CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY
BHILAI

Ph.D. Entrance Examination Scheme, 2015

Maximum Marks – 100 **Duration of Examination – 3 hrs**

Section – I

Consisting of 40 objective type questions from relevant discipline of the syllabus.

Section – II

Consisting of 60 objective type questions from any of the specialization of the relevant discipline of the syllabus.
The weightage for section I shall be 40% & section II shall be 60%.

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

Syllabus for Entrance Examination in Ph.D. Programme 2015

Discipline: Biotechnology

Section - II

Specialization

A: Microbiology

Diversity of Prokaryotic and Eukaryotic Microbes
Archaea, Bacteria, Fungal Systematics and diversity, Fungal endophytes of tropical plants and their applications, Mycorrhizal fungi, Agriculturally important toxigenic fungi, Secondary metabolites from fungi, Genomics and Biodiversity of yeast, Antagonistic interactions in yeasts, Biotechnological applications of yeasts, Algal diversity from morphology to molecules.

Microbial Physiology and Metabolism
Growth and cell division, Solute Transport, Central Metabolic Pathways and Regulation, Nitrogen metabolism, Metabolism of lipids and hydrocarbons, Metabolism of nucleotides, Physiological Adaptations and Intercellular signalling.

Virology

I - Animal Viruses: Classification , Morphology and Chemistry of Viruses, Working with viruses, Virus replication Strategies, Replication patterns of specific viruses, Subviral pathogens, Pathogenesis of viral infection, Anti-viral strategies –prevention and control of viral diseases.

II – Plant and microbial viruses: History and development of plant virology, cryptograms and classification of plant viruses and viroids, Propagation, Purification, characterization and identification and genomics of plant viruses, Symptoms of plant virus diseases, transmission of plant viruses, viral and viroid diseases and their control, Microbial viruses.

Immunology
Three fundamental concepts in immunology, Immune cell receptors, Genetic organization, Immune response and signaling, Tolerance and autoimmunity, Immunological disorders and hypersensitivity, Transplantation and tumour immunology.

Molecular Biology

The nature of Genetic material, DNA replication, Recombination and Repair of DNA, Transcription, Post-transcriptional processes , Translation, Post-translational Processes, Molecular basis of cell physiology.

Recombinant DNA Technology

Basics of DNA cloning, Methods of DNA protein analysis, Polymerase Chain Reaction, Construction of DNA and genomic DNA libraries, Genome sequencing, Transcriptional analysis of gene expression and transcriptomics, Overexpression of recombinant proteins, Analysis of protein-DNA and protein –protein interactions, protein engineering and proteome analysis, Pharmaceutical products of DNA technology, Transgenics and animal cloning.

Microbial Genetics

Genetic analysis of bacteria, Gene transfer and mapping by conjugation, Lytic bacteriophages, Gene transfer by transformation and transduction, Lysogenic phages, Transposons, Gene regulation.

Industrial and Food Microbiology

Introduction to industrial microbiology, Downstream processing of microbial products, fermentation economics, Production aspects, Microbiology of foods, Microbial spoilage of foods, Food preservation, Fermentation processes, Food-borne diseases.

Environmental Microbiology

Brief history and development of environmental microbiology, Culture dependent and culture-independent approaches for understanding microbial diversity in the environment, Microbial diversity in normal and extreme environments, Global warming, Lignin degradation, Liquid waste management, Solid waste management, Bioremediation of environmental pollutants, Microbes and mineral recovery.

Plant – Pathogen Interaction

Concepts and physiology of plant diseases, Biochemical basis of plant diseases, Some important plant diseases and their etiological studies, Genetical basis of plant diseases, Disease control, Molecular approach, Disease forecasting.

Microbial Pathogenicity

Classical view of microbial pathogenicity, Molecular microbial pathogenicity, Emeging and re-emerging pathogens, Molecular microbial epidemiology, Environmental change and infectious diseases, Antimicrobial resistance, Newer vaccines, Rapid diagnostic principles.

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CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY BHILAI

Syllabus for Entrance Examination for Admission in Ph.D. programme, 2015

Discipline: Biotechnology

Section - II

Specialization

B: Bioinformatics

Introduction and Bioinformatics Resources: Definition, role, scope different areas and limitations of Bioinformatics. Biological data & databases: Classification of biological database. Architecture and file formats of Nucleic acid sequence databases (GenBank, EMBL, and DDBJ), Protein sequence databases (SWISS-PROT, TrEMBL, PIR, and PDB), Small molecule database (PubChem, DrugBank, KEGG, ChemSpider), Gene and protein interaction databases (BioGrid, STRING, IntAct, HPRD).

Biological sequence analysis and Alignment: Prediction of physicochemical properties of genes and proteins based on sequence composition and sequence comparison, Algorithms for pairwise and multiple sequence alignment, concept of gaps, gap-penalties scoring matrices, Probabilistic methods including hidden markov models, pattern matching, entropy measures, evolutionary models, and phylogeny, Methods and advanced filtering options available with various sequence alignment programs such as ClustalW, BioEDIT and BLAST etc.

Structural Bioinformatics: Basic properties associated with nucleic acid and proteins structures, RNA folding, RNA loops, Experimental methods available for structural determination of nucleic acids and proteins, Computational methods for structure validation, protein fold prediction (from homology modeling to ab initio prediction), Algorithms and methods available for predicting and analyzing DNA-protein, protein-protein and protein-ligand interactions, Molecular dynamics simulation and Monte Carlo simulation, File format and structural analysis tools available at Protein Data bank (PDB), Nucleic Acid Data Bank (NDB), Molecular modeling Data Bank (MMDB), Structure classification Databases (SCOP, CATH, PDBSum) etc., Tools for predicting biological functions from structures, Molecular docking – concept and methods. Drug Discovery and drug Designing.

Statistical techniques commonly used in biological analysis: Neural Networks, Support Vector Machines, Supervised and unsupervised Learning, Kernel Methods, Normalization of

Gene Expression Data, Classification of Gene Expression Data, Statistical Analysis with the Gene Ontology, Classification of Protein Structures, Statistical methods associated with the analysis of microarray and next generation sequencing (NGS) data. Uni- and multivariate analysis (e.g. ANOVA, correlation, regression, clustering, and ordination), Basic idea of the open source statistical programming environment R.

Genome and Gene Expression: Genome organization: coding versus non-coding sequences, Composition and biochemistry of basic transcription machinery, Transcription initiation, elongation and termination, Regulatory sequences: promoters, enhancers, suppressors, Application of comparative genomics to identify cis-acting elements, Epigenetics: Chromatin structure and histone modifications; DNA methylation, Nuclear structure and long range DNA interactions, Transcription regulation and development, Regulatory networks: the regulation of regulators, Non-coding RNAs and control of gene expression, Intergenic and antisense transcription; RNA processing, including alternative splicing and its regulation, Nucleo-cytoplasmic RNA transport, RNA stability and degradation pathways, RNA interference (siRNAs), Translation regulation (microRNAs), Analysis of gene expression, Human transcriptome, Single-gene analyses and techniques, Deep sequencing and micro-arrays.

Molecular Phylogenetic: Principles of Molecular Evolution and Molecular Phylogenetics, Nomenclature, representation, and general concepts of tree structure. Phylogenetic Tree Construction Methods and Programs: Distance-Based Methods, Character-Based Methods, Phylogenetic Tree Evaluation, and Phylogenetic Programs. Phylogenetic analysis tools- Phylip, ClustalW etc.

Modeling of Biological systems: Basic idea of modeling of biological systems, properties of cell components (such as enzyme kinetics), mass and energy balances, stoichiometry and constraint-based modelling, kinetic modelling, Metabolic Control Analysis, General concepts associated with graph theory, topological properties, centrality measurements, robustness and sensitivity analysis of biological networks, Methods and tools for constructing gene regulatory network and protein interaction network, Prediction of network motifs, modules and subnetworks.

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CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

Syllabus for Entrance Examination in Ph.D. Programme 2015

Discipline: Civil Engg.

Section - II

Specialization

A: Structural Engineering

Advanced Reinforced Concrete Structures

Concrete Technology: Concrete as structural material, strength of concrete and its significance, Strength porosity relationship, Factors effecting compressive strength, Behavior of concrete under stress states, Durability of concrete and its significance, Sulphate attack, Alkali aggregate reaction, Corrosion of embedded steel in concrete and concrete deterioration due to corrosion of steel and its preventive measures.

Design of Slender Columns: Concentrically loaded slender columns, eccentrically loaded slender columns, Slender columns subjected to axial and transverse loads, Structural behaviour of columns in braced and unbraced frames, Codal procedure for design of slender columns.

Flat Slabs: Elements of flat slabs, Codal procedure for design of flat slabs, Behaviour of flat slab in shear, One way and two way shear, Opening in flat slabs, Effect of pattern loading in flat slabs.

Design of Beam Column Joints: Types of joints, Joints in maltistoreyed buildings, Forces acting on joints, Design of joints.

Dynamic of Structures

Single Degree of Freedom Systems: Fundamental, Mass spring damper system, Analysis of free vibrations, Response to harmonic loading, periodic loading, Impulsive loading and general dynamic loading. Generalised SDOF, Vibration analysis by Rayleigh method.

Multi Degree of Freedom Systems: Two degree of freedom system – undamped, free & forced. Multidegree of freedom system- undamped, Holter method, Stodola method, Orthogonality condition, Damped system. Dynamic analysis and Response- Modal Analysis, Response spectrum analysis, Rayleigh's-Rit z method.

Structures with Distributed Mass and Load: Axial, shear and transverse vibration due to bending of beams, Uniform shear beam, Beam in bending, Numerical techniques for shear beam, Bending of beams, Forced vibration, Plates or slabs subjected to normal loads.

Earthquake Motion and Response: Introduction, Strong motion earthquake, Numerical method for spectra, Elastic spectra, Ground velocity and displacement, Inelastic spectra, Equivalent linear system, Comparison of an elastic and inelastic system.

A seismic Design of Structures: Design data and philosophy of design, Seismic co-efficient, permissible increase in stress and load factor for multistoreyed buildings, Base shear, Fundamental time period of buildings, Distribution of forces along the height, Dynamic analysis using IS: 13912, Earthquake resistant construction of buildings, Ductility provision in reinforced concrete construction of structures, Design of water towers, Stack like structures.

Advanced Steel Structures

Concept of Plastic Design: Introduction, Theory of plastic bending, Assumptions, Bending of rectangular section, Plastic hinge, Redistribution of moments, Computation of plastic moment, Shape factor, Overload factor, Method of plastic analysis : Statical Method, Mechanism method, Upper bound, Lower bound and uniqueness theorem, Partial, Complete and over complete failure of indeterminate structures.

Plastic Analysis of Frames: Plastic analysis of portal frames subjected to transverse and lateral loads, Analysis of gable frames, Analysis of multibay multistoreyed frames, Moment balancing method.

Deflections: Assumption, Calculation of deflection at ultimate loads, Deflection at working loads, Rotation capacity.

Secondary Design Consideration: General, Influence of axial force on the plastic moment, Influence of shear force, Local buckling of flanges and webs, Lateral buckling.

