



Bhartiya Skill Development University Jaipur

Ph. D. Entrance Test (02nd Dec., 2018)

Syllabus
“Automotive”

Introduction: Reverse Engineering Fundamentals-The Generic Process-Three Phases of Reverse Engineering- Phase I: Scanning, Phase II: Point Processing, Phase III: Geometric Model Development.

Methodologies and Techniques of Reverse Engineering: Computer Aided Reverse Engineering, Computer Vision and Reverse Engineering, Structured Light Range Imaging, Scanner Pipeline.

Reverse Engineering Hardware and Software: Introduction, Reverse Engineering Hardware, Reverse Engineering Software, Selection of a Reverse Engineering System.

Introduction to Rapid Prototyping: Basic Process, Current Techniques and Materials, Applications, Relationship Between Reverse Engineering and Rapid Prototyping.



Syllabus
“Chemistry”

Physical Chemistry

1. Basic principles and applications of quantum mechanics – hydrogen atom, angular momentum.
2. Variational and perturbational methods.
3. Basics of atomic structure, electronic configuration, shapes of orbitals, hydrogen atom spectra.
4. Theoretical treatment of atomic structures and chemical bonding.
5. Chemical applications of group theory.
6. Basic principles and application of spectroscopy – rotational, vibrational, electronic, Raman, ESR, NMR.
7. Chemical thermodynamics.
8. Phase equilibria.
9. Statistical thermodynamics.
10. Chemical equilibria.
11. Electrochemistry – Nernst equation, electrode kinetics, electrical double layer, Debye-Hückel Theory.
12. Chemical kinetics – empirical rate laws, Arrhenius equation, theories of reaction rates, determination of reaction mechanisms, experimental techniques for fast reactions.
13. Concepts of catalysis.
14. Polymer chemistry. Molecular weights and their determinations. Kinetics of chain polymerization.
15. Solids - structural classification of binary and ternary compounds, diffraction techniques, bonding, thermal, electrical and magnetic properties.
16. Collides and surface phenomena.
17. Data analysis.

Inorganic Chemistry

1. Chemical periodicity
2. Structure and bonding in homo- and heteronuclear molecules, including shapes of molecules.
3. Concepts of acids and bases.
4. Chemistry of the main group elements and their compounds. Allotropy, synthesis, bonding and structure.
5. Chemistry of transition elements and coordination compounds – bonding theories, spectral and Magnetic properties, reaction mechanisms.
6. Inner transition elements – spectral and magnetic properties, analytical applications.
7. Organometallic compounds - synthesis, bonding and structure, and reactivity. Organometallics in homogenous catalysis.



Syllabus
“Chemistry”

8. Cages and metal clusters.
9. Analytical chemistry- separation techniques. Spectroscopic electro- and thermoanalytical methods.
10. Bioinorganic chemistry – photosystems, Porphyrines, Metalloenzymes, Oxygen transport, Electron transfer reactions, nitrogen fixation.
11. Physical characterisation of inorganic compounds by IR, Raman, NMR, EPR, Mössbauer, UV-, NQR, MS, electron spectroscopy and microscopic techniques.
12. Nuclear chemistry – nuclear reactions, fission and fusion, radio-analytical techniques and activation analysis.

Organic Chemistry

1. IUPAC nomenclature of organic compounds.
2. Principles of stereochemistry, conformational analysis, isomerism and chirality.
3. Reactive intermediates and organic reaction mechanisms.
4. Concepts of aromaticity.
5. Pericyclic reactions.
6. Named reactions.
7. Transformations and rearrangements.
8. Principles and applications of organic photochemistry. Free radical reactions.
9. Reactions involving nucleophilic carbon intermediates.
10. Oxidation and reduction of functional groups.
11. Common reagents (organic, inorganic and organometallic) in organic synthesis.
12. Chemistry of natural products such as steroids, alkaloids, terpenes, peptides, carbohydrates, Nucleic acids and lipids.
13. Selective organic transformations – Chemoselectivity, Regioselectivity, stereoselectivity, enantioselectivity. Protecting groups.
14. Chemistry of aromatic and aliphatic heterocyclic compounds.
15. Physical characterisation of organic compounds by IR, UV-, MS, and NMR.

Interdisciplinary topics

1. Chemistry in nanoscience and technology.
2. Catalysis and green chemistry.
3. Medicinal chemistry.
4. Supramolecular chemistry.
5. Environmental chemistry.



