6.2 of the prescribed text book)

Text book: Partial Differential Equations through Examples and Exercises, Endre Pap, Arpad Takaci and Djurdjica Takaci, Kluwer Texts in Mathematical Sciences, Volume 18, 1997 Springer Science+Business Media, Dordrecht
Reference: Elements of Partial Differential Equations, Ian Sneddon, McGraw-Hill International editions, New Delhi

6- Tensor calculus

Unit-1: Tensor Algebra: Introduction, N-Dimensional space, Transformation of coordinates, Indicial and summation conventions, Contravariant vectors, Covariant vectors, Invariants, Second order tensors, Higher order tensors, Addition ,subtraction , and multiplication of tensors, contraction, Quotient law, Conjugate symmetric tensors of the second order.

UNIT-2 The Line Element: Fundamental tensor, Length of a curve, Magnitude of a vector, Associate tensors, Angle between two vectors-Orthogonally, Principal directions.

UNIT-3 Covariant Differentiation: Christoffel symbols, Transformation law of Christoffel symbols, Covariant differentiation of vectors, Covariant differentiation of tensors, Laws of covariant differentiation, Intrinsic derivatives.

UNIT-4 Geodesics-Parallelism: Geodesics, Null-Geodesics, Geodesic coordinates, Parallelism, Covariant derivative.

UNIT-5 Curvature Tensor: Riemann-Christoffel tensor, Curvature tensor, Ricci tensor Curvature invariant, Bianchi's identity, Riemannian Curvature, Flat space, space of constant curvature. Cartesian Tensors: Orthogonal transformations, Rotations, Cartesian tensors, Infinitesimal strain, Stress, Equations of equilibrium, Generalized Hooke's law, isotropic tensors, Homogeneous and isotropic body, Curvilinear coordinates, Mechanics of continuous matter.

TEXT BOOK: Bary Spain, Tensor Calculus-Radha Publishing House,Calcutta
REFERENCE BOOKS: 1. Tensor Calculus, J.L.Synge and A.Schild, University of Toronto Press, Toronto.
2. Tensor Calculus, A.K.Agarwal, Krishna Prakasam mandir, Meerut.
3. Riemannian Geometry by L.P.Eisenhart, Princeton University Press, Princeton 1966

7- Probability & statistics

Unit-I Random variables, distribution functions, Mathematical expectation and Generating functions: One and two dimensional random variables (Discrete and Continuous), Distribution functions, joint and conditional distribution functions, probability mass function, probability density function, Transformation of Random variables. Mathematical expectation, Moments of a distribution function, moment generating functions, characteristic functions and their properties, Chebychev inequality, probability generating functions. (Chapter 5, Chapter 6 except section 6.7 and Chapter 7-Sections 7.1, 7.2, 7.3, 7.5 and 7.9)

Unit-II Probability Distributions: Discrete Distributions-Binomial, Poisson and geometric distributions and their properties with applications. (Sections 8.1-8.5 and 8.7 of Chapter8) Continuous distributions – Gamma, Beta, Cauchy, Normal distributions and their properties with applications (Sections 9.1, 9.2, 9.5, 9.6,9.7 and 9.12 of chapter 9)

Unit-III 1. Correlation and Regression: Correlation, Karl Pearson's coefficient of correlation, Calculation of correlation coefficient for Bivariate frequency distribution, Spearman's rank correlation coefficient. Linear regression- regression coefficients and their properties, angle between regression lines, standard error of estimate, curvilinear regression (Chapter 10 and Chapter 11)

Unit-IV Large Sample Theory :Types of sampling, tests of significance, procedure for testing of hypothesis, tests of significance for large samples, sampling of attributes, sampling of variables (Chapter 14)

Unit-V Exact Sampling Distributions: Exact sampling distributions, $2\ \chi$, t, F distributions and their applications. (Chapter 15 up to 15.6.4 and Chapter 16 up to 16.6 except 16.4)

TEXT BOOK: Fundamentals of Mathematical Statistics-S.C.Gupta and V.K.Kapoor, 11 edition Sultan Chand and Sons, New Delhi
REFERENCE: An introduction to probability theory and mathematical statistics – V.K.Rohatgi Wiley Eastern Ltd, New Delhi

8- NUMERICAL ANALYSIS

Unit-I Numerical techniques of solving transcendental and polynomial equations: Bisection methods, secant method, Newton-Raphson method, Chebyshev method, Rate of convergence. (Sec 2.1- 2.5 of Textbook 1)

Unit-II Numerical techniques of solving system of Linear Algebraic equations: Triangularization method, Gauss elimination method, Gauss-Jordan method, Iterative methods: Jacobi method, Gauss-Seidel method. Numerical techniques of determining the eigen values and eigen vectors of a matrix: Jacobi method, Power method. (Sec 3.1-3.7, 3.11 of Text book 1).

Unit-III Approximation: Lagrange interpolation, Hermite interpolation, Spline interpolation, Least squares approximation. Methods based on undetermined coefficients – Gauss Legendre, Gauss Chebyshev integration methods, Lobatto integration, Composite integration

methods – Trapezoidal rule, Simpson's rule and Romberg integration. (Sec 4.1-4.6, 4.9, 5.6-5.10 of Text book.1).

Unit-IV Numerical techniques for solving ordinary differential equations: Euler method, backward Euler method, Midpoint method. Single step methods: Taylor series method, Runge-Kutta methods, Multistep methods: Predictor-corrector method, Adams Bashforth method, Adams –Moulton method, Convergence and stability analysis of single – step methods. (Sec 6.1-6.7 of Text book 1)

Unit-V Numerical methods for solving elliptic partial differential equations: Difference methods, Dirichlet problem, Laplace and Poisson equations. (Sec 1.1, 1.2, 4.1, 4.2 of Text book 2).

Text books: 1. Numerical method for Scientific and Engineering Computation, M.K. Jain, S.R.K. Iyengar and R.K. Jain, 6rd edition, 2012, New Age International Pvt. Ltd.

2. Computational methods for partial differential equations by M.K. Jain, S.R.K. Iyengar and R.K. Jain, New Age International Pvt. Ltd. (1993)

9-Number Theory

UNIT-I: ARITHMETICAL FUNCTIONS AND DIRICHLET MULTIPLICATION:
Introduction- The Mobius function μ (n) – The Euler totient function φ (n)- A relation connecting φ and μ - A product formula for φ (n)- The Dirichlet product of arithmetical functions- Dirichlet inverses and the Mobius inversion formula- The Mangoldt function □ (n)-multiplicative functions- multiplicative functions and Dirichlet multiplication- The inverse of acompletely multiplicative function-Liouville's function $\lambda(n)$ - The divisor functions $\lambda(n)$-Generalized convolutions.
(Sections 2.1 to 2.14 of the Chapter 2 in the Prescribed Text Book.)

UNIT-II: AVERAGES OF ARITHMETICAL FUNCTIONS:
Introduction- The big oh notation. Asymptotic equality of functions- Euler's summation formula- Some elementary asymptotic formulas-Theaverage order of d(n)- The average order of the divisor functions $^{d}(n)$ - The average order of nσ (n)-An application to distribution of lattice points visible from the origin. The average order of μ (n and Λ (n). The partial sums of a Dirichlet product- Applications to μ (n and Λ (n).
(Sections 3.1 to 3.12 of Chapter 3 in the Prescribed Text Book.)

UNIT-III: SOME ELEMENTARY THEOREMS ON THE DISTRIBUTION OF PRIME NUMBERS: Introduction- Chebyshev's functions $\psi(x)$ and $\vartheta(x)$ - Relations connecting $\vartheta(x)$ and $\pi(x)$ - Some equivalentforms of the prime number theorem- Inequalities for $\pi(n)$ and p_n - Shapiro's Tauberian theorem- Applications of Shapiro's theorem- An asymptotic formula for the partial sums $\sum(1/p)$ - The partial sums of the Mobius function – The partial sums of the Mobius function. $p \leq x$ Brief sketch of an elementary proof of prime number theorem.

UNIT-IV: CONGRUENCES:
Definition and basic properties of congruences- Residue classes and complete residue systems- Linear congruences- Reduced residue systems and the Euler- Fermat theorem-

Polynomial congruences modulo p. Lagrange's theorem- Applications of Lagrange's theorem- Simultaneous linear congruences. The Chinese remainder theorem- Applications of the Chineseremainder theorem.
(Sections 5.1 to 5.8 of the Chapter 5 in the Prescribed Text Book.)

UNIT-V: FINITE ABELIAN GROUPS AND THEIR CHARACTERS:

Characters of finite abelian groups- The character group- The orthogonality relations for characters- Dirichlet characters- Sums involving Dirichlet characters-The nonvanishing of $L(1, \chi)$ for real non-principal χ

DIRICHLET'S THEOREM FOR PRIMES IN ARITHMETIC PROGRESSION

Introduction- Dirichlet's theorem for primes of the form 4n-1 and 4n+1- The plan of the proof ofDirichlet's theorem
(Sections 6.5 to 6.10 & 7.1 to 7.3 of the Chapters 6 and 7 in the Prescribed Text Book.)

Prescribed Text Book:

Introduction to Analytic Number Theory, By T.M.APOSTOL-Springer Verlag-New York,Heidalberg-Berlin-1976.

Reference Books:

1. An Introduction to the theory of numbers, 5th edition by Ivan Niven Herbert S. Zuckermanand Huge L. Montgomery, John Wiley & Sons INC. publications, U.K., 2008.
2. Elementary Number Theory, 7th edition by David M. Burton, 2011.

10- Discrete Mathematics

Unit-I Mathematical logic: Statements structures and notation, connectives, well formed formulas, tautologies, equivalences, implications, normal forms – Disjunctive and conjunctive, Principle disjunctive and conjunctive normal forms.
(Text book 1)

Unit-II Theory of Inference: Theory of inferences for statement calculus, validity using truth tables, rules of Inference. Predicate calculus: predicates, predicate formulas, quantifiers, free and bound variables, Inference theory of predicate calculus.
(Text book 1)

Unit-III Relations and ordering: partially ordered relations, Partially ordered sets, representation and associated terminology. Lattices, Lattices as partially ordered sets, some properties of Lattices, Lattices as algebraic systems, sub-Lattices, direct product and homomorphism some special Lattices. (Text book.1).

Unit-IV Graph Theory: Graphs and Multigraphs, Subgraphs, Isomorphism and Homomorphism, Paths, Connectivity, Traversable Multigraph, Labeled and Weighted Graphs, Complete, Regular and Bipartite Graphs, Trees, Planar Graphs. (textbook 2).

Unit-V Directed Graphs: Rooted Trees, Sequential Representation of Directed Graphs,Warshall's Algorithm, Shortest Path, Binary Trees, Complete and Extended

Binary Trees, Representation of Binary Trees, Traversing Binary Trees and Binary Search Trees (textbook 2).

Text books: 1. Discrete Mathematical structures with Applications to Computer Science by J.P. Trembly and R.Manohar, Tata Mc.Graw hill.
2. Discrete Mathematics, Schaum's outline series, second edition, by Seymour Lipschutz and Marc Lipson Tata Mc Graw-Hill.

11-Topology

UNIT-I: Sets and Functions: Sets and Set inclusion – The algebra of sets – Functions – Products of sets – Partitions and equivalence relations – Countable sets – Uncountable sets – Partially ordered sets and lattices. (Chapter I: Sections 1 to 8 of the prescribed text book).

UNIT-II;: Metric spaces: The definition and some examples – Open sets – Closed sets – Convergence, Completeness and Baire's theorem .
(Chapter 2: Sections 9 to 12 of the prescribed text book).

UNIT-III: Metric spaces (Continued): Continuous mappings, Spaces of continuous functions – Euclidean and Unitary spaces.(Chapter 2: Sections 13 to15 of the prescribed text book) Topological spaces: The definition and some examples – Elementary concepts– (Chapter 3: Sections 16 to 17 of the prescribed text book).

UNIT-IV: Topological spaces (continued): Open bases and open sub bases, Weak Topologies, The function algebras C(X, R) and C(X, C). (Chapter 3: Sections 18 to 20 of the prescribed text book).
Compactness: Compact spaces – Heine – Borel theorem (Chapter 4: Section 21).

UNIT-V: Compactness (continued): Product of Spaces – Tychonoff's theorem and locally Compact spaces – Compactness for metric spaces – Ascoli's theorem. (Chapter 4: Sections 22 to 25 of the prescribed text book).
P**escribed Text Book:** Introduction to Topology and Modern Analysis by G. F. Simmons International Student edition – McGraw – Hill Kogakusha, Ltd.

12- Nonlinear Functional Analysis

UNIT–I: Various Forms of Continuity, Geometry in Normed Spaces and Duality Mapping. Chapter 1, Sections 1.1 to 1.2 of the Text Book.

UNIT –II: Gateaux and Fréchet derivative, Properties of derivative, Taylor's theorem, Inverse function theorem and Implicit function theorem, Subdifferential of convex functions. Chapter 2 of the Text Book.

UNIT –III: Banach's contraction principle and its generalization.
Chapter 4, Section 4.1 of the Text Book.

UNIT-IV: Non expansive mappings.
Chapter 4, Section 4.2 of the Text Book.

UNIT-V: Fixed Point Theorems of Brouwer and Schauder.
Chapter 4, Section 4.3 of the Text Book.

Text Book: Mohan C. Joshi and Ramendra K. Bose, Some Topics in Nonlinear Functional Analysis, Wiley Eastern Limited, Hyderbad, 1985.
Reference: V.I. Istratescu, Fixed Point Theory-An Introduction, Springer, 1981.

13-Fuzzy Algebra

UNIT-I: From Classical (Crisp) sets to Fuzzy sets:- Introduction-Crisp sets: An overview-fuzzy set: Basic types-Fuzzy sets. Basic Concepts- Characteristics and significance of the paradigm shift (CH-1 of (I)). Fuzzy sets versus Crisp sets-Additional Properties of a cuts-Representations of Fuzzy setsExtension principle for Fuzzy sets (CH-2 of (I)).

UNIT-II: Operations on Fuzzy sets - Types of Operations - Fuzzy Compliments - Fuzzy Inter sections: tnorms - Fuzzy unions; t-Conorms - Combinations of operations - Aggregation Operations (CH-3 of (I)).

UNIT-III: Fuzzy Arithmetic -Fuzzy Numbers - Linguistic variables - Arithmetic operations on intervals - Arithmetic operations on Fuzzy numbers - Lattice of fuzzy numbers - Fuzzy equations (CH-4 of (I)).

UNIT-IV: Fuzzy Relations - Crisp versus fuzzy relations - Projections and Cylindric Extensions - Binary Fuzzy Relations - Binary Relations on a Single set - Fuzzy Equivalence Relations . (Sections 1 to 5, CH-5 of (I)).

UNIT-V: Fuzzy Compatibility Relations - Fuzzy Ordering Relations - Fuzzy Morphisms - Sup – i Compositions of Fuzzy Relations - Inf -wi Compositions of fuzzy Relations. (Sections 6 to 10, CH-5 of (I)).

Prescribed Text Book: (1) G.J.KLIR and BO YUAN, "Fuzzy sets and Fuzzy Logic, Theory and Applications" Prentice - Hall of India Pvt. Ltd., New Delhi., 2008.