Advanced Structural Analysis

Stiffness Method: Basis of stiffness method, Influence coefficients, Kinematic indeterminacy, Degree of freedom, Action displacement relationship, Direct stiffness approach, Transformation of axes system, Representing the imposed loads as nodal loads, Elastic supports, Support displacements, Application to various type of structures e.g. Continuous beams, Trusses, Frames and grids, Temperature effects.

Flexibility Method: Particular solution, Complimentary solution, Compatibility equations, Flexibility coefficients, Application of complimentary energy principles, Basis of the method, Numerical integration for flexibility coefficients, Application to various type of structures, Elastics supports, Supports displacement, Temperature shrinkage, Imperfect fit, Analysis of pin jointed trusses, Rigid frames.

Finite Element Method: Introduction, Basic steps in finite element method, Coordinate systems, Rotation of axes, Shape functions, Elements stiffness matrix and load vector, Triangular element in plane stress and strain, Numerical integration, Isoperametric elements,

Rectangular elements in plate flexure, Triangular element in plate flexure, Rectangular element in plane stress and bending combined, Computer programs for these elements.

B: Highway Engineering

Geometric Design

Geometric design standards of Highways: Controls and Criteria for geometric design, basic requirements, Design vehicle, Design of capacity, level of service, design of camber, design methods used in field, design of cross-section elements, design and analysis of different sight distances IRC specifications for design.

Design of Horizontal Alignment: Design and analysis of super elevation, methods for eliminating camber and buildings super elevation in the field, design of extra widening, methods for providing extra widening in the field, design of transition, design of combined curve, IRC specifications for design.

Design of Vertical Alignment: Design of gradients, basic criteria and methods for designing summit and & valley vertical curves, IRC specification for design.

Geometric Design of Inter-sections: Design elements of intersections, elaborate design of rotary intersection, grade separated intersections, median separators.

Pavement Analysis & Design

Importance and functions of various components of pavement structures, concept of wheel loads and tandem axles, ESWL, vehicle damage factors.

Design of Flexible pavements: CBR method of flexible pavement design. Old concepts to be recent concept by IRC-37-2001, Design by group index method, Design of low cost roads.

Design of rigid pavement: Factors affecting, Analysis of stresses, equivalent wheel load, Westergaard's analysis, IRC design guidelines, design of joints, tie bars, dowel bars, CRCP, FRC and pre-stressed concrete pavements.

Highway Materials Design & Construction

Bituminous materials and mixes: Terminology, classification, distillation, grades, asphalts and tars, testing methods and specifications, bitumen aggregate interactive mechanism, design of bituminous mixes.

Intermediate and high type bituminous pavements: Concept of macadam roads, Bituminous surface treatments, Road mix and bituminous plant mixes, bituminous bound macadam, asphalt and concrete, Bituminous concrete laying procedures, use of admixtures, construction methods and machinery.

Rigid pavements: Base course function, design of pavement grade mixes, Construction equipment, methods, quality control and procedures, pumping, joint filers and sealants, mix selection, compaction methods and construction procedures for reinforced and pre-stressed

pavements.

Advanced Traffic Engineering

Introduction: Traffic characteristics, PIEV theory, Traffic flow Characteristics, capacity and level of service concept

Traffic studies: Traffic Volume, spot speed, speed & delay, axle load surveys, Origin & Destination study, sampling techniques, presentation of traffic data, analysis and applications

Traffic facilities design: Design of parking facilities, Design of lighting and terminal facilities.

Traffic Operations and Control: Traffic regulation, Traffic control devices i.e. signs and markings, design of traffic signals.

Traffic Safety: Effect of road conditions on traffic safety, Accident study, presentation and analysis of traffic data, improvement measures

Intelligent Transport System: Highway communication, automatic vehicle detection, electronic toll collection system, advanced driver information system, simulation of traffic systems.

C: Environmental Engineering

Environmental Chemistry

Basic concepts of chemistry involved in water & wastewater analysis: Basic concepts of General chemistry, Physical chemistry, Equilibrium chemistry, Organic chemistry, Bio chemistry, Colloidal chemistry, Nuclear chemistry. Basic concepts of quantitative chemistry: Sampling Gravimetric analysis, Volumetric analysis, Colourimetry, Spectrophotometry. Industrial Methods of Analysis, Optical Methods; Electric Methods Chromatographic methods.

Chemistry of Turbidity, colour, pH, Acidity, Alkalinity Hardness, Residual chlorine, Chlorides, Dissolved oxygen, BOD, COD, Nitrogen, Oil and Grease.

Advanced Wastewater Treatment

Quality characteristics of wastewaters. Physical, chemical & Biological water quality parameters. Water quality requirement; Stream Standards, Potable water standards and waster water Influent standards, Physico- chemical processes involved in Waste water treatment;

Sedimentation, Coagulation & Flocculation, various types of setting, settling tank; principle and design, Grit chamber; principle, types and design aspects. Filtration: Theory, methods of filtration and their modified forms.

Disinfections: Objective and different methods. Organic impurities of waste water,

composition of waster water, biological treatment, aerobic and anaerobic processes. Microorganisms in biological treatment and their metabolic kinetics. Kinetics of plug flow and complete mix reactors.

ASP and its modifications, aeration, objective and methods, design of aeration devices.

Bio-filters: various types, Trickling filters and their design. Sludge handling and disposal; Sludge types and composition. Various methods of sludge treatment. Sludge digestion tanks. Disposal of sludge. Tertiary treatment of wastewater: objective and methods.

Air Pollution & Control

Introduction, Atmospheric composition, Origin of air pollution, Global implications of air pollution, Classification of air pollutants, Particulars, Hydrocarbons and Gaseous air pollutants. Sources of air pollutants and their health effects. Meteorological aspects of air pollution, Influence of Meteorological aspects on Air Quality: Lapse rate and Dispersions, Wind and Dispersions, Moisture and dispersion, modeling.

Air Pollution sampling: Ambient and stack sampling, Ambient Air Quality Monitoring, Engineered systems of air pollution Control: Atmospheric cleansing process, approaches to contaminant control. Control devices for particulate contaminant and gaseous contaminants.

Environmental Pollution & Management

Water Pollution: Components of water, hydrological cycle and water budget equation, Effects of Environmental Pollution on components of hydrological cycle.

Classification of water pollutants and their sources, Types of water pollution, Sources of water pollution and effect of polluted waters on environment and health. Consequences of polluted water disposal on land, rivers and lakes.

Self purification of river and impoundments. Do sag curve and self purification models. Eutrophication of lakes; Ground water pollution, Causes and consequences, Artificial recharging of ground waters.

Noise Pollution: Noise & Noise pollution definitions Physical parameters of Noise pollution, Sources and health effects of Noise pollution. Strategies for noise pollution control; Control at sources and control at path. Case studies of Noise Pollution and its control.

D: Geotechnical Engineering

Origin and Classification of soils, and Phase Relationships, Clay minerology, Diffuse double layer, Compaction Effective Stress Principle, Permeability, Seepage pressure, Quick sand condition, Pheratic lines, Flow nets, Compressibility, Terzaghi's Consolidation Theory, Shear Strength, Shear Strength Parameters – total stress and effective stress, Mohrs Circle, Failure

Envelope, Stress path

Site Exploration: Methods of soil exploration with relative merits and demerits, Depth and spacing of bore holes, Standard penetration tests, Plate load tests, Static cone penetration tests etc.

Bearing Capacity: Bearing capacity theories, corrections for size, shape, depth, eccentricity of loading, water table etc., Presumptive bearing capacities, Codal provisions

Lateral earth Pressure: Rankine's and Coloumb's theories, Earth pressure computation in different soils and surcharge load, Rebhnann's and Culmann's construction. Design considerations of earth retaining structures.

Foundations: Shallow Foundations, Pile Foundations (including under-reamed piles), Cassion and Well foundations; Design considerations, Codal provisions, Layered soils. Choice of shear strength parameters, Total and differential settlement. Stress distribution, Consolidation settlement in clays (with correction factors), Immediate settlement, Settlement in sands

Slope Stability: Finite and infinite slopes, Critical failure surface, factor of safety, Causes of failure in earthen dams and remedial measures.

Ground Improvement: Mechanical soil stabilization, Mixing additives, Compaction piles, compaction by dynamic loads, Pre-loading using sand drain, Reinforced soil

Soil Dynamics: Engineering problems involving soil dynamics; Dynamic loading, Role of inertia; Theory of Vibrations, Types of machine foundations, Design criteria for machine foundations, Codal provisions.

E: Water Resources / Irrigation Engineering

Advanced Hydrology: Introduction Precipitation, Water Losses, Runoff, Estimation of average monthly and annual runoff, rainfall - runoff relationships. Analysis of data , Supplementing missing data, consistency of record, hyetograph, mass curve analysis, depth areas duration analysis. Rainfall frequency analysis, estimation of evaporation and evapotranspiration, Synthetic unit hydrograph, S- curve, Unit hydrograph of varied durations, Instantaneous unit hydrograph, conceptual models, Design Flood, Flood Forecasting Hydrologic Models.

Fluid Mechanics: Equations of motion in general orthogoral coordinate system, Kinematics of Flow, Hydrodynamics, Boundary Layer Theory, Laminar boundary layer, turbulent boundary layer; stability analysis of the boundary layer, Laminar Flow, Turbulent Flow, Dimensional analysis, similitude and model testing.

Open Channel Flow: Fluid Flow Concepts, Classification of channels basic equation; Uniform flow in rigid boundary channels, Shear stress and its distribution, conveyance of a channel, relation with depth; Gradually varied flow-types and governing equation, non-Prismatic channels; Hydraulic Jumps, Forced hydraulic Jump, Jump in rectangular and nonrectangular channels; Channel Controls, Transitions, Unsteady flow, Waves, Celerity of a wave, Surge, Method of characteristics, Flood Routing,

Water Resources & Planning: Project Planning, Resources Planning, System Engg. Earth and Concrete dam, Types of dams:- Rigid dams, Gravity dams, Arch and buttress dams, Basic principles of design and details of construction, Project Economic. Operation of reservoirs. Water management Policy during droughts

Irrigation & Drainage design: Soil & Soil Fertility, Water Requirement of crops, Irrigation methods, Management of Irrigation systems, Irrigation works, Water Logging, Drainage, Design of Drainage system. Salinity of soil. Salinity control. Quality of irrigation water

Ground Water Engineering: Ground water in Hydrologic cycle, Ground Water-Inventory, Flow into Well, Construction of Wells, Shallow Well, Replenishment of Ground Water, Investigation of Ground Water, Ground Water Management, Techniques of artificial recharge, Sea water intrusion into coastal aquifers, multiple well systems ground water development and management.

Water Power Engineering: Development of water power, Estimation of Hydropower potential, Comparison of Hydro, thermal and nuclear power, Flow duration curve, firm power, secondary power, Load and Load duration curves, Load factor, Classification of hydropower plants, Penstocks:- Alignment, types of penstocks, economic diameter of penstocks.