Syllabus
“Chemistry”

Suggested Readings –

1. Principles of Physical Chemistry by Puri, Sharma & Pathania
2. Chemical Kinetics by Keith J Laidler
3. A book of Physical Chemistry (Vol-III) by K L Kapoor
4. Quantum Chemistry through Problems and Solutions by R.K. Prasad
5. Fundamentals of Molecular Spectroscopy by Colin N. Banwell
6. Chemical Applications of Group Theory by F. Albert Cotton
7. Surface Chemistry by A Goel
8. Stereochemistry Conformation and Mechanism by P.S. Kalsi
9. A Guidebook to Mechanism in Organic Chemistry by Peter Sykes
10. Organic Chemistry by - Clayden, Greeves, Warren and Wothers
11. Part-A: Structure and Mechanism by Francis A. Carey, Richard J. Sundberg
12. Part-B : Reactions and Synthesis by Francis A. Carey, Richard J. Sundberg
13. Organic Spectroscopy by William Kemp
14. Organic Photochemistry by James H. Coxon, B. Halton
15. Pericyclic Reactions by R T Morrison, R N Boyd
16. Inorganic Chemistry by J. E. Huheey
17. Concise Inorganic Chemistry by J. D. Lee
18. Inorganic Chemistry by Shriver & Atkins
19. Instrumental Method by Skoog, Holler & Crouch
20. Chemical Application of Group Theory by F A Cotton
21. Advanced Inorganic Chemistry by F A Cotton, Wilkinson, John Wiley
22. Organic Chemistry by R T Morrison and R N Boyd
23. Physical Chemistry by P W Atkins
24. Principles of Biochemistry by A L Leninger
25. Environmental Chemistry by Colin Baird, Freeman.



Renewable Energy Sources

Introduction to Renewable Energy Systems: Wind power, Hydropower, Solar energy-Biomass, Bio-fuel, Geothermal Heat energy, Solar-thermal plants, Applications.

Introduction to PV-Cells, Array, Solar power extraction using PV-Cells, I-V Characteristics, Maximum power point tracking-Methods, PV-Inverters with D.C. to D.C. converters-on low frequency side and high frequency side with isolation, without isolation.

Wind Energy Sources and potentials, Evaluation of Wind Intensity, Topography, General Classification of Wind Turbines-Rotor Turbines, Multiple-Blade Turbines, Generators and speed control used in wind power energy, Wind Power Control: Fixed speed with capacitor bank, Rotor resistance control, Synchronous Generator-external magnetized, Synchronous Generator-permanent magnets.

Fuel Cells: Fuel cells, Commercial Technologies for Generation of Electricity, Constructional Features of Solid Oxide Fuel Cells, Constructional Features of Proton Exchange Membrane Fuel Cells, Load Curve Peak Sharing with Fuel Cells, Advantages and Disadvantages of Fuel Cells,

References:

1. Troy A. Rule, “Solar wind and land: Conflicts in renewable energy development,2014.
2. N.K. Bansal and M.K. Kleeman, “Renewable Sources of Energy and Conversion Systems”.
3. Chetan Singh Solanki, “Solar Photovoltaics: Fundamentals, Technologies and applications, PHI learning Pvt. Ltd.
4. Kreith and Kreider , Solar Energy Handbook, McGraw Hill.
5. G.L. Johnson, Wind Energy Systems, Prentice Hall, 1985
6. J.F.Manwell, J.G. McGowan and A.L. Rogers, Wind Energy Explained John Wiley & Sons Ltd.

Smart Grid

Introduction to smart grid and emerging technologies, Operating principles and models of smart grid components, Key technologies for generation, networks, loads and their control capabilities; decision-making tools.

Grid Integration: Standalone systems, Concept of Micro-Grid and its components, Hybrid systems – hybrid with diesel, with fuel cell, solar-wind, wind –hydro systems, Hybrid system economics, Transient-safety, Operating limits of voltage, frequency, stability margin, energy storage, and load scheduling. Effect on power quality, harmonic distortion, voltage transients and sags, voltage flickers, dynamic reactive power support.

References:

1. James Momoh, “Smart grid: Fundamentals of design and analysis, WILEY-IEEE press, 2015.



Syllabus
“Electrical”

2. Lora T. Berger and Krzysztof Iniewski, “Smart grid applications, communications and security, WILEY, 2015.
3. Strzelecki Benysek, “Power Electronics in Smart Electrical Energy Networks”, Springer, 2008.
4. Clark W Gellings, “The Smart Grid: Enabling Energy Efficient and Demand Side Response”, CRC Press, 2009.

Power System

Percent and per unit quantities. Single line diagram for a balanced 3-phase system, Admittance Model: Branch and node admittances Equivalent admittance network and calculation of Y bus. Modification of an existing Y bus. Bus admittance and impedance matrices. Thevenin’s theorem and Z bus. Direct determination of Z bus. Modification of an existing bus.