14. Mathematical Modelling and Chaotic Dynamics

UNIT-I-Introduction to Mathematical Modeling Introduction Introduction, Characteristics of Mathematical Models, Classification of Mathematical Models, Classification as per the Nature of Basic Equations, Some Simple Examples of Optimization Problems, Limitations Associated with Mathematical Modeling Modeling Approaches: Empirical Approach, Theoretical Approach, Stochastic or Probabilistic Approach, Deterministic Approach, Statistical Approach, Simulation Approach, Discrete and Continuous Approaches Modeling/Cyclic Processes , A Modeling Diagram , Compartment Models ,Mathematical Preliminaries, Construction of the Lyapunov Function and Testing of Stability Krasovskii's Method , Lyapunov Function for Linear Systems with Constant Coefficients, The Routh–Hurwitz Criterion for Stability, Stability Discussion Based on the Linearization Procedure, Global Asymptotic Stability , Limit Cycles , Liénard's Equation and Existence of a Limit Cycle, Energy Balance Method for Limit Cycles , Focus , Dynamic System and Its Mathematical Model , Hamiltonian Systems

UNIT-II-Modeling of Systems from Natural Science Introduction, Models with Single Population Continuous Time Models: Malthusian Model, Verhulst–Pearl Logistic Model, Gompertz Growth Model, Theta-Logistic Model, Model with Allee Effect, Limited Growth Model, Harvest Model, Models with Delay, Discrete Time Models, Linear Map

UNIT-III-Two-Dimensional (2D) Continuous Models (Modeling of Population Dynamics of Two Interacting Species) Analytical Tool, Kolmogorov Theorem, Local Stability Analysis, Lotka–Volterra Model, Variation of the Classical LV Model, Leslie–Gower Model, Rosenzweig–MacArthur Model, Variations of the RM Model, Prey–Generalist Predator Model, Holling–Tanner Model, Modified HT Model, Competition Model, Gause Model, 2D Discrete Models: Nicholson–Bailey Model, Modified NB Model, Aihara Model

UNIT-IV-Introduction to Chaotic Dynamics Introduction. Chaos and Chaotic Dynamics, Basin of Attraction, Primary Routes to Study Chaos, Types of Chaos, Transients, and Attractors, Methods of Investigation for Detecting Chaos, Method for Selection of Parameter Values, Calculation of the Basin Boundary Structures , 2D Parameter Scans,

UNIT V : Bifurcation Analysis
Bifurcation Diagrams, Hopf Bifurcation Analysis, Time-Series Analysis and Phase-Space Diagram Types of Bifurcations: Saddle-Node Bifurcation or Tangent Bifurcation, Transcritical Bifurcation, Pitchfork Bifurcation, Period-Doubling Bifurcation, Andronov–Hopf Bifurcation (Cycle Birth Bifurcation), Poincaré Map and Poincaré Section, Lyapunov Exponents
Text Book

1. Introduction to Mathematical Modelling and Chaotic Dynamics
by Ranjit Kumar Upadhyay, Satteluri R.K. Iyengar, CRC Press
2. Mark Kot, 2001, Elements of Mathematical Ecology, Cambridge University Press

15. Elements of Elasticity and Fluid Dynamics

Unit-I Kinematics of fluids, real and ideal fluids, velocity of fluid at a point, streamlines and path lines, velocity potential, velocity vector, local and particle rates of change, equation of continuity, Acceleration of fluid, conditions at a rigid boundary, General analysis of fluid motion (Chapter 2 of Text book 1)

Unit-II Equation of motion of a fluid, pressure at a point in a fluid at rest and in a moving fluid, conditions at a boundary of two in viscid immiscible fluids, Euler's equations of motion, Bernoulli's equation. Discussion of the case of steady motion under conservative body forces, Vortex motion, Kelvin's circulation theorem. Some further aspects of vortex motion (Chapter 3(excluding sections 3.8 to 3.11) of Text book 1).

Unit-III Some two - dimensional flows: Meaning of two - dimensional flow, use of cylindrical polar coordinates, the stream function, the complex potential for two – dimensional, irrotational, incompressible flow, complex potential for standard two – dimensional flows, some worked examples, two - dimensional image systems. The Milne-

Thomson circle theorem, the theorem of Blasius (Chapter 5(excluding sections 5.10 to 5.12) of Text book 1).

Unit-IV Analysis of strain: Deformation, affine deformation, infinitesimal affine deformation, geometrical interpretation of the components of strain, strain quadric of Cauchy, principal directions, invariants, general infinitesimal deformation, Examples of strain, equations of compatibility, finite deformations. (Chapter 1 of Text book 2)

Unit-V Analysis of stress, body and surface forces, stress tensor, equations of equilibrium, transformation of coordinates, stress quadric of Cauchy, Mohr's diagram, examples of stress (Chapter 2 of Text book2)
Text books: 1. Text book of Fluid Dynamics by F.Chorlton, CBS publishers and distributors, New Delhi.
2. Mathematical theory of Elasticity, by I.S.SOKOLNIKOFF 2 nd edition; Tata Mc Graw Hill-New Delhi

16. BOUNDARY VALUE PROBLEMS

UNIT – I General theory for linear first order system of differential equations, Existence of solutions, Solution space. The first order non-homogeneous equation, variation of parameters. The adjoint nth order equation. Relation between scalar and vector adjoints.

UNIT – II The two point boundary value problems, Homogeneous two-point boundary value problems, the adjoint boundary problem, the non-homogeneous boundary problem, Green's matrix and self – adjoint boundary value problem.

UNIT – III Introduction to Eigen value problems, the vibrating string problem, Heat conduction problem, properties of the Green's operator. Existence of Eigen values and Eigen functions.

UNIT IV Non – linear boundary value problems, kinds of boundary value problems, the Generalized Lipschitz condition, failure of existence and uniqueness to Linear boundary value problem, relation between first and second boundary value problems. A more general Lipschitz condition, application to boundary value problems (Chapters 1,2, and 3 of Ref. 4).

UNIT – V Stability: Definition and examples Liapunov method for uniform stability, Asymptotic stability. Linear and quasi-linear ordinary differential systems, Autonomous Ordinary differential systems, trajectories and critical points, linear systems of second order, critical points of quasi-linear systems of second order.

Books: 1. Theory of Ordinary and delay differential equations by R.D. Driver Kingston R.I., Nov, 1976(Springs Verlag)
2. Theory of ordinary differential equations by E.A. coddington and N. Levinson.
3. Theory of ordinary differential equations by R.H. Cole, appleon century – crofts, New York, 1968. 4. Non-Linear two point boundary value Problems by P.B. Bailey, L.F. Shampine and P.E. Waltman, Academic press, New York, London (1968

17- Operations Research

UNIT-I: Linear Programming: Simplex Method: Introduction-Fundamental properties of solutions-The computational procedure-Use of artificial variables.
(Sections 4.1 to 4.4 of the Chapter 4 in the Prescribed Text Book.)

UNIT-II: Duality in Linear Programing: Introduction-General Primal-Dual pair-Formulating a Dual problem-Prime-Dual Pair in matrix form-Duality theorems-Complementary slackness theorem- Duality and simplex method.
(Sections 5.1 to 5.7 of the Chapter 5 in the Prescribed Text Book.)

UNIT-III: Duality in Linear Programing : Economic Interpretation of Duality, Dual Simplex method **Post-optimal Analysis** : Introduction-Variation in the cost vector-Variation in the requirement vector-variation in the coefficient matrix-Structural variations-Applications of Post-optimal Analysis.
(Sections 5.8, 5.9 and 6.1 to 6.6 of the Chapters 5 and 6 in the Text Prescribed Book.)

UNIT-IV: Transportation Problem and Assignment Problem: Introduction-General transportation problem-The transportation table-Solution of a transportation problem-Finding an initial basic feasible solution-Test for optimality-Degeneracy in Transportation problem-Transportation Algorithm (MODI Method)- Introduction -Mathematical formulation of the problem-The Assignment method-Special cases in Assignment problem-A typical Assignment problem.
12 hours (Sections 10.1 to 10.3 and 10.8 to 10.11 of the Chapter 10 in the Prescribed Text Book.) (Sections 11.1 to 11.5 of the Chapter 11 in the Prescribed Text Book.)

UNIT-V: Games and Strategies: Introduction-Two-person zero-sum games-some basic terms-The maximin-minimax principle-Games without saddle points-Mixed strategies-Graphic solution of 2xn and mx2 games.
(Sections 17.1 to 17.6 of the Chapter 17 in the Prescribed Text Book.)

Prescribed Text Book: Operations Research, Kanti Swarup, P.K. Gupta and Man Mohan Sultan Chand & Sons, New Delhi, 2006.
Reference Books:

1. Operations Research, An Introduction: Hamdy A Taha, Maxwell Macmillan International Edition, New York, 1992.
2. Operations Research Theory, methods and Applications, S.D. Sarma, kedar nath Ram nath publications, 2008.

18- RELATIVITY AND COSMOLOGY

Unit-I Tensor Analysis: N-dimensional space, covariant and contravariant vectors, contraction, second & higher order tensors, quotient law, fundamental tensor, associate tensor, angle between the vectors, principal directions, Christoffel symbols, covariant and intrinsic derivatives, geodesics (Chapters 1 to 4 of Text book.1).

Unit-II Riemann Christoffel Tensor, covariant curvature tensor and its properties, Ricci Tensor, Curvature invariant, Einstein space, Bianchi's identity, Riemannian Curvature, Einstein space, flat space, space of constant curvature, Schur's Theorem (Chapter V of Text book.1).

Unit-III Space-time continuum, the three plus one dimensions of space-time, the geometry corresponding to space-time, the signature of the line element and the three kinds of interval, Lorentz rotation of axes, transformation to proper coordinates (Chapter II, Articles 13-18 of Text book 2).

Unit-IV The mass of a moving particle, the transformation equations for mass, work and kinetic energy, the relations between mass, energy and momentum, Four-dimensional expressions of the mechanics of a particle (Chapter III, Articles 23-28 of Text book 2).

Unit-V The Maxwell-Lorentz Field Equations, The transformation equations for E, H and Q. The force on a moving charge, The energy and momentum of electromagnetic field, electromagnetic stresses, Four dimensional expressions for electron theory (Chapter IV, Articles 39-43 & 46 of Text book 2).

Text Books:

1. Barry Spain, Tensor Calculus-Radha Publishing House, Calcutta.
2. R.C. Tolman, Relativity, Thermodynamics and Cosmology, Clarendon Press, Oxford.

Books

Reference:

1. Introduction to Special Relativity by Robert Resnick, Johnwiley & Sons, New York.
2. Theory of Relativity by S.R. Roy and Raj bali Jaipur Publishing House, Jaipur.
3. J.K. Goyal and K.P. Gupta, Theory of Relativity, Krishna Prakasan Media(P) Ltd., Meerut

19-Linear Algebra

Unit – I: Introduction, Characteristic Values, Similar Matrices, Diagonalizable Operators, AnnihilatingPolynomials, Minimal Polynomials, Cayley – Hamilton Theorem
(Sections 6.1 - 6.3 of Chapter 6 in the Prescribed Text Book)

Unit – II: Invariant Subspaces, T-conductor of a vector, T-annihilator of a vector, Simultaneous Triangulation; Simultaneous Diagonalization.
(Sections 6.4 - 6.5 of Chapter 6 in the Prescribed Text Book)

Unit – III: Direct – Sum Decompositions, Projections, Invariant Direct Sums, The Primary DecompositionTheorem.
(Sections 6.6 – 6.8 of Chapter 6 in the Prescribed Text Book)

Unit – IV: Cyclic Subspaces and Annihilators, T-cyclic Subspace Generated by a Vector, Companion Matrices, Complementary Subspaces, I-admissible Subspaces, Cyclic Decompositions and Rational form, Generalized Cayley – Hamilton Theorem Invariant Factors.
(Sections 7.1, 7.2 of Chapter 7 in the Prescribed Text Book).

Unit – V: The Jordan Forms, Elementary Jordan Matrix with Characteristic Value ,

Computation of Invariant Factors, Elementary Matrices, Smith Normal Forms, Summary; Semi-Simple Operators.
(Sections 7.3 – 7.5 in the Prescribed Text Book)

Prescribed Text Book: Linear Algebra by Kenneth Hoffman and Ray Kunze, Prentice-Hall IndiaPvt. Ltd, 2nd Edition, New Delhi.

20- Boolean Algebra

Unit-I : Boolean rings – Boolean algebras – Fields of sets - Elementary relations-

Unit-II : Order – Infinite operations – Subalgebras – Homo morphisms-

Unit-III : Free Algebras- Ideals and filters – The Homo morphisms theorem-

Boolean o-algebras-

Unit-IV : The countable chain condition – Measure algebras - Atoms – Boolean spaces – The representation theorem -Duality for ideals

Unit-V : Duality for Homo morphisms. Boolean σ spaces,Represanation of σ algebra ,Boolean Measure spaces.

Text Book: Lectures on Boolean Algebras, by Paul R. Halmos, D. Van Nostrand Company, Inc. Princeton, New Jersey

Physics
Pre-Ph. D Syllabus

S.No	Pre-Ph. D Course-1	Pre-Ph. D Course-2
1.	Solid State Physics	Physical Characterization Techniques of Materials
2.	Nanomaterials: Theory and Physics of Nanomaterials	Nanomaterials: Instruments and Applications
3.	Principles of Nuclear Physics	Nuclear Radiation Detectors and Accelerators
4.	Nuclear Radiation and Analytical Techniques	Radiation Protection and Dosimetry
5.	Vacuum Science and Technology of Thin Films	Thin Films: Characterization Techniques and Properties
6.	Advances in Ferro Electric Materials	Advances in Ferroelectric Materials - II
7.	Soft Magnetic Materials	Material Characterization Techniques
8.	Applied Spectroscopy	Spectroscopic Techniques

Solid State Physics

(Pre-Ph.D Course-1)

UNIT I: Crystallography

The nature of the crystalline state, basic definitions, Periodic Array of Atoms, Basis and the Crystal structure, Lattice Translation Vectors, 14 Bravais lattices, Crystal symmetry: point groups, space groups, symmetry-related properties, Describing lattice planes and directions in crystals: Miller indices, Reciprocal lattice vectors, Reciprocal lattice unit cells.

UNIT II: Lattice Vibrations and Heat Capacity

Elastic waves, Equation of Motion in the One-Dimensional Lattice, Elastic Waves in Continuous Media, Waves of Lattice Vibration and the Dispersion Relation w(k), phonon, Einstein Model for Lattice Heat Capacity, Density of States, Debye Density of States, Debye Cut-off Frequency, and Debye Cut-off Wave Vector, Debye Model of the Lattice Heat Capacity and Debye Temperature, Crystal Momentum, Thermal Conductivity.

UNIT III: Free electron and Band theory of Solids

FREE ELECTRON FERMI GAS

Energy Levels in One Dimension, Effect of Temperature on the Fermi-Dirac Distribution, Free Electron Gas in Three Dimensions, desnity of states,Heat Capacity of the Electron Gas, Electrical Conductivity and Ohm's Law

ENERGY BANDS

Nearly Free Electron Model, Origin of the Energy Gap, Bloch Functions, Kronig-Penney Model, Wave Equation of Electron in a Periodic Potential, Crystal Momentum of an Electron, Number of Orbitals in a Band, Metals and Insulators.