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CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

Syllabus for Entrance Examination in Ph.D. Programme 2015

Discipline: Computer Science and Engineering

Section-II

Specialization to CSE

A) Artificial Intelligence and Soft-computing: Natural Language Processing, AI v/s ANN, Neural Networks, Difference between ANN and human brain, characteristics and applications of ANN, single layer network, Perceptron training algorithm, Linear separability, Widrow& Hebb's learning rule, Delta rule, Associative Memory, Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, crisp logic, fuzzy logic, introduction & features of membership functions, fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making & Applications of fuzzy logic, GAencoding, fitness function, reproduction, Particle Swarm Optimization, Ant Colony Optimization.

B) Data Mining and Big Data: Basic Data Mining Tasks, Data Mining Issues, Data Mining Metrics, Data Mining from a Database Perspective, Clustering, Classification and prediction models, Pattern mining and association rules, Apriori principle, Mining high-frequency patterns and high-confidence rules, Interestingness measures for patterns and rules, Big data and social sensing, Big data acquisition, Web scraping, crawling, crowdsourcing, crowd-sensing, Big data technologies and platforms, basic concept of cloud computing, virtualization.

C) Digital Image Processing and Computer Vision: Image Processing and Computer Vision Background, Image Processing and Computer Vision Applications, Human Perception of Pictures, Digital Image Processing Hardware, Image Model, Amplitude digitization, Intensity Quantization, Spatial co-ordinate digitization, Image Sampling, Image Quality, Image Pixel Relationships, Linear Operators, 2-D Transforms, Spatial Domain Methods, Frequency Domain Methods, Inverse Filtering, Image Compression, Redundancy Types, Lossless and Lossy Compression, Image Compression Standards, Object Detection Methods, Edge Liking and Boundary Detection, Thresholding Methods, Region Oriented Methods. Object Representation and Description, Representation schemes, Description, Pattern Recognition, Decision Theoretic Methods for Recognition.

D) Advanced Computer Network and Security: Routing algorithms, Congestion control algorithms, Internetworking, Services and elements of Transport protocols, MANET, Introduction to Network Security, Symmetric Encryption and Message Confidentiality, Public key Cryptography and Message Authentication, Authentication Application, Electronic Mail Security, IP Security, Web Security, Network Management Security, Intruders, Malicious Software Firewalls.

E) Simulation and Modeling: Mathematical Model, types of Mathematical models and properties, Procedure of modeling, Graphical method: Barterning model, Basic optimization, Monte-Carlo simulation, Approaches to differential equation: Heun method, Local stability theory: Bernoulli Trials, Classical and continuous models, Case studies in problems of engineering and biological sciences. General techniques for simulating continuous random variables, simulation from Normal and Gamma distributions, simulation from discrete probability distributions, simulating a non – homogeneous Poisson Process and queuing system.

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CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

Syllabus for Entrance Examination in Ph.D. Programme 2015

Discipline: Information Technology

Section - II

Specialization to IT

A) Information Security and Coding: Security Models and Policies, Program Security, Malicious Software, Operating system security, Privacy and Privacy Enhancement Tools, Steganography, Social Engineering, Security threats on Social networks, digital signature schemes, Interactive Proofs, two-party secure computation, multiparty secure computation, and chosen-ciphertext security, Quantum Cryptography, entropy, relative entropy, mutual information, chain rules, data processing inequality, the asymptotic equipartition property, entropy rates for stochastic processes, arithmetic coding, discrete channels, random coding bound and converse, Gaussian channels, linear block codes and their properties, hard-decision decoding, cyclic codes, Homomorphic encryption

B) Mobile and Pervasive Computing: Cellular Wireless Networks, GSM, Architecture, Protocols, Connection Establishment Frequency Allocation, Routing, Mobility Management, Security, GPRS, Wireless LANs and PANs IEEE 802.11 Standard Architecture Services Network HyperLAN Blue Tooth WiFi WiMAX, Pervasive computing infrastructureapplications Device Technology Hardware, Humanmachine Interfaces, Biometrics, and Operating systems Device Connectivity Protocols, Security, and Device Management Pervasive Web Application architectureAccess from PCs and PDAs Access via WAP.

C) Data Science for Internet of Things: Hardware, SoC, sensors, device drivers, IoT standards, Cloud computing for IoT, Bluetooth, Bluetooth Low Energy, beacons, Introduction to Data Science, Goals of statistical graphics and data visualization, Graphs of Data, Graphs of Fitted

Models, Graphs to Check Fitted Models, Principles of graphics, Bayesian inference: combining models and data in a forecasting problem, Bayesian hierarchical modeling for studying public opinion, Bayesian modeling for Big Data, IoT datasets and APIs by application: Healthcare, Manufacturing, wearables, Energy.

D) Pattern Recognition, Image Processing and Data Mining: Pattern Recognition: Basic Concept of Pattern Recognition, Fundamental Problems in PatternRecognition Systems, Design Concepts and Methodologies, Linear Decision Functions, PatternClassification by Distance Functions, Pattern Classification by Likelihood Functions, Trainable PatternClassifiers - The Deterministic Approach.Image Processing: Digital Image Fundamentals, Image enhancement in the Spatial and Frequency, Domain, Image Segmentation, Morphological Image Processing.Data Mining and Soft Computing: Introduction to Data Mining and soft computing, what is softcomputing? Role of Fuzzy sets, neural networks, Rough Sets, Genetic Algorithm, Wavelets and theirHybridization in Data Mining, Classification and clustering in Data Mining, Multimedia Data Mining.

E) Semantic Web and Linked data: Introduction: History of Web, World Wide Web, Internet, Working Mechanism of Web, Importanceof Document on the Web, URL, IRI, Namespace, Domain.Semantic Web: What is Semantic? What is Semantic Web? Semantic Web Road Map, Comparisonbetween Semantic Web and Traditional Web, Semantic Web Layer Cake and Their Significance,Vision of Semantic Web, Short Introduction to Ontology.Preliminary Knowledge on XML, RDF, RDFa, Microdata.RDF (Resource Description Framework) & RDF Schema: Introduction to RDF, Different Features andComponents of RDF, Detail Study of RDF Class, Property, Instances, Restriction, Domain and Range ofProperties and their Use with Examples, Different Notations of RDF: RDF/XML, N3, NTRIPLES, Turtle.Ontology: What is Ontology? Different Types of Ontology (Upper Ontology, Domain Ontology etc.),Reusability of Ontology, Heterogeneity Problem among Ontologies, Discussion about the Problemand its Solution, Different Building Blocks of an Ontology (Domain Ontology).Linked Data Web and Semantic Web: Introduction to Linked Data, Relation between Linked Data andSemantic Web, Linked Data Principles and Design Consideration, Publishing Linked Data, ConsumingLinked Data, Discussion on Traditional Web of Documents and Web of Data.Introduction to Current Research and Development Work going on Semantic Web: Introduction toDifferent Stages to Develop a Complete Semantic Web Application and Linked Data, Introduction toDifferent

Available Tools.

F) Remote Sensing and GIS: Introduction – Perspectives and concept of remote sensing, special applications. GeophysicalRemote Sensing – external fields, magnetic, geophysical remote sensing: Gravity, crust dynamicsseismology. Electromagnetic spectrum; The photon, Distribution of Radiant energies, Sensortechnology, Spectral signatures- Interpretation and classification. Signatures and Sensors, ImageProcessing & Interpretation, Fundamentals of image processing, image representation, Spatialdomain and transformation domain image processing, Enhancement techniques using softcomputing tools in spatial as well as spectral domain, optimization based image processing. Featuresand classification techniques, GIS Applications, latest trends of GIS applications.

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CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

Syllabus for Entrance Examination in Ph.D. Programme 2015

Discipline: Master of Computer Application

Section - II

Specialization to Computer Application

A) Artificial Intelligence & Soft Computing: Heuristic search techniques - Generate and test, Hill climbing, Best first search, Problem reduction, Constraint satisfaction, Means-Ends Analysis. Game Playing - Minimax search procedure, adding alpha-beta cutoffs, additional refinements, Iterative deepening. Knowledge Structures - Semantic Networks, Frames, Conceptual Dependency diagrams, Scripts. Genetic Algorithms - Significance of Genetic operators, termination parameters, Evolving Neural nets, Ant Algorithms. Fuzzy Set Theory - Classical & Fuzzy set theory, Interval Arithmetic's, Operations on Fuzzy sets. Natural Language Processing - Steps in NLP, Syntactic processing, Semantic analysis, Discourse and Pragmatic processing, Statistical NLP, Spell checking.

B) Discrete Structures: Sets, Relations, Functions, Pigeonhole Principle, Inclusion-Exclusion Principle, Equivalence and partial Orderings, Elementary Counting Techniques, Probability. Models of computation – Finite Automata, Pushdown Automata, Non-determinism and NFA, DPDA and PDAs and Languages accepted by these structures. Grammars, Languages, Non-Computability and Examples of Non-computable problems. Graph- Definitions, paths, connected graphs, regular and bipartite graphs, cycles and circuits, Tree and rooted tree, Spanning tree, Hamiltonian and Eulerian graph, planar graphs.

C) Data Mining and Knowledge Discovery: Types of Data, Data Quality, Data Processing, Measures of Similarity and Dissimilarity. Overview, K-means, Agglomerative Hierarchical clustering, DBSCAN, Classification-Alternative techniques- Nearest Neighborhood classifier, Bayesian Classifier, Support Vector Machines: Linear SVM, Separable and Non Separable case. Cluster Evaluation- Overview, Un- supervised Cluster evaluation using cohesion and separation, using the proximity matrix, Scalable clustering algorithms. Web Data mining- Web terminology and characteristics, web content mining, web usage mining, web structure mining, Search Engines: Characteristics, Functionality, Architecture, Ranking of web pages, Enterprise search.

D) Software Engineering: System Development Life Cycle (SDLC) – Steps, Water fall model, Prototypes, Spiral Model. Software Metrics, Software Project Management. Software Design – System design, detailed design, and function oriented design, object oriented design, user interface design, design level metrics. Coding and Testing – Testing level metrics, Software quality and reliability, clean room approach. Software re-engineering.

E) Semantic Web and Linked data: Introduction: History of Web, World Wide Web, Internet, Working Mechanism of Web, Importance of Document on the Web, URL, IRI, Namespace, Domain. Semantic Web: What is Semantic? What is Semantic Web? Semantic Web Road Map, Comparison between Semantic Web and Traditional Web, Semantic Web Layer Cake and Their Significance, Vision of Semantic Web, Short Introduction to Ontology. Preliminary Knowledge on XML, RDF, RDFa, Microdata. RDF (Resource Description Framework) & RDF Schema: Introduction to RDF, Different Features and Components of RDF, Detail Study of RDF Class, Property, Instances, Restriction, Domain and Range of Properties and their Use with Examples, Different Notations of RDF: RDF/XML, N3, NTRIPLES, Turtle. Ontology: What is Ontology? Different Types of Ontology (Upper Ontology, Domain Ontology etc.), Reusability of Ontology, Heterogeneity Problem among Ontologies, Discussion about the Problem and its Solution, Different Building Blocks of an Ontology (Domain Ontology). Linked Data Web and Semantic Web: Introduction to Linked Data, Relation between Linked Data and Semantic Web, Linked Data Principles and Design Consideration, Publishing Linked Data, Consuming Linked Data, Discussion on Traditional Web of Documents and Web of Data. Introduction to Current Research and Development Work going on Semantic Web: Introduction to Different Stages to Develop a Complete Semantic Web Application and Linked Data, Introduction to Different Available Tools.