Symmetrical fault Analysis: Transient on a Transmission line, short circuit of a synchronous machine on no load, short circuit of a loaded synchronous machine. Equivalent circuits of synchronous machine under sub transient, transient and steady state conditions. Selection of circuit breakers, Algorithm for short circuit studies. Analysis of three-phase faults.

Symmetrical Components: Fortescue theorem, symmetrical component transformation. Phase shift in star-delta transformers. Sequence Impedances of transmission lines, Synchronous Machine and Transformers, zero sequence network of transformers and transmission lines. Construction of sequence networks of power system.

Fault Analysis: Analysis of single line to ground faults using symmetrical components, connection of sequence networks under the fault condition.

Unsymmetrical Fault Analysis: Analysis of line-to-line and double line to ground faults using symmetrical components, connection of sequence networks under fault conditions. Analysis of unsymmetrical shunt faults using bus impedance matrix method.

Load Flow Analysis: Load flow problem, development of load flow equations, bus classification Gauss Seidel, Newton Raphson, decoupled and fast decoupled methods for load flow analysis. Comparison of load flow methods.



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Syllabus “Electronics”

Basic Electronics: Energy bands in intrinsic and extrinsic silicon; Carrier transport current, drift current, mobility and resistivity; Generation and recombination of carriers; Poisson and continuity equations, PN junction, Zener Diode, Simple diode circuits: clipping, clamping and rectifiers, BJT, Common Emitter (CE), Common Base (CB) and Common Collector (CC) configuration, Darlington pair, Transistor biasing, Transistor as switch and amplifier, Feedback amplifier, RC coupled amplifier, Push Pull amplifier, FET, MOSFET, MOS capacitor, Common Source, Common Drain amplifier

Digital Electronics: Number systems; Combinatorial circuits: Boolean algebra, minimization of functions using Boolean identities and Karnaugh map, logic gates, arithmetic circuits, code converters, multiplexers, decoders; Sequential circuits: latches and flip flops.

Basics of VLSI: PROM, PLA, PAL: Architectures and applications. Software Design Flow, CPLD and FPGA Architecture, MOSFET equivalent circuits and analysis, CMOS Technologies, Layout Design Rules: Design Rules Background, Static, dynamic and short circuit power dissipations; Propagation delay; Power delay product, BiCMOS Circuits, Low Power Logic Design, Small-Signal Model for MOS Transistor, Analog CMOS Sub circuits: MOS Switch, MOS Diode, Current Sinks and Sources, Current mirrors. Types of fault, Need of Design for Testability (DFT), Testability, Fault models, Path sensitizing, Sequential circuit test, BIST, Test pattern generation, JTAG & Boundary scan, TAP controller.

Communications: Amplitude modulation and demodulation, angle modulation and demodulation, Digital communications; Pulse Amplitude and Pulse code modulation (PCM), Differential pulse code modulation. Delta modulation, Noise considerations in PCM, Time Division multiplexing, Digital Multiplexers, Baseband Pulse Transmission- Inter Symbol Interference and Nyquist criterion. Pass band Digital Modulation schemes- Phase Shift Keying, Frequency Shift Keying, Quadrature Amplitude Modulation, Principles of light transmission in optical fiber, modes and configurations, Single-mode fibers, Multimode fibers, Numerical aperture, Mode field diameter, V-number, fiber materials, Fiber fabrication techniques. Attenuation, Signal dispersion in fiber. Photonic crystal fibers. Optical sources, LED, LASER diodes, PIN, Avalanche detector, photo detector noise, optical connectors, Wavelength division multiplexing, optical amplifiers, Nonlinear effects, Optical Networks.



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Syllabus “Electronics”

Reference Books:

1. Millman and Halkias, 'Integrated Electronics', TM Hill Pubs, 2017
2. Donald A. Neamen, 'Semiconductor Physics and Devices', Mcgraw Hill Edu, 2012
3. Behzad Razavi, 'Design of Analog CMOS Integrated Circuits', Mcgraw Hill Edu, 2016
4. M. Morris Mano, 'Digital Logic and Computer Design', Prentice Hall, 2018
5. Simon Haykin, 'Communication systems, 4th Edition, Wiley Pubs. 2006.
6. BP Lathi, 'Modern Analog and Digital communications system', Oxford series, 2018
7. R.P. Khare, 'Fiber Optics & Optoelectronics', Oxford Publications, 2014



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Syllabus “English”

Unit 1: *British Literature from 14th century to 20th century*

[Chaucerian Age – Elizabethan Age – Puritan Era – Metaphysical Poets – Restoration Age – Augustan Age – Pre Romantic & Romantic Ages – Victorian Age – Twentieth century – 1950s onwards]

