PhD Course Work Syllabus
Session 2019-20

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.
- Research Ethics
- Plagiarism

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.

Plagiarism Tools

- Handling of plagiarism checking software

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

Syllabus for One Semester Ph. D. Course Work

Advanced Subject Paper CS-I
Code: RCWCS1

Time: 3 Hrs

Max. Marks : 100

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

Introduction to Data Mining, Major Issues in Data Mining, Applications of Data Mining, Social impacts of data mining. Data Preprocessing, Data warehousing, Data Mining primitives, Association Rule Mining. Classification and Predication, Cluster Analysis, Mining complex Types of data.

Web Scale AI and Big Data, Web Intelligence, Big Data, Indexing, Ranking, Page Rank Searching, Searching structured data. Databases and their Evolution, Big data Technology and Trends. Classification, Clustering, and Mining, Information Extraction in Big Data. Forecasting, Neural Models, Deep Learning, and Research Topics. Data Analysis: Regression and Feature Selection.

Introduction to distributed technologies like Grid Computing, Cloud Computing etc. Evolution of computing paradigms, Introduction to virtualization and virtual machine. Cloud Computing: History, Cloud Service Models.

Reference Books:

- Data Mining concepts and Techniques by Jiawei Han, Micheline Kamber –Elsevier.
- The Intelligent Web: Search, Smart Algorithms and Big Data published by Oxford University Press, UK, in November 2013, authored by Dr. Gautam Shroff.

Syllabus for One Semester Ph. D. Course Work

Advanced Subject Paper CS-II
Code: RCWCS2

Time: 3 Hrs

Max. Marks : 100

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

Introduction: Introduction to Network models-ISO-OSI, SNA, Appletalk and TCP/IP models. Review of Physical layer and Data link layers, Review of LAN (IEEE 802.3, 802.5, 802.11b/a/g, FDDI) and WAN (Frame Relay, ATM, ISDN) standards.

Network layer: ARP, RARP, Internet architecture and addressing, internetworking, IPv4, overview of IPv6, ICMP, Routing Protocols- RIP, OSPF, BGP, IP over ATM.

Transport layer: Design issues, Connection management, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), Finite state machine model.

Application layer: WWW, DNS, e-mail, SNMP, RMON.

Network Security: Cryptography, Firewalls, Secure Socket Layer (SSL) and Virtual Private Networks (VPN).

Case study

Study of various network simulators, Network performance analysis using NS2.

Text Books:

1.   Behrouz A. Forouzan, "TCP/IP Protocol Suit", TMH, 2000.
2.   Tananbaum A. S., "Computer Networks", 3rd Ed., PHI, 1999.

References:

1.   Black U, "Computer Networks-Protocols, Standards and Interfaces", PHI, 1996.
2.   Stallings W., "Data and Computer Communications", 6th Ed., PHI, 2002.
3.   Stallings W., "SNMP, SNMPv2, SNMPv3, RMON 1 & 2", 3rd Ed., Addison Wesley, 1999.
3.   Laurra Chappell (Ed), "Introduction to Cisco Router Configuration", Techmedia, 1999.

Syllabus for One Semester Ph. D. Course Work

Advanced Subject Paper CS-III
Code: RCWCS3

Time: 3 Hrs

Max. Marks : 100

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

Artificial Intelligence: problem solving, planning, knowledge representation; pattern recognition; natural language understanding, computer vision, automatic programming, machine learning. Neural Networks, Fuzzy Logic, Fuzzy Arithmetic, Introduction of Neuro-Fuzzy Systems, Probabilistic Algorithm: Genetic Algorithm, Artificial Bee Colony Algorithm, Ant Colony Algorithm etc. Applications and implementations of probabilistic algorithm.

Reference Books:

- Elaine Rich, Kevin Knight,Shivashankar B. Nair, Artificial Intelligence (Third Edition), ata McGraw-Hill Education Pvt. Ltd.

- Vijay Lakshmi, Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms, Soft Computing Paradigms, Prentice Hall of India (2008).

- Timothy Ross, Fuzzy Logic, Wiley India (2007) 2nd ed.

- F. O. Karray and C. de Silva, Soft computing and Intelligent System Design, Pearson, 2009.

- G.J. Klir & B. Yuan, Fuzzy Sets & Fuzzy Logic, PHI, 1995.

- Hertz J. Krogh, R.G. Palmer, Introduction to the Theory of Neural Computation, Addison-Wesley, California, 1991.