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CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

Syllabus for Entrance Examination in Ph.D. Programme 2015

Discipline: Electrical Engineering, Electrical and Electronics Engineering

Section - II

Specialization

A) Power Systems:

Modern power system operation and control, static and dynamic modeling, Load flow studies, transient stability and small signal stability of large power systems, Voltage stability: P-V and Q-V curves, static analysis, sensitivity and continuation power flow method. Introduction to optimization techniques, economic load dispatch of thermal and hydro-thermal plants, loss formula, real and reactive power optimization, optimal power flow, unit commitment, power system security constrained optimization, load-frequency control, energy control centers and power system state estimation.

Bus impedance and admittance matrices; load flow; voltage control; power factor correction; economic operation; symmetrical components; fault analysis; principles of over-current, differential and distance protection; solid state relays and digital protection; circuit breakers; system stability concepts, swing curves and equal area criterion; HVDC transmission.

B) Electrical Machines:

Single phase transformer - equivalent circuit, phasor diagram, tests, regulation and efficiency; three phase transformers- connections, parallel operation; auto-transformer; energy conversion principles. DC machines - types, windings, generator characteristics, armature reaction and commutation, starting and speed control of motors; Three phase induction motors - principles, types, performance characteristics, starting and speed control; single phase induction motors.

Synchronous machines - performance, regulation and parallel operation of generators, motor starting, characteristics and applications Servo and Stepper motors.

C) Control Systems & Instrumentation:

Transient and steady state analysis of LTI control systems and frequency response. Tools and techniques for LTI control system analysis and design: Routh Hurwitz criterion, Root loci, Bode plots. Elements of Proportional Integral Derivative (PID) control. State variable representation and solution of state equation of LTI control systems. Controllability and observability. Pole placement by state feedback.

Static and dynamic characteristics of measurement systems, first order and second order systems, error analysis; electromechanical indicating instruments: AC/DC current and voltage meters, loading effect, extension of instrument ranges, measurement of power and energy; instrument transformers. AC & DC bridges; resistive, capacitive, inductive transducers, and their signal conditioning; digital voltmeter and multimeter, oscilloscope, frequency counter; analog-to-digital and digital-to-analog converters.

D) Power Electronics & Electric Drive:

Operating characteristics of power semi-conductor devices, principle of operation of single and three phase ac-dc line commutated converters, introduction to unity power factor converters. Principle of operation dc-dc (buck, boost, buck-boost, fly-back and forward) converters. Principle of operation single phase and three phase dc-ac converters, PWM techniques, basis concepts of adjustable speed dc and ac drives.

E) Soft Computing:

Artificial Neural Networks (ANN): Artificial Neural Networks, Building Blocks of ANN. ANN Terminologies: Architecture, Setting of Weights, Activation Functions, Mcculloch- Pitts Neuron Model, Hebbian Learning Rule, Perception Learning Rule, Delta Learning Rule. Fuzzy Systems: Fuzzy System: Fuzzy Sets, Properties and Operations - Fuzzy Relations, Cardinality, Operations and Properties of Fuzzy Relations, Fuzzy Composition; Fuzzy Variables, Types of Membership Functions. Genetic Algorithm (GA): Biological Terminology, Elements of GA: Encoding, Types of Selection, Types of Crossover, Mutation, Reinsertion, Theoretical Foundation: Schema, Fundamental Theorems of GA.

F) Advanced Signal Processing and Applications (Exclusively for Electrical and Electronics Engineering):

Discrete time signals and systems, Convolution and frequency response. Discrete time Fourier and z-transforms. Properties, analysis of discrete time systems. The DFT, definition and properties, circular convolution calculation, FFT transform. Relationship between continuous and discrete time systems: sampling time and frequency normalization, discrete time processing of continuous time signals. Difference equation for digital filters definition and properties. FIR filters, IIR filters, Digital filter design techniques: impulse invariance, Bilinear transformation, finite difference, window design methods, introduction to multirate DSP, decimation and interpolation, polyphase decomposition. Adaptive signal processing: time adaptive systems, LMS algorithm. Recursive least squares (RLS) algorithms, least square lattice (LSL) algorithm.

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CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

Syllabus for Entrance Examination in Ph.D. Programme 2015

Discipline: Electronics and Instrumentation Engineering

Section - II

Specialization

A) Process Instrumentation and Process Control:

Process characteristics: Incentives for process control, Process Variables types and selection criteria, Process degree of freedom, The period of Oscillation and Damping, Characteristics of physical System: Resistance, Capacitive and Combination of both. Elements of Process Dynamics, Types of processes- Dead time, self-Regulating /non self regulating, Linear/non linear, and Selection of control action. Study of Liquid Processes, Gas Processes, Flow Processes, Thermal Processes.

Analysis of Control Loop: Steady state gain, Process gain, Valve gain, Process time constant, Variable time Constant, Transmitter gain. Analysis of Flow Control, Pressure Control, Liquid level Control, Temperature control, SLPC-features, faceplate, functions, MLPC- features, faceplate, functions, SLPC and MLPC comparison.

Review of Systems: Review of first and higher order systems, closed and open loop response. Response to step, impulse and sinusoidal disturbances. Transient response. Block diagrams. Stability Analysis: Frequency response, design of control system, controller tuning and process identification. Bode and Nyquist stability criterion. Special Control Techniques: Advanced control techniques, cascade, ratio, feed forward, adaptive control, Smith predictor, internal model control. Multivariable Control Analysis: Introduction to state-space methods, Control degrees of freedom analysis and analysis, Interaction, Bristol arrays, Niederlinski index - design of controllers, Tuning of multivariable controllers.

B) Industrial Instrumentation and Automation:

Introduction to Industrial Automation, Role of automation in industries, Introduction to the types of manufacturing industries, Introduction to type of automation system, Benefits of automation. Introduction to Automation pyramid, Introduction to automation tools like PAC, PLC, SCADA, DCS, Hybrid DCS with reference to automation pyramid, Comparison of PLC, PAC,

and SCADA on the basis of Performance criteria Control system audit, Performance criteria, Development of User Requirement Specifications (URS) for automation. Functional Design Specifications (FDS) for automation tools.

C) Process Modeling and Simulation:

Mathematical models for chemical engineering systems: Introduction, Use of mathematical models, Scope of coverage, Principles of formation, Fundamental laws, Continuity equation, Energy equation, Equations of motions, Transport equations, Equations of state, Equilibrium, Chemical kinetics. Examples of mathematical models of chemical engineering systems: Introduction, Series of isothermal, constant hold up CSTRs, CSTRs with variable hold-ups, Two heated tanks, Gas phase pressurized CSTR, Non-isothermal CSTR, Single component vaporizer, Multi-component flash drum, Batch reactor, Reactor with mass transfer, Ideal binary distillation: Batch distillation with holdup, pH systems. General Concepts of Simulation for Process Design: Introduction, Process simulation models, Methods for solving non-linear equations, Recycle partitioning and tearing, Simulation examples. Computer simulation: Simulation examples, Gravity flow tank, Three CSTRs in series, Non-isothermal CSTR, Binary distillation column, Multi-component distillation column, Batch reactor.

D) Biomedical Signal Processing:

Acquisition, Generation of Bio-signals, Origin of bio-signals, Types of bio-signals, Study of diagnostically significant bio-signal parameters Electrodes for bio-physiological sensing and conditioning, Electrode-electrolyte interface, polarization, The electrode skin interface and motion artifact, biomaterial used for electrode, Types of electrodes (body surface, internal array of electrodes, microelectrodes), Practical aspects of using electrodes Acquisition of bio-signals (signal conditioning) and Signal conversion (ADC's DAC's) Processing, Digital filtering, Biomedical signal processing by Fourier analysis, Biomedical signal processing by wavelet (time-frequency) analysis (Computation of signal parameters that are diagnostically significant), Classification of signals and noise, stationary random signals and non-stationary signals, Principle component analysis, Correlation and regression, Analysis of chaotic signals Application areas of Bio –Signals analysis EEG- frequency component analysis, ECG- QRS detection, R amplitude, interval detection, Phonocardiogram- heart valve disorders etc, EMG analysis.

Sampling theorem, z-transforms, linear shift invariant systems, Correlation and convolution, Signal flow graphs for digital networks, Canonical forms -Design of digital filters -IIR and FIR filters. Image Processing: Acquisition, Image representation, Sampling and Quantization, Histograms, Image Quality, Noise in Images, Image enhancement: Histogram equalization and Contrast Enhancement.

E) Transducer Design and Optical Instrumentation:

Review of transducers for various parameters like temperature, pressure, flow, level, humidity, acceleration, vibration, density etc. Design considerations and selection criterion as per standards, Sensor fabrication techniques, process details, and latest trends in sensor fabrication, fiber optics sensors, electromechanical sensors, Solid state chemical sensors, Bio-sensors, Piezo-resistive sensors, characterization of sensors, effect of sensors on process identification, signal conditioning techniques.

Optical fiber waveguide - total internal reflection, and electromagnetic mode theory of optical propagation, cylindrical fiber, manufacturing of optical fiber. Transmission characteristics of optical fiber -Attenuation, material absorption losses, scattering losses, nonlinear and linear scattering, dispersion, intermodal dispersion, dispersion modified single mode fiber, dispersion flattened fibers, polarization, nonlinear phenomena. Optical sources and detectors - Optical fiber sensors -Introduction to fiber optics sensors, sensors based on intensity modulation, application of optical fiber for displacement, strain, stress and pressure measurement. Active multimode FO sensors, micro-bend optical fiber sensors, current sensors, phase modulated, polarization modulated optical fiber sensors, fiber optic gyroscope. LASER applications - Introduction, application of LASER in biomedical instrumentation, LASER interferometry, performance parameters, LASER telemeters, measurement of distance, LIDAR, holography: basic principle of holography, measurement of strain, stress, bending moments and vibrations using hologram.

F) Soft Computing:

Artificial Neural Networks: Building Blocks of ANN. ANN Terminologies: Architecture, Setting of Weights, Activation Functions, Mcculloch - Pitts Neuron Model, Hebbian Learning Rule, Perception Learning Rule, Delta Learning Rule. Fuzzy System: Fuzzy Sets, Properties and Operations - Fuzzy Relations, Cardinality, Operations and Properties of Fuzzy Relations, Fuzzy Composition; Fuzzy Variables, Types of Membership Functions. Genetic Algorithms: (GA): Biological Terminology, Elements of GA: Encoding, Types of Selection, Types of Crossover, Mutation, Reinsertion, Theoretical Foundation: Schema, Fundamental Theorems of GA.