Unit 2: *American & Non-British Literature*

[Introduction – New Poetry – American Literature – Indian Writings in English (Pre-Independence Era) – Indian Writings in English (Modern Writings, Partition Literature, Dalit Literature, Feminist Writings, Diasporic Writings, North East Indian Literature, Literatures in Translation) – Commonwealth Literature]

Unit 3: *Contemporary Literature*

(Familiarity with contemporary writers, their works, literary award winners, new movements in literature)

Unit 4: *Literary Theory and Criticism*

(Classical Age – Renaissance, 17th & 18th Centuries – Romantic Age – British Liberal Humanists & New Criticism – Structuralism, Post Structuralism & Deconstruction – Postmodernism – Feminism – Marxism - Post Colonialism Theories)

Unit 5: *English Language Teaching*

(Language related theories – Methods – Approaches – Techniques)
English Language Teaching: Approaches, Methods, Techniques

Unit 6: *Grammar and Vocabulary*



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“Entrepreneurship and Innovation”

Significance of Entrepreneur in Economic Development; Economic, Social and psychological need for entrepreneurship; Characteristics, qualities and pre – requisites of entrepreneur; The function of the entrepreneur in economic development of a Country; Methods and procedures to start and expand one’s own business; Life cycle of new business and relationship with large enterprises; Achievement motivation; Environmental Factors affecting success of a new business; Reasons for the failure and visible problems for business. Feasibility Study – Preparation of Feasibility Reports : Selection of factory location, Demand Analysis, Market potential measurement, Capital saving and project costing, Working capital requirements, profit and tax planning; Economic, Technical, Financial and Managerial Feasibility of Project. Govt. support to new enterprise, Incentives, source of Finance, Role of Govt. and Promotional agencies in entrepreneurship development. Entrepreneurship Development Programmes; Role of various institutions in developing entrepreneurship in India (A brief description only).

Types of start up, Definition of Micro, Small and Medium Enterprises, Institutional Support. Scientific Institutions and software Technology. Formulating a business plan, Marketing plan, financial plan, managing innovation and change. Preparation of Project Report, Women Entrepreneurs, labour legislation for SSI. Detailed business plan preparation; Managing small enterprises; Planning for growth; Sickness in Small Enterprises; Rehabilitation of Sick Enterprises; Intrapreneurship.



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Syllabus

“IT & Networking”

Set Theory & Algebra: Sets; Relations; Functions; Groups; Partial Orders; Lattice; Boolean Algebra.

Digital Logic: Logic functions, Minimization, Design and synthesis of combinational and sequential circuits; Number representation, basics of embedded systems

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, 8085 microprocessors.

Programming and Data Structures: Programming in C/C++; Functions, Recursion, Parameter passing, Scope, Binding; Abstract data types, Arrays, Stacks, Queues, Linked Lists, Trees, Binary search trees, Binary heaps. Algorithms: Divide & conquer, Branch & bound, Dynamic programming, Greedy techniques, NP-Hard & NP Complete.

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

Computer Networks: ISO/OSI stack, LAN technologies (Ethernet), Flow and error control techniques, TCP/UDP and sockets, IP(v4), Application layer protocols, Basic concepts of hubs, switches, gateways, and routers. Wireless and mobile communication & computing, Network security – basic concepts of public key and private key cryptography, digital signature, firewalls

AI & Machine Learning: AI techniques for problem solving, like Min-max; neural networks, genetic algorithms, fuzzy logic and their applications, machine learning techniques: Regression, Naïve Bayes, Clustering and Classification; Deep Learning; Python programming

Recommended Books

- a) A S Tanenbaum, ‘Computer Networks’, 4th Ed., PHI-2003.
- b) B A Furouzon, ‘Computer Networks’, 5th Ed, McGraw Hill, 2012.
- c) K Garg, ‘Mobile Computing-theory and Practice’, Pearson Education, 2010.
- d) E Rich, K Knight & B Nair, ‘Artificial Intelligence’, 3rd Ed., McGraw Hill, 2015.
- e) JP Mueller & Luca Massaron, ‘Machine Learning (in Python and R) for Dummies’ John Wiley, 2016.



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Syllabus

“Library & Information Science”

Section 1- Information/Knowledge Society and LIS Education

Knowledge and Information: concepts and mode of acquiring knowledge; Difference between Data, Knowledge and information; Impact of information on society; Changing role of LIS centers in society; Information Acts and Policies. IPR concept, copyright, censorship-print and non-print media; Five Laws of Library Science; Library Legislations; Library Associations in India, UK and USA- ILA, IASLIC, IATLIS, SIS, LA, ASLIB, SLA, ALA etc.; Library Associations and Organizations at International level- FIC, IFLA and UNESCO; Information systems and services; User Education; Information Sources and products;

Section 2- Information Retrieval, Consolidation and Analysis

Knowledge Management; Classification and Cataloguing; Information Products-Its design and Development, Tools and Techniques of Indexing and Abstracting; Standards for Bibliographic Record Format: ISBD, MARC21, CCF Structure, Information consolidation and Repackaging – ways strategies and activities.

