PhD Course Work Syllabus

Session 2015-16

Pre PhD Course Work Scheme
Session 2015-16

THEORY PAPERS Compulsory Papers		No. of Teaching Hours			Credits	Marks
Code	**Subject/Paper**	**L**	**T**	**P**		
RCW – I	RESEARCH METHODOLOGY	4	-	-	4	100
RCW – II	Computer Application	4	-	-	4	100
	Subject Specific Elective Papers					
RCW – III	Computer Science /Information Technology	4	-	-	4	100
RCW – III	Mechanical Engineering	4	-	-	4	100
RCW – III	Civil Engineering	4	-	-	4	100
RCW – III	Electrical Engineering	4	-	-	4	100
RCW – III	Law	4	-	-	4	100
RCW – III	Management	4	-	-	4	100

Syllabus for One Semester Ph. D. Course Work

RESEARCH METHODOLOGY (RCW – I)

(Common for all disciplines)

Time: 3 Hrs.

Max. Marks 100

Note: (i) Eight questions will be set out of which the student shell be required to attempt to five questions. (ii) All questions carry equal marks.

Research

- Objective, Types of research, process and steps in it. Research proposal and concept.
- Research Design- meaning, need, concept and different research designs. Literature survey and review, research design process an error in research.
- Research Modeling- Types of Models, Model building and stages, Data consideration and testing(Sampling, Collection and Analysis), Heuristic and Simulation.

Design of Experiments

- Objectives, strategies, Factorial experimental design, Designing engineering experiments, basic principles- replication, randomization, blocking, guidelines for design of experiment.
- Analysis of variance- ANOVA- Basic principle, One way and Two way technique.
- Analysis of Co-variance- ANOCOVA technique.

Report writing and Interpretation

- Pre- writing considerations. Meaning and technique of interpretation.
- Different steps in report writing, Formats of report writing, Thesis writing, Formats of publication in Research journals.

References:

1. Montgomery, Douglas C.(2007)5/e, Design and Analysis of Experiments.(Willey, India)
2. Kothari, C. R. (2004). 2/e, Research Methodology- Methods and Technique.(New Age International, New Delhi)
3. Montgomery, Douglas C. and Runger, George C. (2007), 3/e. applied statistics and probability for Engineers. (Willey, India)

Syllabus for One Semester Ph. D. Course Work

Computer Application (RCW – II)

(Common for all disciplines)

Time: 3 Hrs.

Max. Marks 100

Note: (i) Eight questions will be set out of which the student shell be required to attempt to five questions. (ii) All questions carry equal marks.

Spreadsheet Tool

- Introduction to spreadsheet application, features and function
- Using formulas and functions, Data storing
- Features for statistical data analysis, Generating charts/ graph and other features.
- Tools used may be Microsoft Excel, Open office or similar tool.

Presentation Tool

- Introduction to presentation tool, features and function.
- Creating presentation, Customizing presentation, showing presentation.
- Tools used may be Microsoft power Point, Open office or similar tool.

Writing Tool

- M.S.Word
- PDF format
- LaTeX

Web Search

- Introduction to Internet, Use of internet and WWW, Using search engine like Google, Yahoo etc.
- Using advanced search techniques.

References:

1. The complete reference Office Xp- Stephan L. Nelson, Gujulia Kelly (TMH)
2. A document preparation system, User's guide and reference manual- Leslie Lamprot. (Addison-Wesley Pub.Co.)

Syllabus for One Semester Ph. D. Course Work

Computer Science /Information Technology
(RCW – III)

Time: 3 Hrs.

Max. Marks 100

Note: (i) Eight questions will be set out of which the student shell be required to attempt to five questions. (ii) All questions carry equal marks.

Digital Logic: Logic functions, Minimization, Design and synthesis of combinational and sequential circuits; Number representation and computer arithmetic (fixed and floating point).

Computer Organization and Architecture: Machine instructions and addressing modes, ALU and data-path, CPU control design, Memory interface, I/O interface (Interrupt and DMA mode), Instruction pipelining, Cache and main memory, Secondary storage.

Programming and Data Structures: Programming in C; Functions, Recursion, Parameter passing, Scope, Binding; Abstract data types, Arrays, Stacks, Queues, Linked Lists, Trees, Binary search trees, Binary heaps.

Algorithms: Analysis, Asymptotic notation, Notions of space and time complexity, Worst and average case analysis; Design: Greedy approach, Dynamic programming, Divide-and-conquer; Tree and graph traversals, Connected components, Spanning trees, Shortest paths; Hashing, Sorting, Searching. Asymptotic analysis (best, worst, average cases) of time and space, upper and lower bounds, Basic concepts of complexity classes – P, NP, NP-hard, NP-complete.