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CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

Syllabus for Entrance Examination in Ph.D. Programme 2015

Discipline: Electronics and Telecommunication Engineering

Section - II

Specialization

A) Electronics:

Carrier transport in silicon: diffusion current, drift current, mobility, and resistivity. Generation and recombination of carriers. p-n junction diode, Zener diode, tunnel diode, BJT, JFET, MOS capacitor, MOSFET, LED and photo diode, Basics of LASERs. Device technology: integrated circuits fabrication process, oxidation, diffusion, ion implantation, photolithography, n-tub, p-tub and twin-tub CMOS process.

Small Signal Equivalent circuits of diodes, BJTs, MOSFETs and CMOS. Simple diode circuits, clipping, clamping, rectifiers. Biasing and bias stability of transistor and FET. Amplifiers: Low and High frequency single-and multi-stage amplifiers, differential and operational, feedback amplifiers, Sinusoidal oscillators; criterion for oscillation and power amplifiers. Frequency response of amplifiers. Simple Operational Amplifier (Op-amp) circuits, Function generators and wave shaping circuits, 555 Timers.

B) Communication Systems:

Random signals and noise: probability, random variables, probability density function, autocorrelation, power spectral density. Analog communication systems: amplitude and angle modulation and demodulation systems, spectral analysis, realizations of analog communication systems; signal-to-noise ratio (SNR) calculations for amplitude modulation (AM) and frequency modulation (FM) for low noise conditions. Basics of information theory and channel capacity theorem. Digital communication systems: pulse code modulation (PCM), differential pulse code modulation (DPCM), digital modulation schemes: amplitude, phase and frequency shift keying schemes (ASK, PSK, FSK), matched filter receivers, bandwidth consideration and probability of error calculations for these schemes. Fundamentals of TDMA, FDMA and CDMA and GSM.

Microwave Tubes and Amplifiers, Principle of working of Radar and Satellite Communication, Basics of Optical Communications, Computer networking, Network management and Mobile communication.

C) Digital System Design & VLSI Design:

Boolean algebra, minimization of Boolean functions; logic gates; digital IC families (DTL, TTL, ECL, MOS, CMOS). Combinatorial circuits: arithmetic circuits, code converters, multiplexers, decoders, PROMs and PLAs. Sequential circuits: latches and flip-flops, counters and shift-registers. Sample and hold circuits, ADCs, DACs. Semiconductor memories. Microprocessor (8085, 8086 & 80386) Microcontroller 8051: architecture, programming, memory and I/O interfacing. Real time systems, ARM Processor and controller, Real Time & Database Applications, Microcomputer Embedded System Design, Software Development and Tools for Embedded system, PIC Microcontroller and Interfacing.

Solid State Devices; MOS Circuit design and Layout & Simulation, CMOS Digital Circuit Design, Design of Semiconductor Memories, Mixed Signal and RF Circuit Design, ASIC. Basic MOS Physics and Equivalent Circuits and their Models, VLSI Design Methodologies, Low Power VLSI Design, MEMS and IC Integration , VLSI Design Rules, Floor Planning, MOS Transistor Principles and CMOS Inverter, Combinational Logic Circuits, Arithmetic Building Blocks and Memory Architectures, Interconnect and Clocking Strategies, MOSFET Devices, Nano-Scaled Classical MOSFETs, Non-Classical MOSFETs, Compact Models For Circuit Simulators ,Hardware Descriptive Language .

D) Signal and Image Processing:

Definitions and properties of Laplace transform, continuous-time and discrete-time Fourier series, continuous-time and discrete-time Fourier Transform, DFT and FFT, z-transform. Sampling theorem. Linear Time-Invariant (LTI) Systems: definitions and properties; causality, stability, impulse response, convolution, poles and zeros, parallel and cascade structure, frequency response, group delay, phase delay. Signal transmission through LTI systems. Analog filter design – IIR filter Design & FIR Filter Design. Multi-rate Signal Processing and its Applications

Digital Image Fundamentals, Image Transforms, Image Enhancement- Spatial and Frequency Domain, Image Restoration, Image Segmentation, Image Compression, Computer Vision.

E) Microwave Engineering:

Electrostatics; Maxwell's equations: differential and integral forms, boundary conditions, wave equation, Pointing vector; Plane waves and properties: reflection and refraction, polarization, phase and group velocity, propagation through various media, skin depth; Transmission lines: equations, characteristic impedance, impedance matching, impedance transformation, S-parameters, Smith chart; Waveguides: modes, boundary conditions, cut-off frequencies, dispersion relations. Antenna: types and radiation effects.

F) Soft Computing:

Artificial Neural Networks (ANN): Artificial Neural Networks, Building Blocks of ANN. ANN Terminologies: Architecture, Setting of Weights, Activation Functions, Mcculloch- Pitts Neuron Model, Hebbian Learning Rule, Perception Learning Rule, Delta Learning Rule.
Fuzzy Systems: Fuzzy System: Fuzzy Sets, Properties and Operations - Fuzzy Relations, Cardinality, Operations and Properties of Fuzzy Relations, Fuzzy Composition; Fuzzy Variables, Types of Membership Functions.
Genetic Algorithm (GA): Biological Terminology, Elements of GA: Encoding, Types of Selection, Types of Crossover, Mutation, Reinsertion, Theoretical Foundation: Schema, Fundamental Theorems of GA.

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CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

Syllabus for Entrance Examination in Ph.D. Programme 2015

Discipline: Mechanical Engineering

Section - II

Specialization

A: DESIGN STREAM

ADVANCED MECHANICS OF SOLIDS-Introduction to Three Dimensional Theory of Elasticity Plane stress and Plane strain problems, Differential Equations of equilibrium, strain-displacement relations in Cartesian and polar co-ordinates, Boundary conditions, Shear centre, Torsion.

ADVANCED THEORY OF MECHANISMS- Kinematics: Review of determination of velocity and acceleration of points and links in mechanisms- Analytical and graphical methods, Synthesis of Mechanisms, Analysis of Cams: Basic curves, pressure, angle-Cam size determination-Cam profile determination-Analytical and graphical. Static and Dynamic Force Analysis: Forces, Couples. Conditions of equilibrium- Free body diagram. Analysis of 4-bar linkage, slider crank mechanisms,

VIBRATION: Introduction, Fundamentals of system modeling, Free Vibration, Forced Vibration, Transient Vibration, Two Degree of Freedom Systems, Multi Degree of Freedom System. Dynamic balancing and alignment of machinery: Dynamic Balancing of Rotors, Field Balancing in one Plane, two Planes, and in several Planes.

TRIBOLOGY- Friction: Types of friction - dry-boundary and fluid-laws of friction and friction theories Variables in friction, theories of wear - stages of wear, Lubrication: Role of

lubrication Lubricants, Hydrodynamic bearings, Hydrostatic bearings, rolling element bearings.

DESIGN ENGINEERING- Design Fundamentals, , Design considerations – material selection, functional design, cost analysis. Fatigue considerations in design - fatigue in materials – fracture mechanics approach to fatigue – theories of fracture, Introduction to reliability in design – reliability function, failure data analysis, failure distribution functions, MTTF/MTBF, hazard rate and models, methods of improving reliability, reliability testing.

OPTIMIZATION TECHNIQUES: Introduction to Optimization, Formulation and Solution methodologies, Single variable optimization, Multivariable optimization with no constraints, with equality constraints and with inequality constraints. Kuhn-Tucker conditions, Lagrange multiplier method. Introduction to integer programming – Gomory's cutting plane method, branch and bound method.

FINITE ELEMENT METHOD- Basic concepts of FEM – a general procedure for finite element analysis, Truss structures: The direct stiffness method, Flexure - elements – elementary beam theory, flexure element, flexure element stiffness matrix and element load vector, Interpolation function for general element formation, one dimensional elements, triangular elements, rectangular elements, three dimensional elements.

B: THERMAL STREAM

ADVANCED THERMODYNAMICS: Reversible work - availability - irreversibility and second – law efficiency for a closed system and steady – state control volume. Availability analysis of simple cycles. Thermodynamic potentials. Different equations of state – fugacity – compressibility - principle of corresponding States - fugacity coefficient, Thermochemistry - First law analysis of reacting systems - Adiabatic flame temperature – entropy change of reacting systems.

ADVANCED ENGINEERING FLUID MECHANICS: Three dimensional continuity equation - differential and integral forms – equations of motion momentum and energy and their engineering applications.Rotational and irrorational flows, Laminar and turbulent Flow, Boundary Layer.

ADVANCED HEAT TRANSFER : One dimensional energy equations and boundary condition - three-dimensional heat conduction equations . radiation in gases and vapour, Momentum and energy equations - turbulent boundary layer heat transfer, heat exchanger , NTU approach

REFRIGERATION & AIR CONDITIONING SYSTEM DESIGN:

Estimation of Solar Radiation : Introduction to cooling and heating load calculations, Solar radiation, Solar geometry ,Selection of Air Conditioning Systems: Introduction to thermal distribution systems and their functions, Selection criteria for air conditioning systems, Classification of air conditioning systems.

Design of Air Conditioning ducts.

COMPUTATIONAL FLUID DYNAMICS HEAT TRANSFER: Conservation equation mass momentum and energy equations convective forms of the equations and general description. Numerical grid generation basic ideas transformation and mapping. Solution of finite difference equations iterative methods matrix inversion methods ADI method operator splitting fast Fourier transform applications.

C: PRODUCTION STREAM

THEORY OF METAL CUTTING: Mechanics of Metal Cutting, Tool Life and Tool Wear, Single Point Cutting Tool, Multipoint Cutting Tool, Grinding, Cutting Temperature, Cutting tool materials Cutting fluids.

ADVANCED MANUFACTURING PROCESSES: Non-Traditional Machining.

ADVANCED METAL FORMING: Fundamentals of Metal Forming, Rolling of metals, theories of cold and hot rolling, defects in rolling, Forging, forging defects, Extrusion Analysis of Extrusion process, defects in extrusion, Drawing, Sheet Metal forming.

ADVANCED CASTING AND WELDING TECHNOLOGIES: Laser Beam Welding, Friction Stir Welding, Electron Beam Welding, Ultrasonic Welding, Investment casting, shell moulding, squeeze casting, vacuum casting, counter-gravity flow-pressure casting, directional and monocrystal solidification, squeeze casting, semisolid metal casting, rheocasting.

ADVANCED CAD: Introduction To Cad,Geometric, Modelling:Synthetic Curves, Surface Modeling, Synthetic Surface, Advanced Surfaces, Transformations, 3-D Modelling, Design Applications.

COMPUTER AIDED MANUFACTURING: Compute-Aided Programming, Automatic Tool Path generation, Tooling for CNC Machines- Interchangeable tooling system, Adaptive control of machining processes like turning, grinding.

QUALITY ENGINEERING IN MANUFACTURING: Quality Value and Engineering, Tolerance Design and Tolerancing, Analysis of Variance (ANOVA), Orthogonal Arrays, ISO-9000 Quality System.

OPERATION RESEARCH: Linear programming, simplex method, transportation and assignment models PERT and CPM.

FINITE ELEMENT TECHNIQUES: Introduction to Finite Element Method, Stress and Equilibrium. Boundary conditions, Strain-Displacement relations, Stress-strain relations.

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CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

Syllabus for Entrance Examination in Ph.D. Programme 2015

Discipline: Chemical Engg.