Section 3- Financial and HR Management in Library and Information Centers

Human Resource Planning and Development and Total Quality Management, PERT and CPM, System Analysis, Design and Management; Organizational Behaviour; Managerial Quality and Leadership; Quality, Audit, LIS related standards, Technology Management; Costing Techniques; Cost Analysis; Marketing: Approach and Techniques; E-Marketing; Library Budgeting, Library Statistics and Reporting

Section 4- Electronic/ Digital/ Virtual Library

History and Genesis of Digital Resources and Services; Tools and Techniques of Collection Development in Digital Libraries; Evaluation of Internet Information Resources; Meta Resources; Norms and Guidelines for Content Development; Database Management System;



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“Library & Information Science”

Section 5- Information and Communication Technologies, Library Automation and recent trend in Library and Information Science.

Impact of IT on Library and Information Centers; Advantages and Disadvantages of Library Automation; Networks- ERNET, NICNET, DELNET, JANET, BLAISE, OCLC, INFLIBNET etc.; Library software; Information Networking, History, concept and Topologies of Internet and Intranet; Barcode Technology, RFID and Online Public access catalogue; Fundamentals of Information and communication Technology.

Section 6- Bibliographic Description and Citation and Referencing Style.

Bibliographical Standards for Information Exchange; Citation technology

References Books:

Arms, W. Y. (2005). Digital Libraries. California: MIT Press.

American Psychological Association (2012) Electronic References, NE, USA: American Psychological Association

Agosti, Maristella, Ed. (2008). Information Access Through Search Engines and Digital Libraries, Berlin, Germany: Springer.

Evans, W. & David B. (2013). A Handbook of Digital Library Economics: Operations, Collections and Services. London: Elsevier

Kesselman, Martin Alan & Weintraub, Irwin, Ed. (2004). Global Librarianship, Florida, USA: CRC Press.

Kumar, Krishan (2007). Library Management in Electronics Environment, New Delhi, Har Anand Publication Pvt. Ltd.

Mittal, R. L. (2007). Library Administration: Theory and Practice, New Delhi, Ess Ess Publication.

Ranganathan, S. R. (2006). Library Administration, New Delhi, Ess Ess Publication.

Stacey, Alison & Stacey, Adrian (2004). Effective Information Retrieval from the Internet: An advanced user's guide, Sawston, U.K.: Chandos Publishing.



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Syllabus “Management”

General Management: Concept, scope and Evolution of Management, Principle and theories of management. Concept and Significance of Organization Behavior, Understanding and Managing behavior- Personality, Perception, Values, Attitude, Learning and Motivation, Leadership, Managing Conflicts, Organizational Development.

Human Resource Management:

Human Resource Management- Objectives and scope; Emerging Issues & Challenges in Human Resource Management; Strategic Human Resource Management; Human Resource Planning; Potential appraisal & Succession Planning; Managing Employee Separation; Employee Empowerment; Total Quality Management & Quality of Work Life; Stress Management; Ethical Issues in Human Resource Development.

Marketing Management

Current Issues in Marketing; Marketing Concepts; Marketing Planning and Strategies; Role of Information Technology in Marketing; Marketing Implementation, Evaluation and Control; Brand Equity; Global Marketing-EPRG Framework, Brand Equity; Brand Loyalty, CRM; Societal Marketing; Marketing Research; Green Marketing; Services Marketing; Retail Marketing; Rural Marketing.

Tourism Management

Tourist / Visitor/ Traveler/ Excursionist- definition and differentiation; Natural Tourism resources in India- Land based, Water based, Air based; Fundamentals of Indian culture and society, Major festivals and fairs of India; Dance and Music in India, Tourism Planning- Origin, concept and approaches, Tourism Marketing- Service characteristics of tourism, Unique features of tourist demand and tourism product, Tourism marketing mix. Analysis and selection of market: Measuring and forecasting tourism demand: forecasting methods, managing capacity and demand. Market segmentation and positioning.

Economics



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Syllabus “Management”

Economic Functions of Modern Government – Role of Government in Economic Planning and Market Governance, Welfare foundations, Foreign trade and Economic Development, Money supply & Money Demand – Role, Constituents & Functions of money - capital markets – central Bank – commercial banks- cooperative Banks- Regional Rural Banks-Technological developments in banking. – performance of different sectors – problems of poverty, unemployment, migration, inflation & environment – Economic reforms in India – India on the eve of economic reforms- objectives, nature & structures of economic reforms – impact of economic reforms.