Theory of Computation: Regular languages and finite automata, Context free languages and Push-down automata, Recursively enumerable sets and Turing machines, Undecidability.

Compiler Design: Lexical analysis, Parsing, Syntax directed translation, Runtime environments, Intermediate and target code generation, Basics of code optimization.

Operating System: Processes, Threads, Inter-process communication, Concurrency, Synchronization, Deadlock, CPU scheduling, Memory management and virtual memory, File systems, I/O systems, Protection and security.

Databases: ER-model, Relational model (relational algebra, tuple calculus), Database design (integrity constraints, normal forms), Query languages (SQL), File structures (sequential files, indexing, B and B+ trees), Transactions and concurrency control.

Information Systems and Software Engineering: information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project, design, coding, testing, implementation, maintenance.

Computer Networks: ISO/OSI stack, LAN technologies (Ethernet, Token ring), Flow and error control techniques, Routing algorithms, Congestion control, TCP/UDP and sockets, IP(v4), Application layer protocols (icmp, dns, smtp, pop, ftp, http); Basic concepts of hubs, switches, gateways, and routers. Network security – basic concepts of public key and private key cryptography, digital signature, firewalls.

Web technologies: HTML, XML, basic concepts of client-server computing.

Syllabus for One Semester Ph. D. Course Work

Mechanical Engineering
(RCW – III)

Time: 3 Hrs.

Max. Marks 100

Note: (i) Eight questions will be set out of which the student shell be required to attempt to five questions. (ii) All questions carry equal marks.

Applied Mechanics And Design

Engineering Mechanics: Free body diagrams and equilibrium; trusses and frames; virtual work; kinematics and dynamics of particles and of rigid bodies in plane motion, including impulse and momentum (linear and angular) and energy formulations; impact.

Strength of Materials: Stress and strain, stress-strain relationship and elastic constants, Mohr's circle for plane stress and plane strain, thin cylinders; shear force and bending moment diagrams; bending and shear stresses; deflection of beams; torsion of circular shafts; Euler's theory of columns; strain energy methods; thermal stresses.

Theory of Machines: Displacement, velocity and acceleration analysis of plane mechanisms; dynamic analysis of slider-crank mechanism; gear trains; flywheels.

Vibrations: Free and forced vibration of single degree of freedom systems; effect of damping; vibration isolation; resonance, critical speeds of shafts.

Design: Design for static and dynamic loading; failure theories; fatigue strength and the S-N diagram; *principles* of the design of machine elements such as bolted, riveted and welded joints, shafts, spur gears, rolling and sliding contact bearings, brakes and clutches.

Fluid Mechanics and Thermal Sciences

Fluid Mechanics: Fluid properties; fluid statics, manometry, buoyancy; control-volume analysis of mass, momentum and energy; fluid acceleration; differential equations of continuity and momentum; Bernoulli's equation; viscous flow of incompressible fluids; boundary layer; elementary turbulent flow; flow through pipes, head losses in pipes, bends etc.

Heat-Transfer: Modes of heat transfer; one dimensional heat conduction, resistance concept, electrical analogy, unsteady heat conduction, fins; dimensionless parameters in free and forced convective heat transfer, various correlations for heat transfer in flow over flat plates and through pipes; thermal boundary layer; effect of turbulence; radiative heat transfer, black and grey surfaces, shape factors, network analysis; heat exchanger performance, LMTD and NTU methods.

Thermodynamics: Zeroth, First and Second laws of thermodynamics; thermodynamic system and processes; Carnot cycle. irreversibility and availability; behaviour of ideal and real gases, properties of pure substances, calculation of work and heat in ideal processes; analysis of thermodynamic cycles related to energy conversion.

Applications: *Power Engineering*: Steam Tables, Rankine, Brayton cycles with regeneration and reheat. *I.C. Engines*: air-standard Otto, Diesel cycles. *Refrigeration and air-conditioning*: Vapour refrigeration cycle, heat pumps, gas refrigeration, Reverse Brayton cycle; moist air: psychrometric chart, basic psychrometric processes. *Turbomachinery:* Pelton-wheel, Francis and Kaplan turbines — impulse and reaction principles, velocity diagrams.

Manufacturing and Industrial Engineering

Engineering Materials: Structure and properties of engineering materials, heat treatment, stress-strain diagrams for engineering materials.