Syllabus for One Semester Ph. D. Course Work

Advanced Subject Paper CE
Code: RCWCE

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

Advanced Subject Paper MECH-I
Code: RCWME1

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

Metal Machining - Modelling and control of Chip Formation, Machining of hard materials and metal matrix reinforced composites, Characterization and surface integrity in hard machining, Modern concepts of machining

Metal Forming:
Yield criteria, Slip line field theory, Temperature Field in Material.- Plastic and viscoplastic behaviour of material, Surfaces of Discontinuity, Numerical Models of Plasticity.

Advanced Machining Processes:
Hybrid electro-chemical processes, Hybrid thermal processes, Solid, liquid and powder based material addition processes (Analytical Study)

Reverse Engineering :
Reverse engineering – Methodologies and Techniques, Hardware and software, Rapid prototyping –Relationship with reverse engineering

Group Technology: Role of group technology in CAD/CAM integration, Methods for developing part families, Classification and coding, Examples of coding systems, Facility design using group technology, Benefits of G.T.
Computer Aided Process Planning: Role of Process Planning, Approaches to process planning-Manual, Variant, Generative approach; Examples of Process planning systems - CAPP, DCLASS, CMPP; Criteria for selecting a CAPP system, Benefits of CAPP.
Computer Integrated Manufacturing Systems: Types of manufacturing systems, Machine tools and related equipment, Material handling systems, Computer control systems, CIMS Benefits.
Quality Engineering in Manufacturing: Introduction – quality and improvement-objectives-quality assurance-quality systems-Economics – Statistical Tolerances – Quality loss function, Process variability- Charts for attributes, variables, moving average control charts

Reference Books:

1. Quality control –by Montgomory
2. Managing for total quality – by N. Logothetis
3. Quality planning and Analysis by Juran and Gryna

4. Computer Integrated Design and Manufacturing by David D. Bedworth, Mark R. Henderson, Philip M. Wolfe.
5. CAD / CAM by Groover & Zimmers (PHI)
6. Avitzur B., "Metal Forming - Process and analysis" Tata Mc-Graw Hill
7. Milton C Shaw, "Metal Cutting Principles" 2nd Edition, Oxford series in Advanced Manufacturing.

Syllabus for One Semester Ph. D. Course Work

Advanced Subject Paper EE
Code: RCWEE

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.

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Advanced Subject Paper MANAGEMENT-I
Code: RCWMGFN1

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

Fundamentals of Financial Management

Meaning, Scope, Function & Objective of Financial Management, Decision Making, Role of Financial Manager in a company. Financial statements and their analysis through Ratio analysis and cash flow analysis.

Statistical Methods

Meaning, scope and limitations of statistics. Measurement of Central tendency- Mean, Mode and Median. Measures of Dispersion- Mean Deviation and Standard Deviation. Meaning Significance and limitations of Correlation and Regression.

Financial System

Meaning and functions of financial system, financial concepts, financial assets, financial intermediaries, financial markets, financial rates of return and financial instruments.

Financial Decision Making

Capital Structure- Meaning, significance & factors affecting capital structure. Calculation of specific and weighted average cost of capital. Capital budgeting- decisions on the basis of traditional and discounted cash flow methods.

International Financial Management

International Accounting & International taxation including DTAA. Foreign Direct Investment- Advantages and Disadvantages. Risk Management through Future contracts, forward contracts and options.

References Books:

1. Prasanna Chandra, Fundamentals of Financial Management, Pearson Education.
2. M Y Khan, Financial Services, Tata Mc Graw Hill
3. V A Avadhani, Management of financial Services, Himalaya Publication
4. A K Seth, International financial Management.
5. P G Apte, International Financial Management, Tata Mc Graw hill

Syllabus for One Semester Ph. D. Course Work

Advanced Subject Paper MANAGEMENT-II
Code: RCWMGHRM2

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

An overview of Human Resource Management: Importance and Functions, development of HRM, Personnel Management Vs. HRM, changing role of HRM, role and qualities of HR manager, challenges to HRM; Strategic HRM

Human Resource Planning: Objectives and Significance, Process, Job Analysis, Recruitment & Selection, Placement and induction, Training and development, Need assessment, Methods of training; Evaluation of training program

Organizational Change & Development: Motivation, Leadership Styles, Job Satisfaction, Organization Culture, Organizational Effectiveness; Organizational Development, Stress & Burn out; Quality of Work Life, Work Life Balance, Employee Engagement
Compensation Management: Job evaluation - Techniques, Wages and salary administration. Incentive payments, fringe benefits;

Performance appraisal: Objectives and techniques, Performance Management and Appraisal, Steps in appraising performance, Types of Appraisal, 360 Degree Feedback, Balanced Score Card; Career Planning and Development

Industrial Relations: Causes of Industrial Unrest and Remedial Measures, Industrial disputes in India, Trade Unionism in India, Social Security, Health & Welfare Measure in India
Grievance management, collective bargaining – Concept, Process; Pre-requisites; industrial democracy and employee participation, Objectives and forms of employee participation.