References:

Books for Organization and Behavior

1. Management of Organizational Behaviour Leading Human Resources, Johnson, Dewey E, PHI Publication
2. Organizational Development and Transformation, Zawacki Robert, Tata McGraw Hill
3. Strategic Management, Garth Saloner, Andrea Shepard, Joel Podolny

Books for Human Resource Management:

1. Aswathappa K., Human Resource Management, McGraw Hill, New Delhi.
2. Rao V.S.P., Human Resource Management, Excel Books, New Delhi.
3. Fisher, Shaw et. Al., Human Resource Management, Wiley Publications, New Delhi.

Books for Marketing Management:

1. Boyd, Westfall and Stasch: Marketing Research, Richard D. Irwin, Homewood Illisons.
2. Churchill, A. Gilbert Jr: Marketing Research- Methodology Foundations, The Drydone Press, Orlando.
3. Green and Tull: Research for Marketing Decisions, Prentice Hall of India (P) Ltd., New Delhi.

Books for Tourism Management:



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Syllabus

“Management”

1. Tourism Research Methods: Integrating Theory with Practice, Brent W. Ritchie, Peter Burns, Catherine Palmer
2. Marketing for Hospitality and Tourism, James C. Makens, John Griffith Bowen and Philip Kotler
3. Dictionary of Travel, Tourism and Hospitality, S. Medlick
4. Sustainable Tourism Management, John Swarbrooke

Books for Economics

1. Development with Dignity by Amit Bhaduri
2. Indian Economy Environment and policy by IC Dhingra
3. Indian Economy: Performance & Policies by Uma , Kapila
4. Banking in India by S.K. Basu
5. Central Banking by M.D. Decock
6. Indian Economy by I.C. Dhingra
7. Modern Banking by R.S. Sayers



Fluid Dynamics:

Governing equations of fluid motion; stream line; velocity potential, path line, equation of continuity, Motion in two dimensions; stream function; complex potential; source; sink and doublet; image circle theorem, Viscous fluid, Stokes-Navier equations; Plane Poiseuille and Couette flows between two parallel plates. Theory of Lubrication. Flow through tubes of uniform cross section in form of circle, annulus, ellipse and equilateral triangle under constant pressure gradient. Unsteady flow over a flat plate. Dynamical similarity. Buckingham p-theorem. Reynolds number. Prandtl's boundary layer. Boundary layer equations in two dimensions. Blasius solution. Boundary-layer thickness. Displacement thickness. Karman integral conditions. Separations of boundary layer flow.

Analysis:

Elementary set theory, finite, countable and uncountable sets, Real number system as a complete ordered field, Archimedean property, supremum, infimum. Sequences and series, convergence, limsup, liminf. Bolzano Weierstrass theorem, Heine Borel theorem. Continuity, uniform continuity, differentiability, mean value theorem.

Linear Programming Problem:

The Linear programming problem. Mathematical Formulation of the Problem, Types of solutions, Linear programming in matrix notation. Some Exceptional Cases, General Linear Programming Problem Slack and Surplus Variables, Theory and application of the simplex method of solution of a linear programming problem, Charne's M-technique, The two phase method, Duality, Transportation & Assignment Problems.

Ordinary Differential Equations (ODEs):

Existence and Uniqueness of solutions of initial value problems for first order ordinary differential equations, singular solutions of first order ODEs, system of first order ODEs. General theory of homogenous and non-homogeneous linear ODEs, variation of parameters, Sturm-Liouville boundary value problem, Green's function.

Partial Differential Equations (PDEs):

Lagrange and Charpit methods for solving first order PDEs, Cauchy problem for first order PDEs. Classification of second order PDEs, General solution of higher order PDEs with constant coefficients, Method of separation of variables for Laplace, Heat and Wave equations.

Numerical Analysis:

Numerical solutions of algebraic equations, Method of iteration and Newton-Raphson method, Rate of convergence, Solution of systems of linear algebraic equations using Gauss elimination and Gauss-Seidel methods, Finite differences, Numerical differentiation and integration, Numerical solutions of ODEs using Picard, Euler, modified Euler and Runge-Kutta methods.



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Syllabus “Mechanical”

Metal Casting: Principles of metal casting, Patterns, their functions, Types, Materials and pattern allowances, Characteristics of molding sand, Types of cores, Chaplets and chills, their materials and functions, Moulds and their types, Requisites of a sound casting, Introduction to Die Casting.

Metal Forming and Shearing: Forging, Rolling, Drawing, Extrusion, Bending, Spinning, Stretching, Embossing and Coining, Die and Punch operation in press work, Shearing, Piercing and blanking, Notching, Lancing.