Metal Casting: Design of patterns, moulds and cores; solidification and cooling; riser and gating design, design considerations.

Forming: Plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk (forging, rolling, extrusion, drawing) and sheet (shearing, deep drawing, bending) metal forming processes; principles of powder metallurgy.

Joining: Physics of welding, brazing and soldering; adhesive bonding; design considerations in welding.

Machining and Machine Tool Operations: Mechanics of machining, single and multi-point cutting tools, tool geometry and materials, tool life and wear; economics of machining; principles of non-traditional machining processes; principles of work holding, principles of design of jigs and fixtures

Metrology and Inspection: Limits, fits and tolerances; linear and angular measurements; comparators; gauge design; interferometry; form and finish measurement; alignment and testing methods; tolerance analysis in manufacturing and assembly.

Computer Integrated Manufacturing: Basic concepts of CAD/CAM and their integration tools.

Production Planning and Control: Forecasting models, aggregate production planning, scheduling, materials requirement planning.

Inventory Control: Deterministic and probabilistic models; safety stock inventory control systems.

Operations Research: Linear programming, simplex and duplex method, transportation, assignment, network flow models, simple queuing models, PERT and CPM.

Syllabus for One Semester Ph. D. Course Work

Civil Engineering
(RCW – III)

Time: 3 Hrs.

Max. Marks 100

Note: (i) Eight questions will be set out of which the student shell be required to attempt to five questions. (ii) All questions carry equal marks.

Structural Engineering

Mechanics: Bending moment and shear force in statically determinate beams. Simple stress and strain relationship: Stress and strain in two dimensions, principal stresses, stress transformation, Mohr's circle. Simple bending theory, flexural and shear stresses, unsymmetrical bending, shear centre. Thin walled pressure vessels, uniform torsion, buckling of column, combined and direct bending stresses.

Structural Analysis: Analysis of statically determinate trusses, arches, beams, cables and frames, displacements in statically determinate structures and analysis of statically indeterminate structures by force/ energy methods, analysis by displacement methods (slope deflection and moment distribution methods), influence lines for determinate and indeterminate structures. Basic concepts of matrix methods of structural analysis.

Concrete Structures: Concrete Technology- properties of concrete, basics of mix design. Concrete design- basic working stress and limit state design concepts, analysis of ultimate load capacity and design of members subjected to flexure, shear, compression and torsion by limit state methods. Basic elements of prestressed concrete, analysis of beam sections at transfer and service loads.

Steel Structures: Analysis and design of tension and compression members, beams and beam- columns, column bases. Connections- simple and eccentric, beam–column connections, plate girders and trusses. Plastic analysis of beams and frames.

Geotechnical Engineering

Soil Mechanics: Origin of soils, soil classification, three-phase system, fundamental definitions, relationship and interrelationships, permeability &seepage, effective stress principle, consolidation, compaction, shear strength.

Foundation Engineering: Sub-surface investigations- scope, drilling bore holes, sampling, penetration tests, plate load test. Earth pressure theories, effect of water table, layered soils. Stability of slopes-infinite slopes, finite slopes. Foundation types-foundation design requirements. Shallow foundations-bearing capacity, effect of shape, water table and other factors, stress distribution, settlement analysis in sands & clays. Deep foundations–pile types, dynamic &static formulae, load capacity of piles in sands &clays, negative skin friction.

Water Resources Engineering

Fluid Mechanics and Hydraulics: Properties of fluids, principle of conservation of mass, momentum, energy and corresponding equations, potential flow, applications of

momentum and Bernoulli's equation, laminar and turbulent flow, flow in pipes, pipe networks. Concept of boundary layer and its growth. Uniform flow, critical flow and gradually varied flow in channels, specific energy concept, hydraulic jump. Forces on immersed bodies, flow measurements in channels, tanks and pipes. Dimensional analysis and hydraulic modeling. Kinematics of flow, velocity triangles and specific speed of pumps and turbines.

Hydrology: Hydrologic cycle, rainfall, evaporation, infiltration, stage discharge relationships, unit hydrographs, flood estimation, reservoir capacity, reservoir and channel routing. Well hydraulics.

Irrigation: Duty, delta, estimation of evapo-transpiration. Crop water requirements. Design of: lined and unlined canals, waterways, head works, gravity dams and spillways. Design of weirs on permeable foundation. Types of irrigation system, irrigation methods. Water logging and drainage, sodic soils.