Section - II

Specialization

A) Process Calculations and Thermodynamics: Laws of conservation of mass and energy; use of tie components; recycle, bypass and purge calculations; degree of freedom analysis. First and Second laws of thermodynamics. First law application to close and open systems. Second law and Entropy Thermodynamic properties of pure substances: equation of state and departure function, properties of mixtures: partial molar properties, fugacity, excess properties and activity coefficients; phase equilibria: predicting VLE of systems; chemical reaction equilibria.

B) Fluid Mechanics and Mechanical Operations: Fluid statics, Newtonian and nonNewtonian fluids, Bernoulli equation, Macroscopic friction factors, energy balance, dimensional analysis, shell balances, flow through pipeline systems, flow meters, pumps and compressors, packed and fluidized beds, elementary boundary layer theory, size reduction and size separation; free and hindered settling; centrifuge and cyclones; thickening and classification, filtration, mixing and agitation; conveying of solids.

C) Heat and Mass Transfer: Conduction, convection and radiation, heat transfer coefficients, steady and unsteady heat conduction, boiling, condensation and evaporation; types of heat exchangers and evaporators and their design. Fick's laws, molecular diffusion in fluids, mass transfer coefficients, film, penetration and surface renewal theories; momentum, heat and mass transfer analogies; stage wise and continuous contacting and stage efficiencies; HTU & NTU concepts design and operation of equipment for distillation, absorption, leaching, liquid-liquid extraction, drying, humidification, dehumidification and adsorption.

D) Chemical Reaction Engineering: Theories of reaction rates; kinetics of homogeneous reactions, interpretation of kinetic data, single and multiple reactions in ideal reactors, non-ideal reactors; residence time distribution, single parameter model; non-isothermal reactors; kinetics of heterogeneous catalytic reactions; diffusion effects in catalysis.

E) Instrumentation and Process Control: Measurement of process variables; sensors, transducers and their dynamics, transfer functions and dynamic responses of simple systems, process reaction curve, controller modes (P, PI, and PID); control valves; analysis of closed loop systems including stability, frequency response and controller tuning, cascade, feed forward control.

F) Plant Design and Economics: Process design and sizing of chemical engineering equipment such as compressors, heat exchangers, multistage contactors; principles of process economics and cost estimation including total annualized cost, cost indexes, rate of return, payback period, discounted cash flow, optimization in design.

G) Chemical Technology: Inorganic chemical industries; sulfuric acid, NaOH, fertilizers (Ammonia, Urea, SSP and TSP); natural products industries (Pulp and Paper, Sugar, Oil, and Fats); petroleum refining and petrochemicals; polymerization industries; polyethylene, polypropylene, PVC and polyester synthetic fibers.

H) Statistics & Research Aptitude Mean, median, mode, basic concepts of probability, coefficient of variance, standard error, standard deviation, and correlation and regression analysis. Student t-test, F-test, analysis of variance (ANOVA), data graphics and data interpretation. Principles and various models of statistical optimization techniques, optimization software's. National and international scenario of scientific research, literature reviewing, reference citation, scientific and research journals, impact valuation, research article and patent drafting, various scientific websites, abstracts.

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CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

Syllabus for Entrance Examination in Ph.D. Programme 2015

Discipline: Management

Section - II

Specialization

A: Behavioural Science

- **Understanding Organizational Behaviour** - Fundamental Concepts, Organizational processes, Organizational structure, Organizational Change and Innovation processes. **Effectiveness in organizations** - Models of Organizational Behaviour, Systems theory and time dimension of effectiveness, Developing competencies, Limitations of Organizational Behaviour, Continuing challenges.
- **Individual differences and work behaviour** - Why individual differences are important, The basis for understanding Work Behaviour, Individual differences influencing Work Behaviour. **Personality** - Sources of personality differences, Personality structure, Personality and Behaviour, Measuring Personality **Attitudes** - The nature of Employee Attitudes, Effects of Employee Attitudes, Studying Job satisfaction, Changing Employee Attitudes. **Perceptions, Attributions and Emotions** - The perceptual process ,Perceptual grouping, Impression management, Emotions, Emotional Intelligence
- **Job Design, Work and Motivation** - Job design and quality of work life, A conceptual model of job design, Job performance outcomes. **Evaluation, Feedback and Rewards** - Evaluation of Performance, Performance Evaluation feedback, Reinforcement theory A model of Individual rewards, Rewards Affect Organizational concerns, Innovative reward system. **Managing misbehaviour** - The emergence in Management of the study of misbehaviour, Selected misbehaviours. **Stress and Counselling** - What is stress?, Stress model, Work stressors, Stress outcomes, Stress moderators, Stress prevention and management, Employee counselling, Types of counselling
- **Informal and Formal Groups** - Group Dynamics, The nature of informal, Organizations, Formal groups. **Teams and Team Building** - Organizational context for teams, Teamwork, Team building. **Managing Conflict and Negotiation** - Conflict in Organizations, A contemporary perspective on intergroup conflict, What causes ntergroup conflict, **Power and Politics** - The concept of power, Sources of power, Interdepartmental power, Illusion of power, Political strategies and tactics, Ethics,

power and politics, Using power to manage effectively. **Empowerment and Participation** - The nature of empowerment and participation,

- **Communication** - Communicating within organizations, Information richness, **Decision Making** - Types of decisions, A Rational Decision-making Process, Behavioural influences on decision making, Group decision making, Creativity on group decision making. **Leadership** - What is leadership, Trait approaches, Behavioural approaches, Situational approaches, Other perspectives, concepts and issues of leadership.
- **Organizational Structure and Design** - Designing an organizational structure, Division of labour, Delegation of authority, Departmental biases, Span of control. **Managing Change and Innovation** - Change at work, Resistance to change, Alternative change management approaches, Learning principles in change management, **Organizational behaviour across cultures** - Conditions affecting multinational operations, Managing International Workforce.

B: Entrepreneurship

The Entrepreneurial Development Perspective: Concept of Entrepreneurship and Development, Conceptual models of entrepreneurship Role of Entrepreneur in Indian economy and developing economies Tiny & SME & Its Contribution in the National Economy; Corporate Entrepreneurship
Entrepreneurial team – matching human resources needs and skills. Identifying business opportunities and planning for business service & production. Business promotion – process – stages – facilities and incentives. Creating Entrepreneurial Venture, Business Planning Process, Environmental Analysis – Search and Scanning; Identifying; Stages in starting the new venture. Project Management a) Meaning, Objectives and How to choose a project b) Technical, Financial, Marketing, Personnel Feasibility c) Estimating and Financing Funds requirement. Schemes offered by various commercial banks and financial institutions.

Role of Central Govt. and State Govt. in Promoting Entrepreneurship; Introduction to various incentives, subsidies and grants, Promotion of Export oriented units; Fiscal and Tax concessions Role of Govt.

Problems of Entrepreneurs- Marketing, Finance, Human Resource, Production, Research and External Problems, beginning and growth as a entrepreneur.

C: FINANCE MANAGEMENT

- **Management Accounting:** Nature and scope of costing; Cost concepts and Classifications; Usefulness of Costing to Managers, **Marginal costing:** Break—even analysis, decision involving alternative choices. **Budgeting:** Types of budgets and their

preparation, Performance budgeting and Zero-base budgeting. **Ratio analysis:** Liquidity, profitability and solvency.

- **Financial management:** Objectives of financial management; Time value of money, sources of finance, **Investment decisions:** Importance, Difficulties determining cash flows, methods of capital budgeting **Risk analysis :** Cost of capital; Concept and importance, Computations of cost of various sources of finance; Weighted Average Cost of Capital; **Capital Structure decisions**; Theories of capital structure, Factors determining capital structure.

- **Stock Market:** Introduction to Indian Stock Market, scope and features of an investment program, investment risk, interest risk, market risk, inflation risk, default risk, systematic and unsystematic risk, problems related to risk and return. **Corporate Risk Management**: Introduction and overview.

- **Corporate Finance:** Basic Concepts; Valuation Methods; Value Creation and New Valuation Tools; Alternative Valuation Approaches to Specific Cases. Optimum capital structure; **Management of working capital** - Cash, Receivables and Inventory Management, Internal Financing and Dividend Policy; Financial Modeling.

- **Taxation:** introduction, basic concepts and theories, direct taxation and Indirect taxation, tax management.

- **Banking and Insurance:** concepts of banking institutions and insurance policies and products in the market. Overview of Indian financial systems and insurance markets, basic issues in banking, regulations in banking and insurance.

- **Foreign exchange market:** introduction and overview of Structure, types of transactions, International monetary system: Introduction, exchange rate regimes,

- **Derivatives** its introduction & meaning, Characteristics, Types, Derivative Market in India, Functions of Derivative Market, Significance of Derivatives, Traders in Derivatives Market.

D: Human Resource Management

Human Resource Management – Significance; Objectives, Function; A Diagnostic Model; External And Internal Environment. Forces And Influences; Organizing HRM Function

Recruitment And Selection- Sources Of Recruits; Recruiting Methods; Selection Procedure; Selection Tests; Placement And Follow Up.

Performance Appraisal System- Importance And Objectives; Techniques Of Appraisal System; New Trends In Appraisal System.

Evaluation Of Performance For Development-Competency Mapping;

Development Of Personnel- Objectives; Determining Needs; Methods Of Training And Development Programmes; Evaluation.

Human Resource Development- HRD Structure; Functions; Systematic approach to Needs Assessment; Training Program Design; Evaluating HRD Programs; Evaluation Process; Training Outcomes; Potential Legal Issues Related To Training; Cross-Cultural Training; The Future Of Training And Development

Career Planning and Development – Concept of Career; Career Planning and Development Methods.

Compensation And Benefits- Job Evaluation Techniques; Wage And Salary Administration; Fringe Benefits; Human Resource Records And Hr Audit.

Employee Discipline- Importance; Causes and Forms; Disciplinary Action; Domestic Enquiry.

Grievance Management- Importance; Process and Practices; Employee Welfare and Social Security Measures.

Labour and Social Security Laws- The Employees Provident Fund & Miscellaneous Provisions Act, 1952; Employees State Insurance Act, 1948; Factories Act, 1948; Payment Of Gratuity Act, 1972; Employee's Compensation Act, 1923; Maternity Benefit.

Industrial Relations- Importance; Industrial Conflicts; Causes; Dispute Settlement Machinery. Trade Unions – Importance of Unionism; Union Leadership; National Trade Union Movement. Collective Bargaining – Concept; Process; Pre Requisites; New Trends in Collective Bargaining.

Industrial Democracy and Employee Participation – Need for Industrial Democracy; Prerequisites for Industrial Democracy; Employee Participation – Objectives; Forms Of Employee Participation.

Future of HRM – Six Sigma Practices; Flexible Work Options, Virtual Organization.

E: Marketing Management

- **Marketing:** Introduction & overview; Marketing philosophies; Marketing management process; Concept of marketing mix.

- **Consumer Behavior**: Introduction & overview; factors influencing consumer-buying behavior; consumer-buying process; The consumer research paradigms and process; **Consumerism**

- **Marketing Research**: Introduction & overview; Marketing research Process; Applications of Marketing Research.