UNIT IV: Dielectric and Ferroelectric properties of materials

Introduction, fundamental definitions, local field, Clausius-Mossotti relation, different types of electric polarizations - electronic, ionic, and dipolar polarizations (qualitative and quantitative), temperature and frequency dependence of polarization, dielectric loss, hopping mechanism, piezoelectricity and ferroelectricity; spontaneous polarization in $BaTiO_3$.

UNIT V: Magnetic Properties

Introduction, fundamental definitions, Weiss theory of ferromagnetism, domain theory of ferromagnetism, hysteresis, Eddy current losses; ferrites (structure) - normal, inverse and mixed ferrites, super exchange interaction (Neel model), initial permeability, effect of frequency on permeability- domain wall relaxation and spin resonance.

Textbooks:

1. “Introduction to solid state Physics 8th edition” by Charles Kittel; Wiley India.

2. "Introduction to Phonons and Electrons" Liang-fu Lou (2003) World Scientific, Singapore

Reference Books:

1. "The Basics of Crystallography and Diffraction" Christopher Hammond (2015) Oxford University Press, UK

Nanomaterials Theory and Physics of Nano-materials

(Pre-Ph.D Course-1)

UNIT I: **Concepts of Nano-technology**

Nano size, top-down and bottom-up approaches, size matters reduction of dimensionality and surface to volume ratio, changes to the system total energy, changes to the system structure, structural properties, thermal properties, chemical properties, mechanical properties, magnetic properties, optical properties and electronic properties of nano-scale systems

UNIT II: Nano materials

Introduction, materials used in nanotechnology, Fullerenes – discovery, variations of Bucky balls, Bucky tubes, Properties of Fullerenes - aromaticity, chemistry of Fullerenes, solubility of fullernes and quantum mechanics of fullernes, synthesis of nano-materials –ball milling and sol gel methods

UNIT III: Carbon nanotubes

Discovery, structure of nano tubes, Types of nano tubes-single walled nano tubes (SWNT) and multi walled nanotubes (MWNT), types of SWNT- chiral, armchair and zig zag, properties of nanotubes – strength, electrical conductivity, thermal conductivity, transport, optical activity and chemical activity.

UNIT IV: Theory of Nano tubes

The continuum shell theories of mechanics of carbon nano tubes, parameterization of continuum theories for single wall carbon nano tube repeat space theory applied to carbon nano tubes, modelling and analysis of carbon nano tube bucking using thick shell theory – Effective medium theory of optical properties of CNTs. Theory of electric charge enhancements in carbon nano tubes.

Unit V: Synthesis of Nano tubes

Growth mechanisms of CNT – tip growth and root growth, Arc Discharge method – synthesis of SWNT and MWNT, Laser Ablation method, Plasma Enhanced CVD, Laser Assisted Thermal CVD, and Flame synthesis, purification of CNTs – Oxidation, Annealing, Magnetic purification

References

1. Nano technology by William Illsey Alkinson, Jaico Books

2. Applicability of the continuum shell theories, VM Harik, TS Gate & MP Nemeth, NASA

3. Wondrous world of Carbon Nanotubes by M.Daenen and R.D. de Fouw

Principles of Nuclear Physics

(Pre-Ph.D Course-1)

Unit I: Nuclear Matter

Properties of nuclear matter, size, shape, charge distribution, magnetic dipole and electric quadrupole moments, spin, parity, binding energy, Weizsaecker formula – Nuclear masses

Unit II: Nuclear Decay and Forces

Nuclear stability, Alpha, Beta, Gamma decays and their selection rules, Characteristics of nuclear forces, Nucleon – nucleon interaction, Meson theory of nuclear forces

Unit III: Nuclear Models

Nuclear liquid drop model, Nuclear shell structure – basics of the nuclear shell model, Collective rotational and vibrational models of nuclei, Nuclear excitations – collective excitations and gaint resonances

Unit IV: **Nuclear Reactions**

Types of nuclear reaction and their features, Nuclear kinematics, Direct nuclear reactions and its applications in nuclear spectroscopy, Compound nuclear reactions, Nuclear fusion and fission

Unit V: Nuclear Spectroscopy

Study of nuclear structure through in-beam gamma ray spectroscopy, Population of high spin states, Discrete gamma ray spectra, Rotational alignment, Back-bending phenomenon. Nuclear deformation – Normal and highly deformed structures

References:

1. Basic Ideas and Concepts in Nuclear Physics: an introductory approach, K. Heyde

2. M. A. Preston and R. K. Bhaduri, (1982), Structure of the Nucleus, Addison-wesley

3. Nuclear Reactions, Daphne F. Jackson

4. Introductory nuclear physics, Kenneth S. Krane

5. Nuclear Structure by Bohr and Mottelson

Nuclear Radiation and Analytical Techniques

(Pre-Ph.D Course-1)

Unit I: Radiation Measurement and Protection

Types of nuclear radiation, Measurement of nuclear radiation, Measurement of exposure, Radiation absorbed dose, Kerma, Calculation of absorbed dose from exposure, Sources of radiation, Radiation protection, Protection of personnel against nuclear radiation, Radiation monitoring

Unit II: Radioisotopes and their Applications

Radioisotopes and their separation techniques, General applications of radioisotopes, Radioisotopes in medicine, Positron Emission Tomography (PET), Single Photon Emission Computed Tomography (SPECT)

Unit III: Radiation Therapy

Types of radiation therapy, External beam radiation (teletherapy), Internal radiation therapy (brachytherapy), Dose depth relations, Radionuclide Therapy-Radioiodine Treatment of Thyroid Disorder, Dosimetry Aspects

Unit IV: X-Ray based Analytical Techniques

Interaction of X-rays with matter, Basic principles and instrumentation of X-ray Fluorescence (XRF), Wavelength Dispersive X-Ray Fluorescence (WDXRF), Total reflection X-ray Fluorescence (TXRF), Particle-Induced X-ray Emission (PIXE), X-Ray Photoelectron Spectroscopy (XPS)

Unit V: Nuclear Analytical Techniques

Principle and experimental set-up of Rutherford Backscattering Spectroscopy (RBS), Mossbauer Spectroscopy (MS), Neutron Activation Analysis (NAA), Nuclear Reaction Analysis (NRA), Particle Induced Gamma Ray Emission (PIGE), and Accelerator Mass Spectrometry (AMS)

References

1. Text Book of Nuclear Medicine by John. Harbert and A.F.G.Rocha.

2. Nuclear Medicine By J.H.Thrall and HarvveyV.Ziessman
3. Atomic and Nuclear Analytical Methods by H.R.Verma, Springer-Verlag Berlin Heidelberg 2007
4. John Lilley, Nuclear Physics, Principles and Application, John Wiley (2002).
5. K.M.Varier, A.Joseph and P.P.Pradyurnan, Advanced Experimental Techniques in Modern Physics, Pragati Prakashan, Meerut (2006).
6. H. Cember, Introduction to Health Physics, Pergamon Press, New York (1983).

Vacuum Science and Technology of Thin Films

(Pre-Ph.D Course-1)

UNIT I: Production and Measurement of Vacuum Vacuum pumps:

Fundamentals of kinetic theory applicable to vacuum technology- Mechanical Pumps: Rotary pump, Roots pump: Dry Pumps- Turbo molecular pump – Diffusion pump – Sorption pump – Cryogenic pump – Sputter ion pump. (1,2) Vacuum Gauges: Thermal conductivity (Pirani) gauge- McLeod gauge – Ionization gauges: Penning gauge, Hot cathode ionization gauge – Bayard –Alpert gauge – Partial pressure measurements gauges: Magnetic deflection mass spectrometer – Quadruple mass spectrometer

UNIT II: Construction and Operation of Vacuum Systems

Valves for medium and high vacuum – Devices for transmitting motion – Working vessel – Pump combinations – Design of vacuum systems - Leaks and leak detection. Vacuum application: Vacuum metallurgy- Space simulators- Freeze drying – Vacuum in electrical applications (Drying, Impregnation, circuit breakers)

UNIT III: Preparation of Thin Films Physical Methods

Vacuum evaporation:– Thickness distribution of evaporated films (Point and Ring sources) - Resistive heating, Electron beam evaporation, Co-evaporation Pulsed laser ablation – Epitaxial thin deposition: Close-space vapour transport (CSVT) and molecular beam epitaxy. Sputtering: Glow discharge, DC and RF sputtering, Reactive sputtering and magnetron sputtering. Chemical methods: Electroplating – Spray pyrolysis – Chemical vapour deposition (CVD), Plasma enhanced chemical vapour deposition (PECVD) and Metal organic chemical vapor deposition (MOCVD)

UNIT IV: Growth and Thickness Measurements of Thin Films

Growth of thin films: Condensation, Nucleation and growth of thin films – Langmuir Frenkel theory of condensation – Theories of thin film nucleation – Capillarity theory – Statistical or Atomistic theory – Comparison of the nucleation theories – The four stages film growth – Incorporation of defects during growth. Thickness measurement: Multiple beam interferometer (MBI) methods – Quartz crystal thickness monitor, Stylus profiler.

UNIT V: Characterization of Thin Films and Applications

Thickness measurement techniques-Multiple beam interferometry (MBI)-Stylus method, Surface analytical techniques: Auger Electron Spectroscopy (AES), X-ray Photoelectron Spectroscopy (XPS), Secondary Ion Mass Spectroscopy (SIMS) and Rutherford Back Scattering (RBS)

Applications of Thin Films: Thin film resistors – Thin film capacitors –Thin film solar cells – Gas sensors – Transparent conducting coatings - Thin films for superconducting devices – Hard coatings, Photolithography

References:

1. Vacuum Technology, A. Roth, North-Holland, 1986.
2. Vacuum Science and Technology, V. Vasudeva Rao, T.B. Ghosh and K.L. Chopra, Allied Publications, 1998.
3. Handbook of Thin Film Technology, L.I. Maissel and R.L. Glang, Mc Graw Hill Book Co., 1970.
4. Thin Film Phenomena, K.L. Chopra, Mc Graw Hill Book Co., New York, 1969.
5. Vacuum Deposition onto Webs, Films and Foils, Charles A. Bishop, Elsevier, London, 2011.
6. The Materials Science of Thin Films, M. Ohring, Academic Press, New York, 1992.
7. The User's Guide to Vacuum Technology, J.F .O'Henlon, John Wiley & Sons, 2003.

Advances in Ferro Electric Materials

(Pre-Ph.D Course-1)

Unit I: Dielectrics

Review of Fundamentals – the three vectors D, E, and P. Dielectric susceptibility, Complex Dielectric constant, Macroscopic and Microscopic Electric fields, Clausius – Mossotti Relation, Polarization Mechanisms, Electronic, Ionic and Dipolar Polarizations and their temperature dependence Frequency Dependence of Dipolar Polarizability, Ionic Polarizability, Electronic Polarizability, Ferro electricity, Curie – Weiss law and Curie Temperature, Theories of Ferro electricity, Ferro electric Hysteresis, Classification of Ferro electric crystals, Ferro elasticity, piezoelectricity, Mathematical Description and Piezoelectric coefficients, pyroelectricity, pyroelectric responsivity, Pyroelectric Energy Conservation [1&2]

Unit II: Magnetic materials

Quantum theory of Diamagnetism, Origin of paramagnetic moments – the Orbital Magnetic moment, the spin magnetic moment, the total magnetic moment, classical and quantum theory of para-magnetism, ferro-magnetism, Weiss theory of spontaneous magnetization, temperature dependence of spontaneous magnetization, Nature and origin of the Weiss Molecular Field theory, Exchange interaction, Hysteresis, Weiss theory of Hysteresis, Ferro magnetic Domains, Anti Ferro magnetism, Neel Temperature, Ferri magnetism, Molecular field theory of Ferri-magnetism, Ferristesuan – Spinel Inverse spinel and mixed ferrites [1&2]

Unit III: Diffusion in solids and sintering

Diffusion in Crystalline solids, Laws Diffusion, Chemical Potential, Diffusional Flux Equations, Temperature Dependence of Diffusion coefficient, Determination of Activation Energy, Sintering-Driving Force for sintering, Mechanisms of sintering, Theoretical analysis of sintering, Numerical simulation of sintering, sintering Diagrams, Liquid Phase sintering – Elementary Features of Liquid phase sintering, stages of liquid phase sintering, The Basic mechanisms of liquid phase sintering, Hot pressing with a Liquid Phase, Activated Sintering [3 &4]

Unit IV: Grain Growth and Microstructure Control

Introduction, General Features of Grain Growth – Grain Growth and Coarsening, Driving Force and Grain Growth, Normal and Abnormal Grain Growth, Effect of Grain size on Properties, Attainment of High Density, Ostwald Ripening – The LSW theory, Ostwald Ripening Controlled by Interface Reaction, Time Dependent Ostwald Ripening, Normal Grain Growth in Dense solids, Computer Simulation of Normal Grain Growth, Abnormal Grain Growth in Dense solids – Causes of Abnormal Grain Growth, Grain Growth and Pore Evaluation in Porous Solids – Thermo dynamics of Pore Boundary interactions, Grain Growth in very Porous solids, Grain Growth in less Porous solids, Pore mobility, Structure Determination – Bragg's Law, Electron Diffraction, Neutron Diffraction, Mossbauer Effect [1 &3]

Unit V: Conventional and Modern Physics of Ferroelectrics

Theory of Polarization – A modern approach: Fallacy of Clausius – Mossotti Picture, Fallacy of Defining Polarization via the Charge Distribution, Landau Primer for Ferroelectrics – Introduction, Landau – Devonshire Theory: General Phenomenology, Second Order (Continuous) Transition, First order (Discontinuous) transition, Coupling to Strain, Soft Modes, Domains, Landau-Ginzburg Thory: General Considerations, Displacive and Order – Disorder Transitions, Diffuse Phase Transitions – Dielectric Relaxators, Recent Developments in Bulk Ferro electricity, What causes Ferro electricity and what causes Ferro magnetism? Multiferroics – The scarcity of Ferro magnetic Ferroelectrics, Magnetoelectric coupling, composites [5 & 6]

References:

1. Introduction to Solid state Physics by Charles Kittel, Wiley Eastern Ltd, New Delhi
2. Solid state physics by R.L. Synghal Kedar Nath Ram Nath & Co, Meerut
3. Ceramic Processing and Sintering by M.N. Rahaman, Second Edition, Marcel Dekkar Inc, New York
4. Material science by Vijaya and Rangarajan,Tata McGraw Hill Publishing Company Ltd., New Delhi
5. Principles and Applications of Ferro electrics and Related Materials by M.E. Lines and A.M. Glass, Clarendon Press 1977, Oxford
6. Physics of Ferro electrics Modern Perspective by Rabe, Ahn, Jean Marc Triscon, Springer Series, 2007

Soft Magnetic Materials

(Pre-Ph.D Course-1)

Unit I Magnetic orders

Magnetism in solid state: Spin of electrons, Hund's rules, magnetism of 3d transition metals and alloys; Magnetic interactions: Direct and Indirect Exchange interactions; Collective Magnetism: ferro, antiferro, ferri, helical order and spin glass; Magnetic Anisotropy; magnetostriction; Crystal field effects, ligand fields, Transition metal ions- Jahn- Teller effect, Quenchingof the orbital angular momentum.