Environmental Engineering

Water requirements: Quality standards, basic unit processes and operations for water treatment. Drinking water standards, water requirements, basic unit operations and unit processes for surface water treatment, distribution of water. Sewage and sewerage treatment, quantity and characteristics of wastewater. Primary, secondary and tertiary treatment of wastewater, sludge disposal, effluent discharge standards. Domestic wastewater treatment, quantity of characteristics of domestic wastewater, primary and secondary treatment Unit operations and unit processes of domestic wastewater, sludge disposal.

Air Pollution: Types of pollutants, their sources and impacts, air pollution meteorology, air pollution control, air quality standards and limits.

Municipal Solid Wastes: Characteristics, generation, collection and transportation of solid wastes, engineered systems for solid waste management (reuse/ recycle, energy recovery, treatment and disposal).

Noise Pollution: Impacts of noise, permissible limits of noise pollution, measurement of noise and control of noise pollution.

Transportation Engineering

Highway Planning: Geometric design of highways, testing and specifications of paving materials, design of flexible and rigid pavements.

Traffic Engineering: Traffic characteristics, theory of traffic flow, intersection design, traffic signs and signal design, highway capacity.

Surveying

Importance of surveying, principles and classifications, mapping concepts, coordinate system, map projections, measurements of distance and directions, leveling, theodolite traversing, plane table surveying, errors and adjustments, curves.

Syllabus for One Semester Ph. D. Course Work

Electrical Engineering
(RCW – III)

Time: 3 Hrs.

Max. Marks 100

Note: (i) Eight questions will be set out of which the student shell be required to attempt to five questions. (ii) All questions carry equal marks.

Electric Circuits and Fields: Network graph, KCL, KVL, node and mesh analysis, transient response of dc and ac networks; sinusoidal steady-state analysis, resonance, basic filter concepts; ideal current and voltage sources, Thevenin's, Norton's and Superposition and Maximum Power Transfer theorems, two-port networks, three phase circuits; Gauss Theorem, electric field and potential due to point, line, plane and spherical charge distributions; Ampere's and Biot-Savart's laws; inductance; dielectrics; capacitance.

Signals and Systems: Representation of continuous and discrete-time signals; shifting and scaling operations; linear, time-invariant and causal systems; Fourier series representation of continuous periodic signals; sampling theorem; Fourier, Laplace and Z transforms.

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.

Power Systems: Basic power generation concepts; transmission line models and performance; cable performance, insulation; corona and radio interference; distribution systems; per-unit quantities; 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 and FACTS concepts.

Control Systems: Principles of feedback; transfer function; block diagrams; steady-state errors; Routh and Niquist techniques; Bode plots; root loci; lag, lead and lead-lag compensation; state space model; state transition matrix, controllability and observability.

Electrical and Electronic Measurements: Bridges and potentiometers; PMMC, moving iron, dynamometer and induction type instruments; measurement of voltage, current, power, energy and power factor; instrument transformers; digital voltmeters and multimeters; phase, time and frequency measurement; Q-meters; oscilloscopes; potentiometric recorders; error analysis.

Analog and Digital Electronics: Characteristics of diodes, BJT, FET; amplifiers – biasing, equivalent circuit and frequency response; oscillators and feedback amplifiers; operational amplifiers – characteristics and applications; simple active filters; VCOs and timers; combinational and sequential logic circuits; multiplexer; Schmitt trigger; multi-vibrators; sample and hold circuits; A/D and D/A converters; 8-bit microprocessor basics, architecture, programming and interfacing.

Power Electronics and Drives: Semiconductor power diodes, transistors, thyristors, triacs, GTOs, MOSFETs and IGBTs – static characteristics and principles of operation; triggering circuits; phase control rectifiers; bridge converters – fully controlled and half controlled; principles of choppers and inverters; basis concepts of adjustable speed dc and ac drives.

Syllabus for One Semester Ph. D. Course Work

Law
(RCW – III)

Time: 3 Hrs.
Max. Marks 100
Note: (i) Eight questions will be set, out of which the students shall be required to attempt five questions. (ii) All questions shall carry equal marks.