- **Distribution & Inventory Management**: Introduction & overview; Marketing Channels: Defining and importance; Functions of marketing channels.

- **Industrial Marketing**: Introduction; Overview & Functional Applications.

- **Services Marketing**: Introduction & Overview; Growth of service sector economy; Classification of service marketing mix; Service Quality Gap Model; **Event Management; Hospitality & Hotel Management**.

- **Advertising and Sales Promotion**: Integrated marketing communications concepts; Basics of Advertising; Creativity strategy; Sales Promotion.

- **Sales Management**: Introduction & overview; Selling Skills; Selling process; Sales Force management.

- **Customer Relationship Management**: Introduction & overview; Types of CRM; CRM Strategies & Models.

- **Retail Marketing**: Basics; Retail Format & Types; Supply Chain Management; Software for Merchandise.

- **Rural & Agro Marketing:** Rural Market; Rural Marketing Index; Agri Business & Marketing; Government support to Agri Business.

- **International Business Marketing**: Theories of international trade; Role of multinationals, Trade Policies, Balance of Payment, Trade Deficits, Regulatory framework, tariffs & quotas

- **Social Marketing**: Introduction & overview; Working on Non-Profit organization; NGOs.

- **Social Media & Internet Marketing:** Internet Age of marketing; Data Mining in Marketing; Social Media Marketing; Online marketing.

- **Travel & Tourism Marketing**: Changing facets of Tourism; Tourism Development; Travel Agency and Tour Operator

- **Product& Brand Management**: Product Management; Product Strategy; PLC; Branding; Brand Equity.

- **Corporate Communications**: Media Relations; Management and Surveillance; Web based Communications.

- **Direct & Network Marketing:** Introduction; Overview; Functional Applications.

- **Green Marketing:** Introduction; Overview; Functional Application.

F: Operation and Production Management

Deterministic Model in Operation research-Linear Programming (Graphical Method, Simplex method, Duality Theory, Sensitivity Analysis),Network Flow (CPM),Transportation Model, Assignment Model

Probabilistic Models in Operation Research-Probability Theory, Decision Theory, Network Flow (PERT), Queuing Model, Simulation Techniques

Game Theory, Integer Programming, Dynamic Programming, Non linear Programming

Role and Scope of Production Management; Facility Location; Layout Planning and Analysis; Production Planning and Control – Production Process Analysis; Demand Forecasting for Operations; Determinants of Product mix; Production Scheduling; Work measurement; Time and Motion Study; Statistical Quality Control.

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CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

Syllabus for Entrance Examination in Ph.D. Programme 2015

Discipline: Applied Chemistry

Section –II

Specialization

A: Reaction dynamics and surface chemistry

Reaction Kinetics: Introduction, Rates of chemical reactions, Methods of determining rate laws, Mechanisms of chemical reactions and steady state approximation, Laws of photochemistry, Kinetics of photochemical and composite reactions, Chain and oscillatory reactions, Collision and transition state theories, Stearic factor, Treatment of unimolecular reactions, Ionic reactions: salt effect. Homogeneous catalysis and heterogeneous catalysis, free radical polymerization, enzyme catalysis, and reaction dynamics. Effect of pressure on reaction rate, Kinetics of catalytic reactions, Kinetics of surface reaction, autocatalysis, unimolecular and bimolecular surface reaction.

Fast Reaction: Luminescence and Energy transfer processes, Study of kinetics by stopped-flow technique, Relaxation method.

Adsorption: Surface tension, Capillary action, Gibbs adsorption isotherm, Estimation of surface area (BET equation), Surface films on liquids (Electro-kinetic phenomenon), Catalytic activity at surfaces.

Properties and stability of colloids, Surface active agents, Reverse micelles, Critical micellar concentration (CMC), Factors affecting the CMC of surfactants, Thermodynamics of micellization, Micro emulsion.

Course Outcome: The students will acquire knowledge of

1. Mechanism for chemical reactions for optimizing the experimental conditions.
2. Application of homogeneous and heterogeneous catalysis in chemical synthesis
3. Importance of adsorption process and catalytic activity at the solid surfaces
4. Concept of colloidal material and their stability for many practical uses.

Recommended Books

1. *Atkins, P.W., Physical Chemistry, W.H. Freeman (1990).*
2. *Laidler, K.J., Chemical Kinetics, Dorling Kingsley (1998).*
3. *Rajaraman, J., and Kuriacose, J., Kinetics and Mechanism of Chemical Transformations, McMillan (2008).*
4. *Moroi, V., Micelles Theoretical and Applied Aspects, Springer (1986).*
5. *Gowarikar, V.A., Vishwanathan, N.V., and Sreedhar, J., Polymer Science, New Age International (1986).*

B: Organic Chemistry

IUPAC Nomenclature of Simple Organic and Inorganic Compounds.

Concept of Chirality: Recognition of symmetry elements and chiral structures, R-S nomenclature, diastereoisomerism in acyclic and cyclic-systems, E-Z isomerism. Conformational analysis of simple cyclic (chair and boat cyclohexanes) and acyclic systems, Interconverison of Fischer, Newman and Sawhorse projections.

Stereochemistry and Conformational Analysis: Newer methods of assymetric synthesis (including enzymatic and catalytic nexus), enantio-and diastereo selective synthesis. Effects of conformation on reactivity in acyclic compounds and cyclohexanes.

Aromaticity: Huckel's rule and concept of aromaticity : annulenes and heteroannulenes,fullerenes. (C60)

Organic reaction mechanisms: Generation, stability and reactivity of carbocations, carbanions, free radicals, carbenes, benzynes and nitrenes. Addition, elimination E1, E2 and substitution reactions with electrophilic, nucleophilic or radical species. Determination of reaction pathways.

Named reactions and rearrangements: Aldol, Perkin, Stobbe, Dieckmann condensations, Hofmann, Schmidt, Lossen, Curtius, Backmann and Fries rearrangements; Reimer – Tiemann, Reformatsky and Grignard reactions. Diels-Alder reactions; Claisen rearrangements; Friedel–Crafts reactions and Witting reactions. Routine functional group transformations and inter-conversions of simple functionalities. Hydroboration, Oppenaur oxidations; Clemmensen, Wolf-Kishner, Meerwein – Ponndrof – Verley and Birch reductions.

Organic transformations and reagents: Use of the following reagents in organic synthesis and functional group transformations; Complex metal hybrids, Gilman's reagent, Lithium dimethylcuprate, Lithium di-iso propylamide (LDA) dicyclohexylcarbodimide. 1,3 – Dithiane

(reactivity umpolung), trimethylsilyl iodide, tri-n-butyl tin hybride, Woodward and provost hydroxylation, osmium tetroxide, DDQ, selenium dioxide, phase transfer catalysts, crown ethers and Merrified resin, Peterson's synthesis, Wilkinson's catalyst, Baker's yeast.

Pericyclic Reactions: Selection rules and stereochemistry of electrocyclic reactions, cycloaddition and sigmatrophic shifts, Sommelet-Hauser, Cope and Claisen rearrangements.

Photochemistry: Principles of energy transfer, cis-trans isomerization, Paterno-Buchi reaction, Norrish Type I and II reactions, Photo reduction of ketones, di-pi-methane rearrangement, photochemistry of arenes.

Heterocycles: Synthesis and reactivity of furan, thiophene, pyrrole, pyridine, quinoline,isoquinoline and indole. Skraup synthesis, Fischer indole synthesis.

Chemistry of natural products: Familiarity with methods of structure elucidation and biosynthesis of Carbohydrates, proteins and peptides, fatty acids, nucleic acids, terpenoids, steroids, alkaloids, cholesterol and hormones. Function and application of enzymes and coenzymes.

Spectroscopy: Combined applications of mass, UV-VIS, IR and NMR spectroscopy for structural elucidation of compounds.

References

1. R.T. Morrison and R. N. Boyd's, **Organic Chemistry**, 6thed., Spring 2008.

2. I.L. Finar, **Organic Chemistry Vol. I & II**, 5th ed, Pearson Education, Singapore, 2004.

3. Micheal B.Smith and Jerry March, **March's Advanced Organic Chemistry Reactions, Mechanishms and Structure**, 6thed., JohnWiley&Sons Inc., New Jersey, 2007.

4. Peter Skyes, **A Guide book to Mechnism in Organic Chemistry**, Orient Longman Private Limited., New Delhi, 2003

5. J.M.Coxon and B. Halton, **Organic Photochemistry**, 2nd edition, Cambridge University Press, 2011.

6. Jagdamba Singh, **Photochemistry and Pericyclic Reactions**, 3rd edition, New Age Science, 2009.

C: Environmental Chemistry

Unit-1

Ecosystem : Structure and function of ecosystem , Food chain, Food web, Energy flow, biogeochemical cycle, Biomagnification.

Unit-2

Air : Natural and anthropogenic sources of pollution. Primary and Secondary pollutants, Transport and diffusion of pollutants, Methods of monitoring of air pollution SO2 , NOx , CO, SPM Effects of pollutants on human beings, plants, animals, materials and on climate, Air Quality Standards.

Unit-3

Water : Sources, types and consequences of water pollution (ground water and surface water). Sampling and physico-chemical analysis of water quality. Dissolved Oxygen, Chemical Oxygen Demand, Biological Oxygen Demand, Heavy metal pollution, surfactant and their toxicity, Water Quality Standards.

Unit-4

Soil : Soil and soil profile, Trace metals and organic matter in soil, Physico-chemical analysis of soil Industrial waste effluents and heavy metals their interactions with soil components. Different kinds of synthetic fertilizers (N,P & K) and pesticides and their interactions with different components of soil.

Unit-5

Solid Waste: Sources and generation of solid wastes, their characterization, chemical composition and classification of municipal and hazardous wastes, Different methods of disposal and management of solid wastes – sanitary landfill, incineration, composting, pyrolysis

Suggested Books –

1. Standards methods for the Examination of Water and Wastewater, APHA / AWWA / WPCF Publishing, 19th Ed. 1995.
2. Quantitative organic analysis : Qualitative inorganic analysis : Qualitative organic analysis, series By – Vogel's.
3. Analysis of Chemicals by Vogel P.K.Goel , Water Pollution Causes Effects and Control. New Age International,2009.
4. M. Petrovic and D. Barcelo, The handbook of Environmental Chemistry.
5. Meyers A. Robert (Eds.) Encyclopedia of Environmental Analysis and Remediation Vol. 1-8, John Wiley & Sons, 1998

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CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

Syllabus for Entrance Examination in Ph.D. Programme 2015

Discipline: Applied Mathematics

Section - II

Specialization

A: Celesial Mechanics

1. **Lagrange and Hamilton Equations**: Introduction; Classification of a Dynamical System; Lagrange's Equations for Simple Systems; Principle of Virtual Work- D' Alembert's Principle; Lagrange Equations for General Systems; Hamilton's equations;Ignorable Coordinates; The Routhian Function.
2. **Hamiltonian Methods**: Introduction; Hailton's Principle—Hamilton's Principle for Conservative System, Principle of Least action; Characteristic function of Hamilton-Jacobi Equation; Phase Space and Liouville's Theorem; Special Transformations—Lagrange and Poisson Brackets; Calculus of Variations.