Machining and Machine Tool Operations: Basic machine tools; machining processes-turning, drilling, boring, milling, shaping, planing, gear cutting, thread production, broaching, grinding, lapping, honing, super finishing; mechanics of machining – geometry of single point and multipoint cutting tools, chip formation, cutting forces and power requirements, Merchant's analysis; selection of machining parameters; tool materials, tool wear and tool life.

Computer Integrated Manufacturing: Concepts of CAD, CAM, CAPP, cellular manufacturing, NC, CNC, DNC, CNC programming G-code, M-code, AutoCAD, Solid works, Catia, Mastercam and CIM, Rapid Prototyping.

Metal Joining Processes: Welding processes – manual metal arc, MIG, TIG, plasma arc, submerged arc, electroslag, thermit, resistance, other joining processes – soldering, brazing, braze welding; inspection of welded joints, defects and remedies; Friction stir welding, friction welding and friction stir processing, powder metallurgy.

Non-traditional machining processes (EDM, USM, CHM, ECM, LBM, AJM, ECDM, WJM).

Composites: Introduction to polymers and composites; Fabrication of Metal Matrix Composites: Commonly used Matrices in MMC, fabrication of polymer matrix composites. Dispersion Processes - Stir-casting & Compo casting, Screw extrusion, Fabrication of ceramic matrix composites - Various techniques of vapour deposition, Liquid phase method and Hot pressing etc., Fabrication of nano-composites. Applications of Metal Matrix composites.

Tribology: Introduction to tribology, Causes of Friction, Adhesion Theory, Abrasive Theory, function Growth Theory Laws of Rolling Friction, Friction Instability, Wear and its Mechanisms, Adhesive Wear, Abrasive Wear, Corrosive Wear, Fretting Wear, Fretting Wear, importance of Lubrication, Boundary Lubrication, Mixed Lubrication, Full Fluid Film Lubrication, Hydrodynamic, Elastohydrodynamic lubrication, Types & Properties of Lubricants, Lubricants Additives.



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Syllabus

“Mechanical”

Industrial Engineering: Introduction to industrial engineering, Productivity Management, Plant Location & Layout, Quality Engineering, Production/ Operations Management, Work Study, Ergonomics, Statistical Process Control, Process Capability Analysis, Process Improvement, Six Sigma Process Quality, Total quality Management, Quality function deployment.



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“Political Science & Public Administration”

Political Theory: meaning, nature, and significance of political theory, importance of classical political theory, debate about the decline of political theory, views of Hobbes, Locke and Rousseau, utilitarianism.

Comparative Politics: meaning, evolution, method and approaches, political process, political parties and social change, political development, dependency, elite and civil society.

State Politics in India: conceptual and constitutional framework, political movements for reorganization and changes, party system and political mobilisation, economic planning and regional development.

Indian Constitution: constituent assembly, debates, adoption of constitution, articles, schedules, amendments, bills, acts, legislature, executive, judiciary, local administration.

The test is also intended to assess the Research Aptitude of the candidates and their ability to critically react to the issues.

Suggestive Readings:

1. Annas, J, An Introduction to Plato's Republic, Oxford: Clarendon Press, 1981.
2. Aristotle, The Politics, Oxford University Press, 1982.
3. J.P,Suda, A History of Political Thought, Meerut, 1989.
4. Aiyar,S.P., Essay on Indian Federalism, Bombay, Allied Publishers, 1965.
5. Austin,G,, The Indian Constitution: Corner Stone of a Nation, Oxford, 1966.
6. Bombwall, K.R., The Foundation of Indian Federalism, Asia Publishing House, 1967.
7. Chatterjee, P, State Politics in India, Delhi, 1997.
8. Pai, Suda, State Politics, New Dimension, Delhi, Shipra, 2000.
9. Almond, G, Comparative Politics Today: A World View, New Delhi, Pearson Education, 2006.
10. Biswal, Tapan, Comparative Politics,: Institution
11. Clark, William Roberts, Principles of Comparative Politics, New Delhi, Sage Publication, 2013.
12. Subash Kashyap, The Constitution, Book Trust of India.
13. D,D,Basu, Indian Constitution.