Unit II: Ferrimagnetic Materials

Introduction to ferrimagnetism, Classes of Crystal Structures in Ferrites, Hexagonal Ferrites, Magnetic Rare Earth Garnets, Intrinsic and Extrinsic Properties of Ferrites, Mixed Ferrites for Property Optimization, Temperature Dependence of Initial Permeability, Time Dependence—Initial Permeability (Disaccomodation), Chemistry Dependence—Low Field Losses (Loss Factor), Chemistry Considerations for Hard Ferrites, Saturation Induction—Microwave Ferrites and Garnets, Ferrites for Memory and Recording Applications.

Unit III: Dilute Magnetic Semiconductors

Band Structure of II–VI and III–V DMS; Exchange Interactions in DMS: s–d Exchange Interaction, p–d Exchange Interaction, d–d Exchange Interactions-Super exchange, Double Exchange, RKKY; Magnetic Properties- Paramagnetism, Carrier-Induced Ferromagnetism.

Unit IV: Nanomagnetism

Introduction to Magnetic properties of nanoparticles, reduction in magnetization with particle size, surface magnetism, shape and size effects on magnetic anisotropy, single domain particles, Spin reversal in uniaxial magnetic nanoparticles, superparamagnetism, blocking temperature, magnetism in thin films.

Unit V: Multiferroics

Magnetoelectric materials, magnetoelectric coupling, Multiferoics, Type-1 and Type-2 multiferroics, Approaches to the coexistence of ferroelectricity and magnetism, Independent

systems, Ferroelectricity induced by lone-pair electrons, Geometric ferroelectricity in hexagonal manganites, Spiral spin-order-induced multiferroicity, magnetoelectric coupling.

References:

1. Fundamentals of Magnetism, Mathias Getzlaff Springer-Verlag Berlin Heidelberg 2008
2. Modern Ferrite Technology 2nd Ed., Alex Goldman (2006) Springer New York, NY
3. Cibert, J., Scalbert, D. (2008). Diluted Magnetic Semiconductors: Basic Physics and Optical Properties. In: Dyakonov, M.I. (eds) Spin Physics in Semiconductors. Springer Series in Solid-State Sciences, vol 157. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-540-78820-1_13
4. "Chapter 4 Diluted magnetic semiconductors" J. Kossut, W. Dobrowolski, Handbook of Magnetic Materials, Elsevier, Volume 7 (1993) 231-305
5. Nanoparticle magnetism, Georgia C. Papaefthymiou, Nano Today, 4 (2009) 438-447
6. Majetich, S. A., and M. Sachan. "Magnetostatic interactions in magnetic nanoparticle assemblies: energy, time and length scales." Journal of Physics D: Applied Physics 39.21 (2006): R407.
7. Nanomagnetism- Ultrathin Films, Multilayers and Nanostructures (2006) Editors: D.L. Mills, J.A.C. Bland Elsevier Science
8. Multiferroicity: the coupling between magnetic and polarization orders, K. F. Wang, J.-M. Liu and Z. F. Ren, Advances in Physics, 58, No. 4, 321–448, 2009
9. Multiferroic Materials - Properties, Techniques, and Applications Edited ByJunling Wang 1st Edition(2016) CRC Press USA

Applied Spectroscopy

(Pre-Ph.D Course-1)

UNIT I: Molecular Spectroscopy

Introduction – Rotational structure of electronic bands of diatomic molecules – Fortrat diagram – General relations – Combination relations for $^1\Sigma$ - $^1\Sigma$ and $^1\Sigma$ – $^1\pi$ bands – Evaluation of rotational constants with reference to above transition. Isotope effect in electronic spectra of diatomic molecules – Vibrational effect and rotational effect. Potential energy curves and dissociation energy and pre-dissociation energy. Vibrations of polyatomic molecules: CO_2 and H_2O).

UNIT II: Raman Spectroscopy

Introduction – Theory of Raman Scattering – Rotational Raman Spectra – Vibrational Raman Spectra – Mutual Exclusion Principle – Laser Raman Spectroscopy – Polarization of Raman Scattered Light – Single Crystal Raman Spectra

UNIT III: Fourier Transformation

Raman Investigation of Phase Transitions – Resonance Raman Scattering – Structure Determination using FTIR and Raman Spectroscopy. Fourier Transform (FT) Raman Spectroscopy and its additional advantages over the conventional Raman Spectroscopy, Surface enhanced Raman Scattering-Coherent Anti-Stokes Raman Spectroscopy.

UNIT IV: Spectrophotometry

Introduction – Beer's law – Absorptivity – UV and visible absorption – Instrumentation – Essential parts of spectrophotometer – Gratings and prisms – Radiant energy sources – Filters – Photosensitive detectors – Barrier layer cells – Photo emissive cells – Photomultiplier tubes IR spectrophotometry – Fourier Transform Infrared (FTIR) Spectrometer – Molecular structure – Qualitative and Quantitative analysis – The most sensitive lines of the elements – Method of identifying elements – Microphotometer

UNIT V: Phosphorescence Spectroscopy and High Resolution Spectroscopy

Introduction – Normal and Resonance Fluorescence – Intensities of Transitions – Nonradioactive decay of fluorescent molecules – Phosphorescence and the nature of the triplet state – Population of the triplet state – Delayed Fluorescence – Excitation spectra – Experimental methods

High Resolution Spectroscopy: Introduction – Light detectors – Single photon counting technique – Phase sensitive detectors – Laser optogalvanic spectroscopy –Laser cooling and its applications

References:

1. Molecular spectra and Molecular structure Volume I by G. Herzberg (2nd Edition, Van. Nostrand London)
2. Fundamentals of Molecular Spectroscopy by C.N. Banwell (Tata Mc Graw-Hill Publishing Company Ltd, 1983)
3. Spectroscopy by Straughan and Walker (volume 2 and Volume 3, John Wiley and Sons, 1976)
4. Molecular Structure and Spectroscopy by G. Aruldhas (Printice-Hall of India, Pvt. Ltd., 2001
5. Instrumental Methods of Analysis by Willard, Merritt, Dean and Settle (CBS Publishers, New Delhi,(2001)
6. High Resolution Spectroscopy by J.M. Hollas, Wiley, 2nd edition, 1998.
7. Fundamentals of Molecular Spectroscopy by C.N. Banwell (Tata Mc Graw-Hill Publishing Company, New Delhi, 1983)

Physical Characterization Techniques of Materials

(Pre-Ph.D Course-2)

UNIT I: Materials processing

Conventional ceramic method, ball-milling, PVD, RF sputtering, sol-gel, chemical co precipitation, auto-combustion. Heat treatment: calcination, green body density, sintering, annealing, bulk density and porosity.

UNIT II: Diffraction and Imaging

X-ray diffraction- Bragg's law, powder X • ray diffractometer • construction and working, crystalline phase analysis, fundamentals of transmission electron microscopy and scanning electron microscopy, study of crystal structure using TEM, study of microstructure using SEM • scanning electron microscopy with EDS • construction and working, grain size and chemical analysis.

UNIT III: Molecular Spectroscopy

Fundamentals of IR, Raman, Uv-Vs, XPS and Photoluminescence, Techniques for measuring

IR spectra, Raman spectra, Uv-Vs spectra, XPS spectra and Photoluminescence spectra.

UNITIV: Transport Properties

Measurement of DC and AC conductivity, Impedance Spectroscopy- Impedance-Related Functions, Measurement Systems-Impedance Analysers, Measurement of Magnetoresistance, measurement of Hall effect, measurement of thermoelectric power.

UNIT V: Magnetic and Dielectric measurements

Magnetic resonance methods - Electron spin resonance- A simple EPR spectrometer; Vibrational Sample Magnetometer-Hysteresis and Related Properties; Magnetostriction measurement; SQUID magnetometry; P-E hysteresis measurements- Hysteresis and Related Properties; measuring d33.

Textbooks:

1. Materials Characterization Techniques, Sam Zhang, Lin Li, Ashok Kumar, 92008) CRCpress

2. "Impedance Spectroscopy Theory, Experiment, and applications", 2ndEdited by Evgenij Barsoukov, J.Ross Macdonald, (2005) John Eiley & Sons.

3. "Ceramic Processing and Sintering", by Mohamed N. Rahaman, (2003) CRC Press

Reference Books:

1. "Electron paramagnetic resonance: elementary theory and practical applications"2ndJohn A. Weil, James R. Bolton (2007) John Wiley & Sons.

2. "Handbook of Nanophase and Nanostructured Materials: Volume I: Synthesis" by Z.L. Wang, Yi Liu, Ze Zhang (2002) Springer.

3. Measuring Piezoelectric d33 coefficients using the Direct Method by Mark Stewart, Will Battrick & Markys Cain http://eprintspublications.npl.co.uk/2768/1/mgpg44.pdf

4. "An overview of magnetostriction, its use and methods to measure these properties" N.B. Ekreem, A.G. Olabi, T. Prescott, A. Rafferty, M.S.J. Hashmi, Journal of Material Processing Technology, 191 (2007) 96-101. https://doi.org/10.1016/j.jmatprotec.2007.03.064

5. Vibrating Sample Magnetometer https://tinyurl.com/VSMinstrument

6. Ferroelectric Hysteresis Measurement & Analysis, M. Stewart, M. G. Cain, and D. A. Hall (1999) National Physical Laboratory, UKhttps://tinyurl.com/PEhysteresis

Nanomaterials: Instruments and Applications

(Pre-Ph.D Course-2)

Unit I: Nanoelectronics

Fabrication of Integrated Circuits, substances deposited for integrated circuits – polysillicon, silicon dioxide, metals, Microelectromechanical Systems(MEMS) – materials in MEMS technology, MEMS processes – deposition, pholollithography, wet and dry etching, Applications of MEMS.

Unit II: Nanoelectromechanical Systems (NEMS)

Nanowires- Production of nanowires, conductivity of nanowires, Nanocircuits – Production of nanocircuits, applications of nanocircuits, Quantum Wires – CNTs as quantum wires, Quantum Wells –fabrication of quantum wells, Applications of quantum wells

Unit III: Molecular Nanotechnology

Smart materials and Nano sensors, manufactories, self replacing machines, types of molecular machines – synthetic, biological and theoretical machines, Nanorobotics – theory, Nubots, applications, DNA nanotubes, DNA Polyhedra, DNA nanomechanical devices, potential social impacts of molecular nanotechnology.

Unit IV: Analytical instruments

Atomic Force Microscope(AFM) – Principle, imaging modes, tapping modes and applications, Scanning tunnelling microscope(STM) – tunnelling, working; STM related techniques; Electron beam lithography, ion beam sculpting.

Unit V: Nano medicine

Drug delivery, nano particles as controlled drug delivery devices, Surgery, Nano particle targeting, nano Robols, cell repair machines, Insulin loaded Nano capsules, Nano bio technology and applications.

Reference Books:

1. Nanotechnology by William lllsey Atkinson, Jaico Books.
2. Principles of Nanotechnology by Phani Kumar
3. Nanotechnology by Ratner and Ratner
4. Wondrous world of Carbon Nanotubes by M. Daenen and R.D. de Fouw

Nuclear Radiation Detectors and Accelerators

(Pre-Ph.D Course-2)

Unit I: Interaction of Radiation with Matter

Interaction of photons with matter, Photo-electric effect, Compton scattering, Rayleigh scattering, Pair production, Attenuation coefficients, Interaction of charged particles with matter – Energy loss of charged particles, Bremsstrahlung, Cherenkov radiation, Interaction of neutrons with matter

Unit II: Properties of Radiation Detectors

Modes of detector operation, detector sensitivity, detector response, pulse-height spectra, Energy resolution, detection efficiency, dead time, methods for measuring detector dead time

Unit III: Nuclear Radiation Detectors

Gas detectors -Geiger-Muller counters, Alpha/Beta counters, Scintillation detectors – Basic principle, photo multiplier tubes and photodiodes, Solid state detector –Germanium detectors [HPGe], Lithium drifted Silicon detectors [Si (Li)]

Unit IV: Experimental Nuclear Physics Techniques

Gamma ray spectroscopy with hyper pure germanium detectors, Charged particle spectroscopy for particle identification, Neutron detection and energy measurement, Neutron-gamma energy discrimination.

Unit V: Particle Accelerators

Introduction, Production of charged particles using particle accelerators - Cockcroft-Walton accelerator, Van de Graff accelerator, Tandem Van de Graff accelerator, linear accelerator (LINAC), Cyclotron, Synchrotron

References

1. Radiation detection and measurement, Glenn F. Knoll, John Wiley & Sons. Inc.

2. Techniques for nuclear and particle physics experiments, W. R. Leo, Springer Berlin, Heidelberg
3. Accelerator Physics, S. Y. Lee, World Scientific
4. Particle Accelerator Physics, H. Wiedemann
5. Experimental Techniques in High-energy Nuclear and Particle Physics, edited by Thoma Ferbel

Radiation Protection and Dosimetry

(Pre-Ph.D Course-2)

UNIT I Radiations and Dosimeter

Basic Concepts of Radiation and Dosimetric Units: Radiation & need for its measurements, physical features of radiations, conventional sources of radiation, tissue equivalent materials, radiation dose, Definition of dose quantities :- Fluence, kerma, exposure, absorbed dose, Dose equivalent, Quality factor Q, effective dose equivalent, determination of dose equivalent, Radiation quality

UNIT II: Radiation Physics Applications

Archaeological applications: Carbon dating; limitations and accuracy. Industrial Applications: Smoke detection, blockage/leakage detection of buried pipelines, thickness gauge, nondestructive testing. Agricultural Applications: benefits of radiation processing of food items, sterilization. Medical Applications: sterilization of medical equipment's, diagnosis and radiotherapy: in-vivo and in-vitro. Space Exploration: nuclear batteries/RTG. Practical applications and some simple numerical problems.

UNIT III Measurement of Radiation Dose

Measurement of Radiation Dose: Thermo-luminescent dosimetry (TLD):- Theoretical aspects of thermos-luminescence, Characteristics of TL dosimeters, commercial TLD dosimeters, - LiF, $Li_2B_4O_7$, $CaSO_4$, $MgB4O_7$.,TLD instrumentations, Applications of TLD. An introduction to Photoluminescence (PL), Solid state Nuclear Track dosimetry, Internal dosimetry, External dosimetry.

UNIT IV Radiation Effects & Protection:

Effects of radiations exposure, Biological effects of radiation, acute and delayed effects, stochastic and non-stochastic effects, Dose response characteristics, Relative Biological Effectiveness (RBE). History of radiation protection standards, current limits of radiation exposure, protective barriers for radiation sources, protection for sealed sources, radiation surveys, personal monitoring.

Permissible dose to occupational and non-occupational workers, safe handling of radioactive materials. ALARA, ALI and MIRD concepts, Radiation waste and its disposal.