International Human Resource Management: Dynamics of HRM in Multinational Corporations, Cross Cultural HRM. Human Relations Challenges of the Future, workforce diversity management, talent management; Ethical Issues in Human Resource Management

Reference Books:

1. D'Cenzo, David A. and Stephan P. Robbins: Human Resource Management, John Wiley and Sons, New Delhi, 2011

2. Flippo, Edwin B.: Principles of Personnel Management, McGraw Hill, New York.

3. Bartlett, C.A, & Ghoshal,S. (1989): Managing Across Borders; The Transnational Solution. Boston: Havard Business School Press.

4. Aswathappa. K., (2008) Human Resource management: Text and Cases, Tata McGraw Hill, New Delhi

Syllabus for One Semester Ph. D. Course Work

Advanced Subject Paper MANAGEMENT-III
Code: RCWMGMKT3

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

Marketing – Basics, Present day importance of marketing in national and global context;
Market Segmentation Process, Identifying and Evaluation Segments, Market Targeting and Positioning for Competitive Advantage. Consumer Behaviour – Decision Making Perspectives, Improving the judgement process, Models of consumer behaviour; Marketing Information System – Marketing Research System and Marketing Decision Support System.

Research Methods in Marketing – Quantitative and Qualitative Research in Marketing, Attitude Measurement and Scaling Techniques, Product Research, Test Marketing, Advertising Research, Media Research, Motivation Research.

Strategic Marketing – Customer, Competitor and Environmental Analysis; SWOT Analysis, BCG Framework model, Porter's Model, GE Model, McKinsey Model, Market Leader, Challenger, Follower and Nicher Strategies; Market Entry/Exit Decision; Marketing Mix Strategies; Sustaining Competitive Advantage and Core Competence.
New Product Development, Product Mix Strategies, Product Differentiation Strategies, Branding and Packaging Strategies and Decisions.

Logistics and Supply Chain Management; Retail Merchandising – Retailers' Marketing Mix, Product Merchandising and Display, Vendor Relations, Pricing and Mark Downs, e-retailing, Customer Relationship Management – Customer Life Time Value Customer Acquisition Development and Retention, Brand and Customer Equity.

Nature of Marketing of Services, Services Versus Physical Goods, Different types of service Attributes –Search, Experience and Credence, Marketing Mix, Extended Marketing Mix for Services(Seven Ps of Services), Classification of services, Characteristics of services (4-I's of

Services). Service Consumer and Buying Process, Managing Service Product, Promotion, Place and Service Inventory, Managing Service Product, Promotion, Place and Service Inventory, 'People' Element in Marketing Mix and Relationship Marketing.

Reference Books :

1. Kotler, P., Marketing Management; Analysis, Planning, Implementation and Control, New Delhi,MacMillan

2. Schiffman, L.G. and Kanuk, L.L., Consumer Behaviour, New Delhi, PHI.

3. Belch, G.E. & Belch, M.A., Introduction to Advertising and Promotion, Chicago, Irwin.

4. Porter, M.E., Competitive Advantage : Creating, Sustaining Superior Performance, New York, Free Press.

5. Keegan, W., Global Marketing Management, Englewood Cliffs, New Jersey, PHI.

6. Levy, M & Barton, A.W., Retailing Management, Irwin, London.

Syllabus for One Semester Ph. D. Course Work

Advanced Subject Paper LAW
Code: RCWLAW

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

Essential Features of Indian Constitution
Distribution of Legislative and Executive Powers between Union and States
Fundamental Rights, Fundamental Duties and Directive Principles
Principles of Natural Justice
Judicial Review of Administrative Action- Writ Jurisdiction
Judicial Contribution in Bringing Social Changes

Nature and Definition of Offence
Common Intention and Common Object
Offences against Human body
Offences against Property
Offences against women

Nature of International Law and its relationship with Municipal Law
Recognition of States and Governments
Human Rights: Nature and scopes, Evolution and growth
Environmental Pollution- Meaning of Environment and Environmental Pollution,
Remedies for Environmental Protection- Civil, Criminal and Constitutional
International Development for protection of Environmental Pollution

Law relating to Right to Information
Law relating to Disadvantage Sections
Emerging Trends in Cyber Crimes
Laws relating to Women Empowerment
Law relating to Scientific Investigation in Criminal matters