Constitutional Law India

Essential features of Indian Constitution

- Premable
- Fundamental Rights and Duties
- Fundamental principles of State policy
- Judiciary
- Executive
- Union State Legislative Relations
- Emergency Provisions
- Amendment of Constitution
- Writ Jurisdiction

Legal Theory

- Nature and Sources of Law
- Positivism, Natural Law Theory, Sociological Jurisprudence
- Rights and Duties
- Concepts of Possession and Ownership
- Law and Morality

Public International Law

- Nature of International Law and its relationship with Municipal Law
- Sources of International Law
- Recognition of States and Governments
- United Nations and its organs

Human Rights: Nature and scopes, Evolution and growth

Administrative Law

Nature, Scope and Importance of Administrative Law

Principles of Natural Justice

Administrative Discretion and its control

Delegated Legislation

Lokpal and Lokayukta

Law of Torts

Foundation of Tortuous Liability

General Defences to an action of Torts

Vicarious Liability

Strict and AbsoluteLiability: Emerging trends in India

Law of Crimes – General Principles

Nature and Definition of Offence

Private defences

Common Intention and Common Object

Offences against Human body

Offences against Property

Offences against women

Law of Contracts-General Principles

Essentials of a valid contract

Offer, acceptance and consideration

Capacity to Contract-Minor's contract

Elements vitiating contract-mistake, fraud, misrepresentation, public policy, coercion, undue influence, frustration of contract

Remedies for breach of contract-Damages.

Syllabus for One Semester Ph. D. Course Work

Management
(RCW – III)

Time: 3 Hrs.

Max. Marks 100

Note: (i) Eight questions will be set out of which the student shell be required to attempt to five questions. (ii) All questions carry equal marks.

Managerial Economics

Demand Analysis: Demand forecasting, Law of Demand. Determinants of Demand, Measurement of Elasticity of Demand; Production Function with One Variable Input and with Two variable input; Cost Concepts, Short Run and Long Run Cost Function. Cost Output Relationship.

Forms of Market Perfect Competition: Monopoly, Monopolistic Compilation. Price Determination in Different Market

Macro Economics – concept, need and significance; National Income concepts and its measurement, Inflation and Unemployment

Organisation Behaviour

Concept and significance of organisational behaviour, , organisational design, types of organisational structure and structural components, understanding and managing Individual behaviour – Personality, Perception, Attitudes, Learning Theories and reinforcement, Motivation theories

Understanding and managing Group Behaviour – Process, interpersonal and group dynamics, communication – verbal, non-verbal, Leadership – types, , Managing conflicts, Change Management and organisation development

Human Resource Management

Concepts and perspectives in HRM; HR Planning – objectives, process and techniques; Job Analysis- job description and specification; Recruitment and selection process; Induction, Training and Development – types and process;

Performance appraisal methods and evaluation; Job evaluation and wage & salary administration, Industrial Relations and Trade Unioins; Industrial Disputes – dispute settelement bodies and process, greivance handling; Labour Welfare & Social Security measures

Financial Management

Financial Management – nature, scope, objective and importance. Assumptions, importance and limitations of Cost volume profit analysis; Capital Budgeting decisions- Traditional methods and Discounted Cash Flow methods.

Factors affecting Capital Structure and calculation Cost of Capital; Determinants of Dividend Policy; Long term and short term sources of finance, Preparation of cash flow statements and its advantages. Meaning, objectives and limitations of Ratio Analysis. Calculation of various Ratios.

Marketing Management

Consumer and Industrial markets, Market Segmentation – Targeting and positioning; Product decisions, Product Mix, Product life cycle, Branding and Packaging, Pricing methods and strategies;

Promotion decisions, promotion mix - advertising, personal selling; Channel Management, Vertical marketing system; Evaluation and control of marketing effort; New issues in Marketing – online marketing, customer relationship management

Production and Operations Management

Role and scope of production management, Facility location, layout planning and analysis; production planning and control – production process analysis, Production scheduling; Work measurement, Time and motion study, Statistical quality control, TQM

Role and scope of operations research; Linear Programming; Sensitivity analysis; Transportation Model; Inventory control, Queing Theory, PERT/CPM, Probability distributions – Binomial, Poisson, Normal and Exponential, Correlation and regression analysis

Business Environment & Strategic Management

Nature and Concept, Components (Economic and Non-Economic), Types of Market Economy, Monetary Policy : Concept & Instruments, Fiscal Policy : Concept, Government Budget and its Components; Privatization and Liberalization, Fundamentals and Facets of Globalization, GATT, WTO;

Components of Strategic Management, BCG Model, Porter's generic strategies, strategies in industry evolution, fragmentation, maturity and decline, Global entry strategies, Joint Ventures and Strategies Alliances

Business Ethics & Corporate Governance

Entrepreneurship – concept, types, issues in innovation and creativity; Ethical issues in management, Ethical organization and its corporate code, Importance and need for business ethics; concept and importance of corporate governance, Corporate Governance & Ethics, Corporate Social Responsibility – concept, scope of Social Responsibility, Stakeholders (Internal and External),