UNIT V: Safety in Nuclear Medicine

Performance check of radiation measuring and monitoring instruments, work place and environmental(stack) monitoring, Permissible radiation limits for controlled and supervised area, Contamination limits, Radiation protection survey and contamination checks, Air-borne contamination, estimation of gases effluent discharge, dose apportionment and dose budgeting. Radiological safety aspects during servicing and maintenance. Unusual occurrences and its handling procedures: Failure of cooling system, target foil ruptured, spillage, power failure, excessive exposure, personnel contamination; Protective and Emergency equipment requirements in medical cyclotron facility.

Text Books:

1. G.F. Knoll, 'Radiation Detection and Measurement', 3rd Edn., John Wiley & Sons Inc., 2000
2. Physics for Radiation Protection: A Handbook, James E. MartinWiley online library,2006.
3. Atoms, Radiation and Radiation Protection, James E. Turner Wiley-VCH 2007.
4. Radiation Protection in health sciences, Marilyn E. Noz and Gerald Q. Maguire Jr. World Scientific 2007.
5. Jeffry A. Siegel, Radiation Safety in Nuclear Medicine. 2nd Edition, Elsevier, 2007
6. Michael G.Stabin, Radiation Protection and Dosimetry – An Introduction to Health Physics, Springer, 1st Edition, 2007.

Thin Films: Characterization Techniques and Properties

(Pre-Ph.D Course-2)

UNIT I: X-ray and Electron microscopy techniques

X-ray Diffractometer (XRD), Wide angle X-ray Scattering(WAXS), X-ray photoelectron spectroscopy (XPS).

Electron microscopic techniques

Scanning Electron Microscopy (SEM), Atomic Force Microscopy (AFM), Scanning probe microscopy (SPM), Transmission Electron Microscopy (TEM).

UNIT II: Spectroscopic techniques

UV-VIS-NIR spectroscopy, Photoluminescence and Raman spectroscopy; Energy dispersive spectroscopy, and Rutherford Backscattering Spectrometry (RBS), Spectroscopic Ellipsometer

UNIT III: Electrical characteristics

Electrical resistivity-Four probe method, I-V and C-V characteristics, Theories of conduction in discontinuous films, Electronic conduction in thin insulating films, Transport phenomenon in semiconducting and dielectric thin films, Thermoelectric properties of thin films.

UNIT IV: Optical properties

Reflection, refraction and transmission in thin films, Optical constants -Optical band gap-spectroscopic ellipsometer measurements

UNIT V: Dielectric properties

Dielectric polarizations - Frequency and temperature dependent of dielectric properties (dielectric constant, loss factor and capacitance), Ac conductivity, Experimental techniques for dielectric films.

Text Books:

1. Yan, g Leng, Materials Characterization: Introduction to Microscopic and Spectroscopic Methods, John Wiley & Sons (Asia) Pte Ltd, 2008.

2. K. L. Chopra,Thin Film Phenomena, Mc Grow-Hill Book Company, New-York, USA, 1969.

3. A. Goswami, Thin film fundamentals , New Age International Pub., New Delhi, 2003.

4. L.I. Maissel and R. Glang, Hand Book of Thin Film Technology, McGraw Hill Inc. New York, 1970.

5. M. Ohring, Materials Science of Thin Films, 2nd ed., Academic Press, San Diego, New York, Boston, London, 2002.

Advances in Ferroelectric Materials – II

(Pre-Ph.D Course-2)

Unit I: Ferroelectric Materials

General Classification of Ferroelectric Materials: Corner Sharing Octahedra, Tetrahedral Oxygen Groups, Hydrogen Bonded Compounds and polymers, properties and Characteristics of some Important Ferroelectric Materials: The Ferroelectric perovskites – Barium Titanate, Lead Titanate, Sodium Niobate, Lithium Niobate, Antiferroelectric and cell Doubling pervoskites – Lead Zirconate, Lead Zirconate Titanate, Tungsten Bronze Type Structures – Strontium Barium Niobate, Barium Sodium Niobate, other Ferroelectrics-Magnetic Ferroelectrics, Electronic Ferroelectrics and Non Bulk Ferroelectrics, Multiferroics – $BiFeO_3$ and $YMnO_3$ (3&4)

Unit II: Fabrication of Ceramic Materials

Powder Preparation by Mechanical Methods: Solids State Reaction (Stoichiometry, Calcination, Sintering etc.) – Ball Milling, Hardness, Considerations, Types of Hardness, Density and Hardness, Normalized Density, Knoop Hardness and Normalized Density, Powder preparation by Chemical Methods – Sol Gel Processing : Preparation Techniques, Thin Film Growth of Complex Oxides: Vacuum Chamber, Temperature Control and Monitoring, Pulsed Laser Deposition – Laser, Targets, Ablation Process and Film Growth using PLD, Sputter Deposition – Sputtering Process, The Sputtering of Insulators, Process Gas, Oxide Molecular Beam Epitaxy – Hardware, RHEED, Fundamentals of Growth (1,2 &3)

Unit III: Structure and Microstructure Characterization

X-Ray Diffraction : Experimental Methods – Laue Method (Introduction, Cameras, Specimen Holders, Collimators and Shapes of Laue Spots), Debye Scherre Method (Specimen Preparation and Film Loading) Grain Size, Particle Size, Preliminary Treatment of Data, Indexing Patterns of Cubic Crystals, Indexing Patterns of Non Cubic Crystals – Graphical Methods, Indexing Patterns of Non Cubic Crystals – Analytical Methods, Determination of Number of Atoms in a Unit Cell, Determination of Atom Positions, Microstructure Determination Techniques – Scanning Electron Microscopy, Scanning Tunnelling Microscopy and Transmission Electron Microscopy (5)

Unit IV: Other characterization Techniques

Small Signal Dielectric Measurements, Pyroelectric Measurements – Voltage Responsivity, Current Responsivity and Normalized Detectivity, Experimental Constraints, Measurement of Piezoelectric Coefficients – Experimental Techniques (Berlin Court D-33 Meter etc.), Hysteresis Measurement, Experimental Techniques for DC Resistivity Measurement- Two Probe Method and Four Probe Method, Determination of Chemical Composition – Optical Atomic Spectroscopy and X-Ray Fluorescence Spectroscopy, Thermal Analysis – Differential Thermal Analysis and Differential Scanning Calorimetry (2&4)

Unit V: Application of Ferroelectrics

Sensors, Ultrasonic Cleaners, Flow Detectors, High Voltage Generators, Electromechanical Transducers, Actuators, Optical Information Storage Devices, Underwater Acoustics, Heterodyne Detection, Pyroelectric Imaging, Ferroelectric Memory Technology – Electrically Read Memories, Optically Read Memories, High Capacity Memories, Electro – Optic Modulators, Travelling Wave Modulators, Potential Future Applications (Ferroelectric Nano Structures, Field Effect Devices, Ferroelectric Device Fabrication using Atomic Force Microscopy, Ferroelectric Cooling Devices) (4)

References

1. Some Fundamentals of Mineralogy and Geochemistry by L. Bruce Railsback
2. Ceramic Processing and Sintering by M.N. Rahaman, Second Edition, Marcel Dekker Inc. New York.
3. Physics of Ferroelectrics - Modern Perspective by Rabe, Ahn , Jean Marc Triscon, Springer Series, 2007
4. Principles and Applications of Ferroelectrics and Related Materials by M.E. Lines and A.M. Glass, Clarendon Press 1977, Oxford.
5. X-Ray Diffraction by B. D. Cullity, Adison Wesley Publishing Company, Inc. 1956, Masachusetts.

Material Characterization Techniques

(Pre-Ph.D Course-2)

UNIT-I: Magnetic Measurements:

Magnetometry: Vibrating Sample Magnetometery, Thermomagnetic Analysis, Superconducting quantum interference device (SQUID), Spintronic measurements.

UNIT-II: X-Ray Techniques

XAFS and XANES Spectroscopy, X-Ray Magnetic Circular Dichroism, Single crystal and powder x-ray diffraction, X-Ray Diffraction Techniques for Liquid Surfaces and Monomolecular Layers, Small-angle X-ray scattering (SAXS). Inelastic x-ray scattering, Synchrotron radiation sources: advantages and special features of synchrotron radiation.

UNIT III: Neutron Scattering Techniques

Neutron Powder Diffraction, Single-Crystal Neutron Diffraction, Magnetic Neutron Scattering, Small-angle neutron scattering (SANS), Phonon and dynamics studies by inelastic and quasi elastic neutron scattering. Neutron reflectometry for thin films.

UNIT IV: Microscopy

Optical, polarizing and confocal microscopy, Scanning Electron Microscopy (SEM) and Transmission electron microscopy (TEM). Elemental analysis by Energy dispersive and wavelength dispersive X-ray analysis. Sample preparation for TEM by ion milling and shadow techniques. AFM and STM: Basic principles and different modes of operation. Magnetic Force Microscopy (MFM).

UNIT V: Thermal Analysis

Thermogravimetric analysis (TGA), Differential thermal analysis (DTA), Differential scanning calorimetry (DSC), Pressurized TGA (PTGA), Thermo mechanical analysis (TMA), Dilatometry (DIL), Evolved gas analysis (EGA)

Text Books:

1. John Clarke and Alex I. Braginski, 'The SQUID Handbook: Fundamentals and Technology of SQUID and SQUID Systems', Wiley-VCH, 2004.
2. 'Solid State Magnetism', John Crangle, Edward Arnold – UK, 1991.
3. J. Daillant and A. Gilaud, 'X-ray and Neutron Reflectivity', Springer, 2009.
4. T.L. Alfard, L.C. Feldman and J.W. Mayer, 'Fundamentals of Nanoscale Film Analysis', Springer, 2007.
5. R. F. Egerton, 'Physical Principles of Electron Microscopy: An Introduction to TEM, SEM and AEM', Springer, 2005. 6. S. Zhang, L. Li and A. Kumar, 'Materials Characterization Techniques', CRC Press, 2009.

Spectroscopic Techniques

(Pre-Ph.D Course-2)

Unit-I: Raman Spectroscopy

Instrumentation, Basic Components of Raman system, Spectrometer and Detectors, Raman Spectroscopy of Solid and Liquids, Raman spectroscopy of Materials, Qualitative versus Quantitative Raman, Vibrational Analysis, Spectral Analysis by Group Theory, Character Table

Unit –II IR-Spectroscopy

Instrumentation, Basic Components, IR-sources, Spectrometer and Detectors, Infrared absorption spectroscopy, Fourier transformed infrared spectroscopy attenuated total Reflectance (ATR) spectroscopy, diffuse reflectance spectroscopy.

Unit-III Electronic Spectroscopy Techniques

Instrumentation, Basic Components, UV-Visible sources, spectrometer and detectors, UV-Vis spectroscopy, Absorption., Transmission, Reflection, Photoluminescence, spectroscopy, florescence and phosphorescence, circular dichroism

Unit-IV Advance Spectroscopy Techniques

Surface Enhanced Raman Spectroscopy, UV Resonance Raman Spectroscopy, Tera hertz Spectroscopy, Laser Induced Breakdown Spectroscopy (LIBS)

Unit –V Other Techniques

Particle Induced X-ray emission, Nuclear Magnetic Resonance (NMR) spectroscopy, Electron Spin Resonance (ESR) Spectroscopy

Text and Reference Books

1. Modern Spectroscopy, 4th Edition , J.Michael Hollas , Wiley
2. Chemical Application of Group Theory , 3rd Edition By F.Albert Cotton , Willey
3. Introduction to Molecular Spectroscopy : By Goron M.Barrow , Mc Grraw Hill New York

4. Handbook of Vibrational Spectroscopy , Vol0-I & II: By John M.Chalmers and Peter R.Griffiths, Wiley
5. Condensed Matter Optical Spectroscopy : An illustrated Introduction by Luhan Ionita , CRC Press
6. Handbook of Raman Spectroscopy : From the Research laboratory to the process line : By Lan R. Lewis , Howell Edwards .CRC Press
7. Infrared and Raman Spectroscopy of Biological Materials : By Hans Ulklrich Grelich , Bing Yan CRC Press
8. Terahertz Spectroscopy : Principles and Applications , By Susan L.Dexheimer , CRC Press
9. NMR and Chemistry : An Introduction to modern NMR Spectroscopy , Fourth Edition By J.W. Akitt , B.E Mann , CRC Press
10. Laser Spectroscopy : Basic Concepts and Instrumentation 2nd Edition By Wolfgang Demtroder Springs

MANAGEMENT STUDIES

Pre-Ph.D Course I and II Subjects and Syllabus

Pre-Ph.D Course I

1. Human Resource Management
2. Human Resource Development
3. Organisational Behaviour
4. Financial Management
5. Financial Risk Management
6. Marketing Management
7. Digital and Social Media Marketing
8. Green Marketing
9. Decision Support Systems
10. Innovation Technology Management

Pre-Ph.D Course II

1. Human Resource Metrics and Analytics
2. Innovation and Entrepreneurship
3. Financial Derivatives
4. Investment Analysis and Portfolio Management
5. Finance and Accounting for Small Business
6. Services Marketing
7. Enterprise Resource Planning
8. Data Mining and Machine Learning
9. Cyber Laws and Security
10. Big Data Analytics

Pre – Ph.D Course I

Human Resource Management

UNIT I: HRM: Significance - Definition and Functions – evolution of HRM- Principles - Ethical Aspects of HRM- Role of HRM - HR policies, Strategies to increase firm performance - Role and position of HR department - HRM at global perspective.

UNIT II: Investment perspectives of HRM: HR Planning - Recruitment and Selection, Tests and Interview Techniques - Training and Development – retention - Job Analysis. HRD concepts – mechanisms – MDPs.

UNIT III: Performance Evaluation: importance – methods – traditional and modern methods – Latest trends in performance appraisal - Career Development and Counseling- Compensation, Concepts and Principles- Influencing Factors- Current Trends in Compensation- Methods of Payments

UNIT IV: Salary and Wage Administration: Concept- Wage Structure- Wage and Salary Policies- Legal Frame Work- Determinants of Payment of Wages- Wage Differentials - Job design and Evaluation- - Incentive Payment Systems- Safety and welfare management- Nature and concepts – statutory and non-statutory welfare measures – incentive mechanisms – types of incentives. Safety at work – nature and importance – work hazards – safety mechanisms - Managing work place stress.

UNIT V: Managing Industrial Relations- Trade Unions-Employee Participation Schemes-Collective Bargaining-Managing Knowledge Work force –Grievances and disputes resolution mechanisms.

References

1. Muller_Camen. Croucher and Leigh: "***Human Resource Management- A Case Study Approach***", JAICO Publishing, Delhi.
2. Scott Snell and George Bohlander: "***Human Resource Management***", Cengage Learning, 2007.
3. Deepak Kumar Bhattacharya: "***Human Resource Management***", Excel Books, New Delhi.
4. S.Seetharaman, B.Venkateswara Prased: "***Human Resource Management***", SCITECH Publication (India) Limited, Hyderabad, 2007.
5. Gary Dessler, Biju Vrkkey: "***Human Resource Management***", Pearson Education, New Delhi, 2009
6. Uday Kumar Haldar: "***Human Resource Development***", Oxford University Press,New Delhi, 2009.
7. Iain Henderson: "***Human Resource Management***", Universities Press (India) Private Limited, Hyderabad, 2008.