B: Fuzzy Logic / Game Theory/Algebra

1. Sets and mappings
    a. Sets
    b. Relations
    c. Mappings
    d. Binary Operations
    e. Cardinality of sets
2. Matrices
    a. Matrices
    b. Operations on matrices
    c. Determinant function
    d. Properties of Determinant function
3. Groups
    a. Semi groups and groups
    b. Homomorphism
    c. Subgroups and cosets

   d. Generators and relations
   e. Normal subgroup
   f. Direct products
   g. Sylow's Theorem
4. Rings
   a. Definitions and elementary properties
   b. Subrings and characteristics of a ring
   c. Ideals and Homomorphism
   d. Sub modules
   e. Polynomial ring
5. Modules and vector spaces
   a. Definitions and examples
   b. Sub modules and direct sums
   c. Free modules
   d. Representation of linear mapping
6. Fuzzy Sets
   a. Definition and examples
   b. Operations on Fuzzy Sets
   c. Zero person game
   d. Two person game
   e. n-person game

References:

1. Bhattacharya P.B., Jain S.K. :Basic abstract algebra, Cambridge University Press
2. Lotfi A. Zadeh : Fuzzy Sets information and control, 1965
3. Von Neumann, J: Theory of games and economic behavior, Princeton University Press, 1947

C: FIXED POINT THEORY AND APPLICATION

Topological Spaces: open sets, closed sets, neighbourhoods, bases, subbases, limit points, closures, interiors, continuous functions, homeomorphisms.

Quotient Topology: Construction of cylinder, cone.

Connectedness and Compactness: Connected spaces, Connected subspaces of the real line, Components and local connectedness, Compact spaces, Heine-Borel Theorem, Local - compactness.

Separation Axioms: Hausdorff spaces, Regularity, Complete Regularity, Normality, Urysohn Lemma, Tychonoff embedding and Urysohn Metrization Theorem, Tietze Extension Theorem.

Complete metric spaces: Function spaces, Characterization of compact metric spaces, equicontinuity.

Normed spaces: Continuity of linear maps. Hahn-Banach Extension and Separation Theorems. Banach spaces. Dual spaces and transposes. Uniform Boundedness Principle and its applications. Closed Graph Theorem, Open Mapping Theorem and their applications.

Inner product spaces: Hilbert spaces. Orthonormal basis. Projection theorem and Riesz Representation Theorem.

Fixed Point Theorems with Applications: Banach contraction mapping theorem, Brouwer fixed point theorem, Leray-Schauder fixed point theorem. Calculus in Banach spaces, Gateaux as well as Frechet derivatives, chain rule, Taylor's expansions, Implicit function theorem with applications, subdifferential.

Fuzzy Logic: Crisp set and Fuzzy set, Basic concepts of fuzzy sets, membership functions. Basic operations on fuzzy sets, Properties of fuzzy sets, Fuzzy relations. Propositional logic and Predicate logic, fuzzy If – Then rules, fuzzy mapping rules and fuzzy implication functions, Applications.

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CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

Syllabus for Entrance Examination in Ph.D. Programme 2015

Discipline: Applied Physics

Section - II

Specialization

A: Biomedical Physics

1 Concept of Quantum theory, Wave particle duality, Photoelectric effect, de Broglie Wave , Compton effect , Compton scattering, X-rays ,Properties of X-Rays, Practical Application of X-Rays. Types of indirectly ionizing photon radiation

2 Important derived physical constants and relationships, Speed of light in a vacuum: Reduced Planck's constant × speed of light in a vacuum: Fine structure constant: Bohr radius: Rydberg energy: Rydberg constant: Classical electron radius: Compton wavelength of the electron: Classification of radiation: Non-ionizing radiation (cannot ionize matter). Ionizing radiation (can ionize matter either directly or indirectly):

3 Photon fluence and energy fluence, KERMA, Absorbed dose, Stopping powers, radiation dosimeter, Ionization chambers, TLDs,

4 X ray machines for radiotherapy, Gamma ray beams and Gamma ray units

5 Radioactivity: Modes of radioactive decay, Radiosurgical techniques, Gamma Knife, Linac based radiosurgery

Reference Books : 1 ATTIX, F.H., Introduction to Radiological Physics and Radiation Dosimetry, Wiley.

2. KHAN, F.M., The Physics of Radiation Therapy, Lippincott, Williams and Wilkins

3. HORTON, J., Handbook of Radiation Therapy Physics, Prentice Hall, New York .

B: Nano Science & Applications

Unit no. 1: Nanotechnology

1.1 Introduction 1.2 Emergence of nanotechnology 1.3 Bottom up and Top down approaches 1.4 Zero dimensional nanostructures: nanoparticles

Unit no. 2: Nanowires and nanorods

2.1 Introduction to one –dimensional Nanostructures 2.2 Evaporation – condensation growth 2.3 Dissolution – condensation growth 2.4 Vapor (or solution)- liquid-solid (VLS or SLS) growth 2.5 Templet based synthesis

Unit no. 3: Thin films

3.1 Introductoin to Two – Dimensional Nanostructures 3.2 Fundamentals of film growth 3.3 Physical Vapor Deposition (PVD) 3.4 Chemical Vapor deposition (CVD) 3.5 Atomatic Layer deposition (ALD) 3.6 Electrochemical deposition 3.7 Sol- Gel films

Unit no. 4: Characterzation and Properties of Nanomaterials

4.1 Structural characterization (XRD, SEM, TEM) 4.2 Chemical Characterization (Optical spectroscopy , Electron spectroscopy) 4.3 Physical properties of nanomaterials 4.4 Electrical conductivity

Unit no. 5: Application of nanomaterials

5.1 Molecular Electronics and nanoelectronics 5.2 Nanobots 5.3 Biological applications of nanoparticles 5.4 Bandgap engineered quantum device

5.5 Nanomechanics

Reference Book

Nanostructures and nanomaterials: Synthesis, properties and application : Cuozhong Cao

Thin Film Fundamentals : A. Goswami

Nanophysics and Nanotechnology: An introduction to modern concept in nanoscience: Edward L. Wolf

C: Luminescence & Applications

Types of luminescence. *Luminescent* Materials. Resonance, spontaneous, and stimulated luminescence. Three- and four-level luminescence. Chemiluminescence, electroluminescence (cathodoluminescence), mechanoluminescence, photoluminescence (fluorescence, phosphorescence), radioluminescence, sonoluminescence, thermoluminescence. X-ray fluorescence analysis, fluorescence yields for K and L shells.

Thermo luminescence - models: Jablonski model, Configuration-coordination model, energy band model, thermoluminescence mechanisms, Method of analysis; methods using different rates, half width method, initial rise method, Applications of thermoluminescence in radiation dosimetry and dating

Mechanoluminescence: Mechanoluminescent materials, Characteristics, mechanisms, theories of Mechanoluminescence, applications. Lyoluminescence, LL reader, Inorganic lyoluminescence phosphors, mechanisms, enhancements and spectra

D: Solid State Ionics & Material Science

1. **Experimental Material Science** :

   Material Preparation and characterization studies and solid-state electrochemical device applications viz. solid state batteries. supercapacitor, light emitting elechrochemical cell of ionic composites, nano-composites, ionic polymers and polymer nano-composite electrolyte materials.

2. **Theoretical Material/Nano-material Science :**

   (i) **Mathematical -Modeling**: Mathematical modeling and evaluation of transport properties of some ionic/superionic solids by using space charge depolarization method. Modeling of electrochemical devices viz. solid state batteries, super capacitors and sensors are also in progress.

   (ii) **DFT based first principle studies : M**olecular structure, electronic/electrical, mechanical, optical and transport properties using density functional based approach of nano-matrials, biomaterials, ionic/super-ionic solids and electronic/ionic conducting polymers implemented in SIESTA / transiesta software.

   (iii) **Molecular mechanics and Molecular dynamic simulation** of polymer nano-composite materials for solid state battery, super capacitor, organic light emitting diode(OLED), light emitting electrochemical cell (LEEC) applications.

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CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY BHILAI

Syllabus for Entrance Examination for Admission in Ph.D. programme, 2015

Discipline: Pharmacy

Section - II

Specialization

A) Pharmaceutics

Recent advances in solid dosage form manufacturing. Principle and technology involved in Disperse systems, Molecular dispersion, emulsion- micro and multiple emulsion. Design and fabrication of Oral controlled release drug delivery systems. Parenteral products and Ocular drug delivery systems. Implantable products, Transdermal therapeutic system. Prodrugs as sustained chemical delivery system, Biochemical and Molecular approach to Controlled Drug delivery. Drug kinetics in coarse disperse systems, drug diffusion in coarse disperse systems.

Dosing considerations and bioavailability assessment. Transport of drugs through membranes and barriers other than GI Tract, Buccal absorption, Salivary excretion of drugs, excreting of drugs via sweat, excretion of drugs in to milk, penetration of drugs into eye, transfer across placenta, passage of drugs into and out of cerebrospinal and brain. Consideration of one, two and multiple compartment model on Intravenous administration, Intravenous infusion and first order absorption of single dose.

B) Pharmacognosy

Plant growth regulators. Origin of secondary metabolism in relation to the basic metabolic pathway. Methods of investigation of biosynthetic pathway such as tracer techniques and autoradiography, biogenesis of some important secondary metabolites, stress compound. WHO guidelines for assessment of crude drug. Mutation – polyploidy and hybridization in relation to the improvement of vegetable drugs, chemical rashes. Cell – tissue culture techniques role of plants growth regulators, micro-propagation of medicinal and aromatic plants, germplasm storage and methods of cell immobilization.

C) Pharmacology

Clinical Pharmacokinetics: Dose – response in man, Influence of renal and hepatic disease on pharmacokinetics, Therapeutic drug monitoring, Population pharmacokinetics. Adverse drug reactions: Definition and classification, epidemiology, predisposing factors, mechanism of ADR & different types of ADR. Statistical treatment of model problems in evaluation of drugs. Methods of biological assay, principles of biological assays with certain examples. Development of new bioassay methods. Receptors, ion channels and their modulators i.e. calcium, potassium, sodium and chloride channels, enzymes and

carrier proteins, mechanism of signal transduction.

D) Quality Assurance

General principles of validation of processes- manufacturing & analytical, and products. Calibration of instruments, equipments, etc. & their validation. Types of validation - prospective, concurrent, retrospective and revalidation. Genesis of Quality control and Quality Assurance. Concept of Total Quality Management; CGMP and GLP, ICH and ISO 9000. Statistical Quality Control. Types of sampling systems/plans followed and interpretation.

E) Pharmaceutical Chemistry

Historical perspective, Drug Discovery Strategies in Direct Drug Design (Structure based) and Indirect drug design, Target selection and lead identification, Natural product sources, Fermentation / Microbial sources, Synthetic, Introduction to pharmacogenomics. QSAR: Parameters, Lipophilicity, electronic, stearic factors, Quantitative Models, Hansch analysis, Free Wilson Analysis, Mixed approach, Other QSAR Approaches, Applications of Hansch Analysis, Free Wilson Analysis.

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