Pre – Ph.D Course I

Human Resource Development

UNIT-I: Concept of HRD-objectives-Structure-Need-Scope- HRD in selected industrial organisationssignificance-HRD functions-Framework-Techniques-Attributes of a HRD manager.

UNIT – II: HRD Strategies:- An Overview - Strategies - Training and Development - Methods - Evaluation of training programmes. HRD Process Model: Methods of Implantation, Evaluation of HRD programmes. Identification of HRD needs and Design and development of HRD programmes.

UNIT – III: HRD interventions: Mentoring for employee development: Concepts of Mentoring-PerspectivesMentoring relationship-Outcomes of Mentoring programmes-Design and implementation of formal-mentoring programmes-Barriers to mentoring-Role of mentoring in development, understanding the role and responsibilities of mentor, mentee-Special issues in Mentoring.

UNIT – IV: Employee counselling for HRD: Overview of counselling programmes, employee assistance programme, stress management, employee wellness and health promotion. Career Planning, management, and development: Career development stages and activities, role of individual and organization in career planning, Issues in career management.

UNIT-V : The future of HRD and HRD Ethics: Research, practice and education of HRD for innovation and talent development and management, Role of HRD in developing ethical attitude and behaviour and development, Ethical problems with HRD roles. Applications of HRD: HRD Climate, HRD for managing organizational change, HRD for Workers (blue collar employees), HRD Audit.

References:

1. Arun Monappa; Personnel Management;
2. Rudrabasava Raj M.N. : Dynamic Personnel Administration Management of Human Resources;
3. Udai Pareek, Human Resource Development;
4. S. Ravishankar & R.K. Mishra (Ed). : Management of Human Resources in Public Enterprises;
5.Haribson F, Educational Planning and Human Resources Development, International Institute for Education, UNESCO, Paris;
6. Bell DJ, Planning Corporate' Manpower, Longman;
7. Walker James W'. Human Resource Planning, MGH.

Pre – Ph.D Course I

Organisational Behaviour

UNIT I: Introduction - Nature and scope – linkages with other social sciences - Individual Roles and Organizational Goals - Perspectives of Human Behavior, Approach to Organizational behavior - models of organizational behavior.

UNIT II: Perceptual Management**:** nature - Process – selection, organization and interpretation – Influencing factors -Motivation – Concepts - Needs and Motives and theories. Leadership and Motivating people - Leadership Theories. Attitudes and Values: formation - types – changes and behavior modification techniques.

UNIT III: Personality Development: Nature - Stages, Determinants of Personality, - Johari Window - Transactional Analysis, Learning Processes - theories, Creativity and Creative Thinking. Leadership – nature – skills.

UNIT IV: Decision Making Process**:** Behavioral Dimensions, Groups and their formation - Group Dynamics, Informal Organizations, Group versus Individual Interaction.

UNIT V: Inter-Personal Communication: Listening, Feedback, Collaborative Processes in Work Groups, Team Building, Team Decision Making, Conflict Resolution in Groups and Problem Solving Techniques. Organizations - Taxonomy, Elements of Structure, Determinants of Structure, Functional Aspects of Structure, Role Impingement, Stress in Organization. Principles Underlying the Design of Organizations, Organizational Culture, Power and Authority. Nature of OD - interventions, OD techniques and OD applications.

References

1 K.Aswathappa: "**Organizational Behavior-Text, Cases and Games**", Himalaya Publishing House, New Delhi, 2008,
2. Steven L McShane, Mary Ann Von Glinow, Radha R Sharma: "***Organizational Behavior***", Tata McGraw Hill Education, New Delhi, 2008.
3. Jerald Greenberg and Robert A Baron: "***Behavior in Organizations***", PHI Learning Private Limited, New Delhi, 2009.
4. Pareek Udai: "***Understanding Organizational Behavior***", Oxford University Press, New Delhi, 2007.
5. Jai B.P.Sinha: "***Culture and Organizational Behavior***", Sage Publication India Private Limted, New Delhi, 2008.
6. Sharma VS, Veluri: "***Organizational Behavior***", JAICO Publishing House, New Delhi, 2009.
7. Slocum,n Helireigel: "***Fundamentals of Organizational Behavior***", Cengage Learning India, New Delhi, 2009.

Pre – Ph.D Course II

Human Resource Metrics and Analytics

UNIT I: HR Metrics Overview--Concepts, Objectives-- Historical evolution of HR metrics.--Explain how and why metrics are used in an organization--Deciding what metrics are important to your business--HR metrics design principles--Approaches for designing HR metrics--The Inside-Out Approach--The Outside-In Approach-- Align HR metrics with business strategy, goals and objectives--Link HR to the strategy map.

UNIT II: Creating levels of metrics measures—HR Effeciency measures—HR Effectiveness measures-- HR value / impact measures. Building HR functions metrics-- Workforce Planning Metrics-- Recruitment Metrics --Training & Development Metrics-- Compensation & Benefits Metrics -- Employee relations & Retention Metrics

UNIT III: HR Analytics Overview -- What HR Analytics. -- Importance of HR Analytics. --Translating HR metrics results into actionable business decisions for upper management (Using Excel Application exercises, HR dashboards)-- HR information systems and data sources-- HR Metrics and HR Analytics-- Intuition versus analytical thinking-- HRMS/HRIS and data sources--Analytics frameworks like LAMP-- HCM:21(r) Model.

UNIT IV: Diversity Analysis-- Equality, diversity and inclusion, measuring diversity and inclusion, Testing the impact of diversity, Workforce segmentation and search for critical job roles.. Recruitment and Selection Analytics--Evaluating Reliability and validity of selection models, Finding out selection bias.Predicting the performance and turnover. Performance Analysis-- Predicting employee performance, Training requirements, evaluating training and development.

UNIT V: Optimizing selection and promotion decisions. Monitoring impact of Interventions--Tracking impact interventions-- Evaluating stress levels and value-change-- Formulating evidence based practices and responsible investment-- Evaluation mediation process, moderation and interaction analysis.

References

1. Edwards Martin R, Edwards Kirsten (2016),―Predictive HR Analytics: Mastering the HR Metric‖,Kogan Page Publishers, ISBN-0749473924
2. Fitz-enz Jac (2010), ―The new HR analytics: predicting the economic value of your company‘s human capital investments‖, AMACOM, ISBN-13: 978-0-8144-1643-3
3. Fitz-enz Jac, Mattox II John (2014), ―Predictive Analytics for Human Resources‖, Wiley, ISBN- 1118940709
4. Bernard Marr(2018), Data Driven HR:How to use Analytics and metrics to data driven performance,Kindle Edition.
5. John Sullivan(2003)HR Metrics The World Class Way, Kennedy Information ISBN 978-193207901

Pre – Ph.D Course II

Innovation and Entrepreneurship

UNIT I Entrepreneurship: Definition of Entrepreneur, Entrepreneurial motivation and barriers; Internal and external factors; Types of entrepreneurs; Theories of entrepreneurship; Classification of entrepreneurship. Creativity and Innovation: Creative Problems Solving, Creative Thinking, Lateral Thinking, Views of De Bono, Khandwalaand others, Creative Performance in terms of motivation and skills.

UNIT II Creativity and Entrepreneurial Plan: Idea Generation, Screening and Project Identification, Creative Performance, Feasibility Analysis: Economic, Marketing, Financial and Technical; Project Planning, Evaluation, Monitoring and Control, segmentation, Targeting and positioning of Product, Role of SIDBI in Project Management.

UNIT III Operation problems: Incubation and Take-off, Problems encountered Structural, Financial and Managerial Problems, Types of Uncertainty. Institutional support for new ventures: Supporting organizations; Incentives and facilities; Financial Institutions and Small-scale Industries, Govt. Policies for SSIs.

UNIT IV Family and non-family entrepreneurs: Role of Professionals, Professionalism vs. family entrepreneurs, Role of Woman entrepreneur, Sick industries, Reasons for Sickness, Remedies for Sickness, Role of BIFR in revival, Bank Syndications.

Unit V Introduction to Innovation management, Managing Innovation within Firms, Business strategy & organization Knowledge, New Product Strategy & Managing New Product Development, Role of Technology in Management of innovation, Managing for Intellectual Property Right.

References:

1) Couger, C-Creativity and Innovation (IPP, 1999)
2) Nina Jacob, -Creativity in Organisations (Wheeler, 1998)
3) Jonne&Ceserani-Innovation & Creativity(Crest) 2001.
4) BridgeSetal-Understanding Enterprise: Entrepreneurship and Small Business (Palgrave,2003)
5) Holt-Entrepreneurship: New Venture Creation (Prentice-Hall) 1998.
6) Singh P&Bhanderkar A-Winning the Corporate Olympiad:TheRenaissan cearadigm(Vikas)
7) Dollinger M J-Entrepreneurship (Prentice-Hall, 1999).
8) Tushman, M.L. & Lawrence, P.R. (1997)-Managing Strategic Innovation & Change Oxford .
9) Jones T. (2003)-Innovating at the Edge: How Organizations Evolve and Embed Innovation Capability.Butterwork Heinemann, U. K.
10) Amidon, D. M.(1997)-Innovation Strategy for the Knowledge Economy:The Kanawakening. Butterwork-Heinemann, New Delhi, India.

Pre – Ph.D Course I

Financial Management

UNIT I: The Finance Function – Objective: Profit or Wealth Maximization and EPS Maximization, An overview of Managerial Finance functions- Time value of money. present value, future value of money and the basic valuation models.

UNIT II: Investment decisions**:** Nature of Capital Budgeting decisions - techniques of capital budgeting: Pay back method, Average rate of return and Time-Adjusted methods: IRR and NPV, profitability index, and excess present value index. Advanced problems and cases in capital budgeting.

UNIT III: Cost of Capital: Concept and measurement of cost of capital, Debt vs.Equity, cost of equity, preference shares, equity capital and retained earnings, weighted average cost of capital and marginal cost of capital. Importance of cost of capital in capital budgeting decisions. Capital structure Decisions: Capital structure vs financial structure - Capitalisation, financial leverage, operating leverage and composite leverage. EBIT-EPS Analysis, Indifference Point/Break even analysis of financial leverage, Capital structure theories –The Modigliani Miller Theory –A critical appraisal.

UNIT IV: Dividend Decisions: Dividends and value of the firm - Relevance of dividends, the MM hypothesis, Factors determining Dividend Policy-dividends and valuation of the firm-the basic models. Declaration and payment of dividends. Bonus shares. Rights issue, share-splits, Walter Model and Gordon Model.

UNIT V: Liquidity Decision: Working Capital Management, components of working capital, gross vs. net working capital, determinants of working capital needs, the operating cycle approach. Planning of working capital, Financing of working capital through Bank finance and Trade Credit. Basic strategies for cash management, cash budget, cash management techniques/processes. Marketable securities.

References

1. Brigham and Ehrdhart: "***Financial Management Text and Cases***", Cengage Learning, New Delhi.
2. I.M Pandey: "***Financial Management***", 9/e, Vikas Publishing, 2004
3. M.Y Khan, P K Jain: "***Financial Management-Text and Problems***", Tata McGraw Hill, New Delhi. 2003
4. James C.VanHorne: "***Financial Management and Policy***", Pearson Education, 2004
5. Srivatsav, RM: "***Financial Management***", Himalaya Publishing House, Mumbai.
6. Chakraborty, Bhattacharya, Rao and Sen: "***Financial Management and Control***", Macmillan India Limited, 2003
7. John J. Hampton: "**Financial Decision Making-Concepts, Problems and Cases"**, Prentice Hall .2003

Pre – Ph.D Course I

Financial Risk Management

Unit – I: Introduction The concept of Risk, Nature, Need and scope of risk. Source, measurement, identification and evaluation of Risk. Types of risk–Product market risk and capital market risk. Possible Risk events, Risk Indicators, Risk Management Process–prerequisites and fundamentals. Misconceptions of Risk. An integrated approach to Corporate Risk Management. Risk management approaches and methods. A comprehensive view of Risk in Financial Institutions. Risk reporting process–internal and external.

Unit – II: Measurement and Management of Risk: Value at risk (VaR): The concept, computation, stresses testing, back testing. Cash flow at risk (CaR): VaR and CaR to make investment decisions. Managing risk when risk is measured by VaR or CaR Non-Insurance methods of Risk Management-Risk Avoidance, Loss Control, Risk Retention and Risk Transfer. Asset-Liability Management (ALM): evolution & concept, RBI guidelines. Capital Adequacy. Management of interest rate risk, liquidity risk, credit risk and exchange rate risk.

Unit – III: Techniques and Tools of Risk Management: Forward contracts and Futures contracts The concept of Derivatives and types of Derivatives. The role of Derivative securities to manage risk and to exploit opportunities to enhance returns. Individuals, speculators, hedgers, arbitrageurs and other participants in Derivatives Market. Forward contracts: Definition, features and pay-off profile of Forward contract. Valuation of forward contracts. Forward Contracts to manage Commodity price risk, Interest rate risk and exchange rate risk. Limitations of Forward contract. Futures contracts: Definition. Clearing house, margin requirements, marking to the market. Basis and convergence of future price to spot price. Valuation of Futures contract. Differences between forward contracts and futures contracts. Risk management with Futures contracts–the hedge ratio and the portfolio approach to a risk–minimizing hedge.

Unit – IV: Techniques and Tools of Risk Management: SWAPS Definition, types of swaps. Interest rate swaps, Currency swaps. Interest rate Swaps: Mechanics of Interest rate swaps .Using Interest rate Swaps to lower borrowing costs, hedge against risk of rising and falling interest rates. Valuation of interest rate Swaps. Pricing of Interest rate swaps at origination and valuing of Interest rate swaps after origination. Currency Swaps: Types of Currency Swaps. Valuation of currency swaps. Using Currency Swaps to lower borrowing costs in foreign country, to hedge against risk of a decline in Revenue, to hedge against risk of an increase in Cost, to hedge against risk of a decline in the value of an asset, to hedge against risk of a rise in the value of a liability. Pricing of currency swap at origination and valuing of currency swap after origination.

Unit – V: Techniques and Tools of Risk Management: Options Definition of an option. Types of options: call option, put option, American option and European option. Options in the money, at the money and out of the money. Option premium, intrinsic value and time value of options. Pricing of call and put options at expiration and before expiration. Options on stock indices and

currencies. The Binominal option pricing model (BOPM): assumptions - single and two period models. The Black & Scholes option pricing model (BSOPM): assumptions.

References:

1. Dun and Bradstreet, ―Financial Risk Management‖, 2007, TMH, Delhi.
2. Paul Hopkins, Kogan Page, ―Fundamentals of Risk Management‖, 2010, Institute of Risk Management.
3. Ravi Kumar, ―Asset Liability Management‖, Vision Books Pvt. Ltd.
4. David. A. Dubofsky & Thomas. W. Miller, Jr., ―Derivatives Valuation and Risk Management‖, 2003, Oxford University Press.
5. Jean-Philippe Bouchaud and Mark Potters, ―Theory of Financial Risk and Derivative Pricing‖, 2009, 2nd Ed. Cambridge press
6. John C. Hull & Sankarshan Basu, ―Options, Futures and Other Derivatives‖, 7th Ed, Pearson Education.
7. ―Theory and Practice of Treasury and Risk Management in Banks‖, Indian Institute of Banking and Finance, March 2006, Taxmann
8. Peter S. Rose & Sylvia C. Hudgins, ―Bank Management & Financial Services‖, 7th Ed, Tata McGraw-Hill
9. Rene. M. Stulz, ―Risk Management & Derivatives‖, 2003, Thomson Southwestern. 10. Jayanth Rama Varma, ―Derivatives and Risk Management‖, TMH.

Pre – Ph.D Course II Financial Derivatives

Unit - I: Introduction to Financial Derivatives – Meaning and Need – Growth of Financial Derivatives in India – Derivative Markets – Participants- Functions – Types of Derivatives – Forwards – Futures – Options-Swaps – The Regulatory Framework of Derivatives Trading in India.

Unit - II: Features of Futures –Differences Between Forwards and Futures – Financial Futures – Trading – Currency Futures – Interest Rate Futures – Pricing of Future Contracts- Value at Risk (VaR)-Hedging Strategies – Hedging with Stock Index Futures – Types of Members and Margining System in India – Futures Trading on BSE & NSE.

Unit - III: Options Market – Meaning & Need – Options Vs Futures -Types of Options Contracts – Call Options – Put Options- Trading Strategies Involving Options – Basic Option Positions – Margins – Options on Stock Indices – Option Markets in India on NSE and BSE.

Unit - IV: Option Pricing – Intrinsic Value and Time Value- Pricing at Expiration – Factors Affecting Options pricing- Put-Call Parity Pricing Relationship- Pricing Models - Introduction to Binominal Option Pricing Model – Black Scholes Option Pricing Model.

Unit – V: Swaps – Meaning – Overview – The Structure of Swaps – Interest Rate Swaps – Currency Swaps – Commodity Swaps – Swap Variant – Swap Dealer Role –Equity Swaps – Economic Functions of Swap Transactions - FRAs and Swaps.

References:

1. Hull C. John, ―Options, Futures and Other Derivatives‖, Pearson Educations Publishers,
2. David Thomas. W & Dubofsky Miller. Jr., Derivatives valuation and Risk Management, Oxford University, Indian Edition.
3. ND Vohra & BR Baghi, Futures and Options, Tata McGraw-Hill Publishing Company Ltd.
4. Red Head: Financial Derivatives: An Introduction to Futures, Forward, Options‖ Prentice Hall of India. 5. David A. Dubofsky, Thomas W. Miller, Jr.: Derivatives: Valuation and Risk Management, Oxford University Press.
6. Sunil K.Parameswaran, ―Futures Markets: Theory and Practice‖ Tata-McGraw-Hill Publishing Company Ltd.
7. D.C. Patwari, Financial Futures and Options, Jaico Publishing House.
8. T.V. Somanathan, Derivatives, Tata McGraw-Hill Publishing Company Ltd.
9. NSE Manual of Indian Futures & Options & www. Sebi.com
10. S.C. Gupta, Financial Derivatives: Theory, Concepts and Problems, Prentice Hall of India.

Pre – Ph.D Course II

Investment Analysis and Portfolio Management

Unit-I: Concept of Investment, Investment Vs Speculation, and Security Investment Vs Nonsecurity Forms of Investment-Investment Environment in India. Investment Process - Sources of Investment Information, Security Markets – Primary and Secondary – Types of securities in Indian Capital Market, Market Indices. Calculation of SENSEX and NIFTY.

Unit-II: Return and Risk – Meaning and Measurement of Security Returns. Meaning and Types of Security Risks: Systematic Vs Non-systematic Risk. Measurement of Total Risk - Intrinsic Value Approach to Valuation of Bonds - Preference Shares and Equity Shares.

Unit-III: Fundamental Analysis – Economy, Industry and Company Analysis, Technical Analysis – Concept and Tools and Techniques Analysis – Technical Analysis Vs Fundamental Analysis - Efficient Market Hypothesis; Concept and Forms of Market Efficiency.

Unit-IV: Elements of Portfolio Management, Portfolio Models – Markowitz Model, Efficient Frontier and Selection of Optimal Portfolio. Sharpe Single Index Model and Capital Asset Pricing Model, Arbitrage Pricing Theory.

Unit-V: Performance Evaluation of Portfolios; Sharpe Model – Jensen‘s Model for PF Evaluation, Evaluation of Mutual Fund.

References:

1. Fisher DE and Jordon RJ, Security Analysis and Portfolio Management,PHI, New Delhi
2. Ambika Prsasad Dash, Security Analysis and Portfolio Management,IK Int Pub House, New Delhi
3. Hirt and Block, Fundamentals of Investment Management, TataMcGrawHill, New Delhi
4. Reily Frank K, Investment Analysis and Portfolio Management,Cengage, New Delhi
5. Bodie,Kane,Marcus and Mohanty, Investments, TataMcGraw Hill, New Delhi
6. Peter Lynch, One Up on Wall Street, Simon & Schuster Paperbacks, New York
7. Sharppe W, Alexander,GJ., & Baily JV., Investments, TMH, New Delhi
8. Avadhani, VA, SAPM, Himalaya Publishers.
9. Bhalla, VK Investment Management, S.Chand., New Delhi
10. Preeti Singh, Investment Management, Himalaya Publishers. 11. Timothy Vick, How to Pick Stocks like Warren Buffett, TMH, New Delhi

Pre – Ph.D Course II

Finance and Accounting for Small Business

Unit - I Accounts - Accounting Process - Accounting Concepts & Conventions - Accounting equation - Basic Accounting Procedure - Single Entry System : an admixture - Double Entry System - Accounting Elements - Classification of Accounts - Golden Rules - Journal - Classification of Journal - Ledger : Principal Books of Accounts - Cash Book - Vouchers-The documents to the transactions - Trial Balance - Depreciation - Preparation of Final Accounts and Balance Sheet - Techniques of Preparation of Final Accounts -The Balance Sheet

Unit – II Finance: Understanding Balance Sheet – It‘s Use - Profit and Loss Account (P/L A/c) - Understanding Financial Statement - Ratio Analysis - Cash Flow Statements - Cash Budget - Working Capital : Determination & Calculation - Operating Cycle - Computation of Working Capital - Framework for Regulation of Bank Credit - Long-Term Source of Finance - Retained Earnings - Equity Capital / Equity Share - Debenture - Preference Shares.

Unit - III Costing: Introduction - Classification Cost - Use of Cost Data - Marginal Costing - Cost-Volume Profit Relationship - Mathematical Relationship between Cost-Volume Profit - Margin of Safety -BEP Analysis : Graphical Analysis - Use of Marginal costing in decision making- pricing decision, make or buy etc.

Unit - IV Taxation: Income Tax - Definitions - Residential Status - How to Compute Total Income - Profit and Gains of Business or Profession - Deduction Under Chapter VIA - Central Sales Tax Act, 1956 - Preliminary - Formulation of Principles for Determining when a Sale or Purchase of Goods Taken Place in the Course of Inter-state Trade or Commerce or Outside a State or in the Course of Import or Export - Inter-State Sales Tax - Goods of Special Importance in Inter-State Trade or Commerce - Liability in Special Cases - Central Excises Act, 1944 - Preliminary - Levy and Collection of Duty - Powers and Duties of Officers and Landholders - Transport by Sea - Adjudication of Confiscations and Penalties - Appeals - Presumption as to Documents - Supplemental Provisions.

Unit - V Goods and Services Tax (GST): – concept and status – Genesis - GST and Centre-State Financial Relations - Constitution (One Hundred and First) Amendment Act, 2016 - Goods and Services Tax Council (GSTC) - Salient Features of GST - Benefits of GST - Goods and Services Tax Network – GST Registration process of business enterprises – GST HSN – SAC Cods and tax rates.

References:

1. Dhanesh K Khatri, Financial Accounting, Mc Graw Hill.
2. Asish K. Bhattacharyya, Financial Accounting for Business Managers, 3rd Edition, PHI, Eastern Economy Edition.
3. Dr. V K Goyal, Financial Accounting, 3rd Edition, EB (Excel Books).
4. S N Maheswari, Suneel K Maheshwari and Sharad K Maheshwari, Financial Accounting, 5 th Edition, Vikas Publications.
5. Horngren, Sundem, Stratton, Burgstahler and Schatzberg, Introduction to Management Accounting, 14th Edition, Pearson Hall.
6. Charities An Exhaustive Treatise for Tax and Other....by S Rajaratnam , M. Natarajan , C.P. Thangaraj
7. Laws of Trade Tax Central Sales Tax and Tax on Ent....by O S Vatsa
8. Trade Tax, Central Sales Tax & Tax on Entry of Goo.... by Arvind Agarwal , Adarsh K Gupta
9. GST official website: https://www.gst.gov.in

Pre – Ph.D Course I

Marketing Management

UNIT -I Introduction to Marketing: Needs - Wants – Demands - Products - Exchange - Transactions - Concept of Market and Marketing and Marketing Mix - Production Concept- Product Concept - Sales and Marketing Concept - Societal Marketing Concept - Green Marketing concept - Indian Marketing Environment.

UNIT -II Market Segmentation, Targeting and Positioning: Identification of Market Segments - Consumer and Institutional/corporate Clientele - Segmenting Consumer Markets - Segmentation Basis – Evaluation and Selection of Target Markets – Positioning significance - Developing and Communicating a Positioning Strategy.

UNIT -III Product and Pricing Aspects: Product – Product Mix - Product Life cycle - Obsolescence- Pricing- Objectives of Pricing - Methods of Pricing - Selecting the Final price - Adopting price - Initiating the price cuts - Imitating price increases-Responding to Competitor‘s price changes.

UNIT -IV Marketing Communication: Communication Process – Communication Mix – Integrated Marketing Communication - Managing Advertising Sales Promotion - Public relations and Direct Marketing - Sales force – Determining the Sales Force Size - Sales force Compensation.

UNIT -V Distribution, Marketing Organization and Control: Channels of DistributionIntensive, Selective and Exclusive Distribution- Organizing the Marketing Department - Marketing Implementation - Control of Marketing Performance - Annual Plan Control - Profitability Control - Efficiency Control - Strategic Control.

References :

1. Phillip Kotler: ―Marketing Management ―, Pearson Publishers, New Delhi, 2013.
2. Rajan Saxena: ―Marketing Management‖, Tata McGraw Hill, New Delhi, 2012.
3. V S Ramaswamy & S Namakumari, Marketing Management Global Perspective Indian Context 4th Edition, Mac Millan Publishers 2009.
4. Tapan K Panda: “Marketing Management‖, Excel Books, New Delhi, 2012
5. Paul Baines, Chris Fill, Kelly Page Adapted by Sinha K: ―Marketing‖, Oxford University Press, Chennai, 2013

Pre – Ph.D Course I

Digital and Social Media Marketing

Unit – I Understanding Digital Marketing: Concept, Components of Digital Marketing, Need and Scope of Digital Marketing, Benefits of Digital Marketing, Digital Marketing Platforms and Strategies, Comparison of Marketing and Digital Marketing, Digital Marketing Trends.

Unit – II Channels of Digital Marketing: Digital Marketing, Website Marketing, Search Engine Marketing, Online Advertising, Email Marketing, Blog Marketing, Social Media Marketing, Audio, Video and Interactive Marketing, Online Public Relations, Mobile Marketing, Migrating from Traditional Channels to Digital Channels. Marketing in the Digital Era Segmentation – Importance of Audience Segmentation, How different segments use Digital Media – Organizational Characteristics, Purchasing Characteristics, Using Digital Media to Reach, Acquisition and Retention of new customers, Digital Media for Customer Loyalty.

Unit – III Digital Marketing Plan: Need of a Digital Marketing Plan, Elements of a Digital Marketing Plan – Marketing Plan, Executive Summary, Mission, Situational Analysis, Opportunities and Issues, Goals and Objectives, Marketing Strategy, Action Plan, Budget, Writing the Marketing Plan and Implementing the Plan.

Unit – IV Search Engine Marketing and Online Advertising Importance of SEM, understanding Web Search – keywords, HTML tags, Inbound Links, Online Advertising vs. Traditional Advertising, Payment Methods of Online Advertising – CPM (Cost-per-Thousand) and CPC (Cost per-click), Display Ads - choosing a Display Ad Format, Landing Page and its importance.

Unit – V Social Media Marketing: Understanding Social Media, Social Networking with Facebook, LinkedIn, Blogging as a social medium, Microblogging with Twitter, Social Sharing with YouTube, Social Media for Customer Reach, Acquisition and Retention. Measurement of Digital Media: Analyzing Digital Media Performance, Analyzing Website Performance, Analyzing Advertising Performance.

References:

1. Digital and Social Media Marketing: A Results-Driven Approach, by Aleksej Heinze (Editor), Gordon Fletcher (Editor), Tahir Rashid (Editor), Ana Cruz (Editor)
2. Digital and Social Media Marketing: Emerging Applications and Theoretical Development, by Nripendra P. Rana (Author), Emma L. Slade (Author), Ganesh P. Sahu (Author), Hatice Kizgin (Author), Nitish Singh (Author)

Pre – Ph.D Course I

Green Marketing

Unit – I Green Marketing and Green Product : Introduction to green marketing-strategic green planningenvironment and consumption- Green Product- Green Behavior- Five shades of green consumers Segmenting consumers- Green consumer‘s motives-Buying strategies -Green Business Opportunities- Designing green products-eco-design to eco-innovation-Fundamentals of green marketing-Establishing Credibility-Green distribution and Packaging Contemporary Government polices and subsidies that aids green product development.

Unit – II Green Marketing Concepts: Green Spinning – Green Selling – Green Harvesting – Enviropreneur Marketing - Compliance Marketing – Green Washing – Climate Performance Leadership Index .

Unit – III Purchase Decision: Meaning of Purchase decision – Factors affecting Purchase decision - Steps in the decision making process - Five stages of consumer buying decision process - Models of buyer decision-making .

Unit – IV Environmental consciousness: Introduction of Environment - Importance of environmentalism - Environmental movement - Benefits of green environment to the society - E-waste exchange - Extended Producer Responsibility Plan - Guidelines for Collection and Storage of E-Waste - Guidelines for Transportation of E-Waste - Guidelines for Environmentally Sound Recycling of E-Waste .

Unit – V Green Marketing Initiatives: Green Firms – HCL‘s Green Management Policy – IBM‘s Green Solutions – IndusInd Bank‘s Solar Powered ATMs – ITCs Paperkraft – Maruti‘s Green Supply Chain – ONCGs Mokshada Green Crematorium – Reva‘s Electric Car – Samsung‘s Eco-friendly handsets- Wipro Infotech‘s Eco-friendly computer peripherals.

References:

1. Green Marketing and Environmental Responsibility in Modern Corporations, Esakki and Thangasamy, IGI Global, 2017
2. Green Marketing Management, Robert Dahlstrom, Cengage Learning, 2010.
3.Green Marketing: Challenges and Opportunities for the New Marketing Age, Jacquelyn A. Ottman, NTC Business Books, 1993
4. The New Rules of Green Marketing, Jacquelyn A. Ottman,Berrett-Koehler Publishers, 2011.

Pre – Ph.D Course II

Services Marketing

Unit – I Introduction to Services Marketing: Understanding Services, Differences in Goods versus Services, Emerging Service Environment, Classification of Services. Service Market Segmentation, Targeting & Positioning: Process of market segmentation, customer loyalty Segmentation, Targeting and Positioning service value addition to the service product, planning and branding service products, new service development.

Unit – II Pricing strategies for services: Service pricing, establishing monetary pricing objectives foundations of pricing objectives, pricing and demand, putting service pricing strategies into practice. Service promotion: The role of marketing communication. Implication for communication strategies, setting communication objectives, marketing communication mix.

Unit – III Implementing Services Marketing: Improving Service Quality and Productivity, SERVQUAL, Service Failures and Recovery Strategies. Customer Relationship Marketing: Relationship Marketing, the nature of service consumption understanding customer needs and expectations, Strategic responses to the intangibility of service performances.

Unit – IV Managing Service Delivery Process: Managing Physical Evidence of Services, Designing and Managing Service Processes, Managing People for Service Advantage.

Unit – V Marketing of Services in Sectors: Financial Services, Health Service, Hospitality Services including travel, hotels and tourism, Professional Service, Public Utility Services, Educational Services.

References:

1. Valarie A. Zeithaml & Mary Jo Bitner - Services Marketing: Integrating Customer Focus Across The Firm, Third Edition, 2004; Tata McGraw-Hill Publishing Company Ltd, 2008.

2. Christopher H. Lovelock, Jochen Wirtz, Jayanta Chatterjee, Services Marketing: People, Technology, Strategy (A South Asian Perspective) Fifth Edition 2011; Pearson Education

3. Cengiz Haksever, Barry Render, Roberta S. Russel, and Robert G. Murdic: Service Management and Operations (Second Edition); Pearson Education (Singapore) Pte., Ltd., 2003.

4. Kenneth E. Clow & David L. Kurtz: Services Marketing, Biztantra Publication, 2003.

5. Nimit Chowdhary & Monika Chowdhary, Textbook of Marketing of ServicesThe Indian Experience, Macmillan India Ltd., 2005.

Pre – Ph.D Course II

Enterprise Resource Planning

UNIT I Introduction to Enterprise resource planning (ERP), Evolution of ERP, Reasons for the growth of ERP, Scenario and Justification of ERP in India, Evaluation of ERP, Various Modules of ERP, Advantage of ERP - MRP – problems of systems islands – need for system integration and interface.

UNIT II An overview of Enterprise: Integrated modules, Business Process Mapping for ERP Module Design, Organizational Environment and its selection for ERP Implementation. ERP – Packages – products and market opportunities – problems of ERP selection and implementation – identifying ERP benefits.

UNIT III ERP and Related Technologies: ERP and Related Technologies, Business Process Reengineering (BPR), Management Information System (MIS), Executive Information System (EIS), Decision support System (DSS), Supply Chain Management (SCM). ERP process – implementation – managing changes in IT organisations – preparing IT infrastructure – measuring benefits of ERP. Modules of ERP.

UNIT IV ERP Modules: ERP Modules, Introduction, Finance, Plant Maintenance, Quality Management, Materials Management, ERP Market. A Comparative Assessment and Selection of ERP Packages and Modules.

UNIT V ERP implementation lifecycle, issues in implementing ERP packages, pre-evaluation screening, package evaluation, project planning phase, gap analysis, reengineering, configuration, implementation, team training, testing, going live, end-user training, post implementation (Maintenance mode).

References:

1. Alexis Leon, ERP demystified, second Edition Tata McGraw-Hill, 2007.
2. Jagan Nathan Vaman, ERP in Practice, Tata McGraw-Hill, 2008.
3. Hammer, Michael – Reengineering the corporation.
4. E-commerce strategy, technologies and applications by David Whitley.
5. Alexis Leon, Enterprise Resource Planning, second edition, Tata McGraw-Hill, 2008.
6.. Mahadeo Jaiswal and Ganesh Vanapalli, ERP Macmillan India, 2009.
7.. Vinod Kumar Grag and N.K. Venkitakrishnan, ERP- Concepts and Practice, Prentice Hall of India,2 nd edition, 2006.
8. Summer, ERP, Pearson Education, 2008.

Pre – Ph.D Course I

Decision Support Systems

UNIT I: M.I.S and Its Role In Organizations - Open-Systems and Closed Systems D.S.S Its Relation to M.I.S, Characteristic Role of D.S.S as Different From M.I.S in an Organization, Expert DSS and Its Role as an Aid to Management Decision Process.

UNIT II: Deterministic Models - Models Required to Cope With Uncertainty, Probabilistic Models and Fuzzy Sets, Fuzzy DSS and Fuzzy Expert DSS

UNIT III: Application of DSS - Some Functional Areas of Management Like Finance, Marketing, Production Planning and Control Etc.

UNIT IV: Non-Optimizing Models of DSS - Simulation Techniques and Monte- Carlo Methods.

UNIT V: Application of DSS - Technical Feasibility and Financial Viability of DSS. Advantages and Limitations of DSS –Contemporary practices. Introduction to Artificial Intelligence (AI) - An Overview of AI– AI Technologies in Business, Domains in AI, Neural networks. Fuzzy logic systems in Business: Virtual Reality, Intelligent agents, expert system and its components, Applications of expert system, developing expert systems, value of expert systems.

References:

1. V.S. Janaki Raman: Decision Support System, PHI Learning, New Delhi,2009
2 Mallah: Decision Support and Data Warehouse Systems, TMH New Delhi, 2002
3 Turbon: DSS and Intelligent Systems, Pearson Education, 2010.
4 George M..Marakas: “Decision Support Systems in the 21st Century”, 2/e,Pearson Education, New Delhi, 2008.

Pre – Ph.D Course I

Innovation Technology Management

Unit – I Analyzing the Current Business Scenario, Innovation and Creativity - An Introduction, Innovation in Current Environment, Types of Innovation , School of Innovation. Challenges of Innovation, Steps of Innovation Management, Idea Management System, Divergent Vs Convergent Thinking, Levers of Idea Management. Experimentation in Innovation Management, Idea Championship,Participation for Innovation, Co-creation for Innovation , Proto typing to Incubation.

Unit – II Marketing of Innovation, Technology Innovation Process, Technological Innovation Management Planning, Technological Innovation Management Strategies, Technology Forecasting.

Unit – III Introduction to Technology Management:Concept and Meaning of Technology and Technology Management- Technology; Technology management, Evolution and Growth of Technology, Role and Significance of Technology Management, Impact of Technology on Society and Business- Technology and competition; Key issues in managing technological innovation, Forms of Technology- Process technology; Product technology

Unit –IV Technology Acquisition: Technology Acquisition, Alternatives for Acquiring New Technologies, Reasons Compelling a Company for Obtaining a New Technology, Management of Acquired Technology, Measures of Scale and Mechanisms for Acquiring TechnologiesEconomy of scale or Scale economy; Levels of scale; The measurement of scale; Factors affecting the choice of scale

Unit - V Technology Forecasting:Concept of Technology Forecasting- Characteristics of technology forecasting ; Technology forecast method; Principles of technology forecasting, Technology Forecasting Process, Need and Role of Technology Forecasting, Forecasting Methods and Techniques, Planning and Forecasting, Technology Strategy and Competitiveness:Technology Strategy-Technology strategy and management; Elements of an accessible technology strategy, Innovation Management, Competitive Advantage- Components of competitive advantage; Creating competitive advantage using value chain, Technology Management Evaluation or Assessment

References:

1. Industry, Innovation and Infrastructure: Leal Filho, W. (Ed), Azul, A. M. (Ed), Brandli, L. (Ed), Lange Salvia, A. (Ed), Wall, T. (Ed) (2021)
2. Innovation Management in the Intelligent World: Daim, T. U. (Ed), Meissner, D. (Ed) (2021)
3. Technological Innovation and International Competitiveness for Business Growth: Ferreira, J. J. M. (Ed), Teixeira, S. J. (Ed), Rammal, H. G. (Ed) (2020)

4. Entrepreneurship, Technology Commercialization, and Innovation Policy in Africa: Daniels, C. U. (Ed), Dosso, M. S. (Ed), Amadi-Echendu, J. (Ed) (2020)
5. Business innovation with new ICT in the Asia-Pacific: Case studies: Kosaka, M. (Ed), Wu, J. (Ed), Xing, K. (Ed), Zhang, S. (Ed) (2021)

Pre – Ph.D Course II

Big Data Analytics

Unit I Introduction to Big Data: Big Data-definition, Characteristics of Big Data (Volume, Variety,Velocity, Veracity, Validity), Importance of Big Data , Patterns for Big Data Development, Data in the Warehouse and Data in Hadoop [Zikopoulos] - Introduction to Hadoop: Hadoop- definition, Understanding distributed systems and Hadoop,Comparing SQL databases and Hadoop, Understanding MapReduce, Counting words with Hadoop—running your first program, History of Hadoop, Starting Hadoop - The building blocks of Hadoop, NameNode, DataNode, Secondary NameNode, JobTracker and Task Tracker.

Unit II HDFS: Components of Hadoop -Working with files in HDFS, Anatomy of a MapReduceprogram, Reading and writing the Hadoop Distributed File system -The Design of HDFS, HDFS Concepts, The Command-Line Interface, Hadoop Filesystem, The Java Interface, Data Flow, Parallel Copying with distcp, Hadoop Archives. Hadoop I/O: Compression— Serialization-- Avro and File-Based Data structures.

Unit III MapReduce Programming: Writing basic Map Reduce programs - Getting the patent data set,constructing the basic template of a Map Reduce program, Counting things, Adapting for Hadoop's API changes, Streaming in Hadoop. MapReduce Advanced Programming: Advanced MapReduce - Chaining Map Reduce jobs,joining data from different sources.

Unit IV Hadoop Eco System --User Defined Functions-- Data Processing operators. Hive :Hive Shell-- Hive Services-- Hive Metastore-- Comparison with Traditional Databases—HiveQL-- Tables, Querying Data and User Defined Functions. Hbase : HBasics—Concepts—Clients—Example-- Hbase Versus RDBMS. Big SQL : Introduction

Unit V Graph Representation in MapReduce: Modeling data and solving problems with graphs,Shortest Path Algorithm, Friends-of-Friends Algorithm, PageRank Algorithm, BloomFilters. Data Analytics with R Machine Learning : Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.

References

1. Tom White ― Hadoop: The Definitive Guide‖ Third Edit on, O'reily Media, 2012.
2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.
3. Michael Berthold, David J. Hand, "Intelligent Data Analysis‖, Springer, 2007.
4. Jay Liebowitz, ―Big Data and Business Analytics‖ Auerbach Publications, CRC press (2013)
5. Tom Plunkett, Mark Hornick, ―Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop‖, McGraw-Hill/Osborne Media (2013), Oracle press.

6. Anand Rajaraman and Jef rey David Ulman, ―Mining of Massive Datasets‖, Cambridge University Press, 2012.
7. Bill Franks, ―Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics‖, John Wiley & sons, 2012.
8. Glen J. Myat, ―Making Sense of Data‖, John Wiley & Sons, 2007
9. Pete Warden, ―Big Data Glossary‖, O'Reily, 2011.
10. Michael Mineli, Michele Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.
11. ArvindSathi, ―BigDataAnalytics: Disruptive Technologies for Changing the Game‖, MC Press, 2012
12. Paul Zikopoulos ,Dirk DeRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles , David Corigan , "Harness the Power of Big Data The IBM Big Data Platform ", Tata McGraw Hill Publications, 2012.

Pre – Ph.D Course II

Data Mining and Machine Learning

UNIT- I: Introduction to Data Mining: Introduction-- Scope of Data Mining-- What is Data Mining-- How does Data Mining Works-- Predictive Modeling-- Data Mining and Data arehousing-- Architecture for Data Mining: Profitable Applications-- Data Mining Tools.

UNIT- II: Data Mining Techniques An Overview: Introduction-- Data Mining-- Data Mining Versus Database Management System-- Data Mining Techniques- Association rules— Classification—Regression—Clustering-- Neural networks.

UNIT- III: The ingredients of machine learning, Tasks: the problems that can be solved with machine learning, Models: the output of machine learning, Features, the workhorses of machine learning. Binary classification and related tasks: Classification, Scoring and ranking, Class probability estimation Beyond binary classification: Handling more than two classes, Regression, Unsupervised and descriptive learning. Concept learning: The hypothesis space, Paths through the hypothesis space, Beyond conjunctive concepts.

UNIT- IV: Tree models: Decision trees, Ranking and probability estimation trees, Tree learning as variance reduction. Rule models: Learning ordered rule lists, Learning unordered rule sets, Descriptive rule learning, First-order rule learning Linear models: The least-squares method, The perceptron: a heuristic learning algorithm for linear classifiers, Support vector machines, obtaining probabilities from linear classifiers, Going beyond linearity with kernel methods.

UNIT- V: Features: Kinds of feature, Feature transformations, Feature construction and selection. Model ensembles: Bagging and random forests, Boosting- Dimensionality Reduction: Principal Component Analysis (PCA), Implementation and demonstration. Artificial Neural Networks: Introduction, Neural network representation, appropriate problems for neural network learning, Multilayer networks and the back propagation algorithm.

References:

1) Machine Learning: The art and science of algorithms that make sense of data, Peter Flach, Cambridge.
2) Machine Learning, Tom M. Mitchell, MGH.
3) Understanding Machine Learning: From Theory to Algorithms, Shai Shalev-Shwartz, Shai Ben-David, Cambridge.
4) Machine Learning in Action, Peter Harington, 2012, Cengage.

Pre – Ph.D Course II

Cyber Laws and Security

UNIT-I: Introduction to Computer Security: Definition, Threats to security, Government requirements, Information Protection and Access Controls, Computer security efforts, Standards, Computer Security mandates and legislation, Privacy considerations, International security activity.

UNIT-II: Secure System Planning and administration: Introduction to the orange book, Security policy requirements, accountability, assurance and documentation requirements, Network Security, The Red book and Government network evaluations.

UNIT-III: Information security policies and procedures: Corporate policies- Tier 1, Tier 2 and Tier3 policies - process management-planning and preparation-developing policies-asset classification policy-developing standards.

UNIT-IV: Information security: fundamentals-Employee responsibilities- information classification Information handling- Tools of information security- Information processing-secure program administration.

UNIT-V: Organizational and Human Security: Adoption of Information Security Management Standards, Human Factors in Security- Role of information security professionals.

References:

1. Debby Russell and Sr. G.T Gangemi, "Computer Security Basics (Paperback)‖, 2nd Edition, O‘ Reilly Media, 2006.
2. Thomas R. Peltier, ―Information Security policies and procedures: A Practitioner‘s Reference‖, 2nd Edition Prentice Hall, 2004.
3. Kenneth J. Knapp, ―Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions‖, IGI Global, 2009.
4. Jonathan Rosenoer, ―Cyber law: the Law of the Internet‖, Springer-verlag, 1997.