Journals:

1. Economic and Political Weekly.
2. Indian Journal OF Public Administration.
3. Indian Journal of Political Science.



Bhartiya Skill Development University Jaipur

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Syllabus

“Refrigeration & Air Conditioning”

1. 1st law of thermodynamics for open and closed systems, 2nd law of thermodynamics, Kelvin-Planck and Clausius statements, and Clausius inequality. 3rd law of thermodynamics.
2. Heat Engines, Heat Pumps and Refrigeration Systems, Maximum COP, Thermodynamic properties, Thermodynamic processes, T-s and p-h diagrams, Continuity and Momentum equations, Bernoulli's equation and friction factor, Modes of heat transfer, Concept of thermal resistance and overall heat transfer coefficient, Radiative heat transfer coefficient, Forced Convection, Free Convection, Boiling and Condensation heat transfer coefficients, Joule Thompson coefficient and Inversion Temperature, Linde, Claude and Stirling cycles for liquefaction of air.
3. Vapour Compression Refrigeration Systems, Vapour Absorption Refrigeration Systems, Air Cycle Refrigeration Systems, Vapour Jet Refrigeration Systems, Thermoelectric systems, Vortex tube systems, Intermittent-Solar Refrigeration Systems, Combined Cycles, refrigerants and classifications, compressor and its classifications, refrigerant components classification working and applications.
4. Comfort Air Conditioning: Residential air conditioning, Commercial air conditioning, Industrial air conditioning, Industrial Refrigeration: Chemical and process industries Dairy plants, Petroleum refineries, Food processing and food chain.
5. Psychrometry, heating, and cooling load calculations, nanofluids, Psychrometric process, building management system and control, VRV, Duct, chiller, low-temperature refrigeration, cryogenics.
6. Energy conservation in refrigeration and air conditioning system. Phase change heat transfer and heat exchanger. HVAC system in Automobiles.

Thermal Engineering

Thermodynamics: Basic concepts and Definitions-Properties of gas and pure substance- First law for closed system; Application of steady state flow process; Second law of thermodynamics; Carnot cycle; Otto cycle; Diesel cycle; Rankine cycle; Brayton cycle, Vapor compression refrigeration cycle. Heat transfer: Basic modes of heat transfer; General heat conduction equation; Steady and unsteady heat conduction; Natural and forced convection; Laws of radiation. Heat exchanger performance, LMTD and NTU methods. Fluid Mechanics: Fluid properties- Viscosity; Hydrostatics- Buoyancy; Bernoulli's equation, Differential equation of continuity and momentum; boundary layer; Flow measurement- Pipes and pipe fittings- Pumps, Compressors and Turbines.



Bhartiya Skill Development University Jaipur

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Syllabus

“Research Methodology and Statistics”

UNIT 1: Meaning of research

Meaning, aims, nature and scope of research

Prerequisites of research

Types of research methods: Fundamental or Pure research, Applied research, Quantitative research, Qualitative research, Descriptive research, Experimental research and Historical research

UNIT 2: Research Problem

Meaning of research problem

Sources of research problem

Characteristics of a good research problem

Hypothesis: Meaning and types of hypothesis.

Research proposal

Unit 3: Review of related literature

Purpose of the review.

UNIT4: Data Collection (Sampling)

Sampling and Population

Techniques of sampling Selection

Characteristics of a good sample

Types of data.

UNIT 5: Tools of Data collection

Observation, Interview, Questionnaire, and Attitude scales

Characteristics of good research tools.

UNIT 6: Descriptive Statistics

Measures of Central Tendencies: Mean, Median, Mode

Measures of Variability: Range, Quartile Deviation, Standard Deviation, and Coefficient of variation.

Normal Probability Distribution: Properties of Normal Probability Curve, Applications of Normality. Divergence from Normality: Skewness and Kurtosis

UNIT 7: Research report

Format of the research report

Style of writing the report

References and bibliography



Bhartiya Skill Development University Jaipur

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Syllabus

“Research Methodology and Statistics”

Reference books:

1. Best John W. and James Kahn, V., 1989, Research in Education, Sixth Edition, Prentice-Hall of India Pvt. Ltd, New Delhi.
2. Sharma R.A., 1992, Fundamentals of Educational Research, Loyal Book Depot, Meerut, UP, India.
3. Kulbir Singh Sidhu, 1990, Methodology of Research in Education, Sterling Publishers Pvt. Ltd., New Delhi.
4. Lokesh Koul, 1997 Methodology of educational Research, third edition, Vikas Publishing House Pvt. Ltd. , New Delhi.
5. Kothari C.R., 1990, Research Methodology Methods and Techniques, Wiley Eastern Limited, New Delhi.
6. Borg Walter R., Gall Meridith D., 1983, Educational Research an Introduction, Fourth Edition, Longaman, New York & London.
7. Nitko Anthony J., 1983, Educational Tests and Measurement an Introduction, Harcourt Brace Jovanovich, Inc., New York.
8. Aggarwal Y.P., 1988, Statistical Methods Sterling Publishers Pvt. Ltd., New Delhi.
9. Garret Hnery E., 1985 Statistics in Psychology and Education, Viakils, Feffer and Simon, Bombay.
10. Guilford, J.P., and Benjamin Fruchter, 1982 Fundamentals of statistics in Psychology and Education, Fifth edition, Mc Graw-Hill Book Company, New York.
11. Gupta S.C. and Kapoor V.K., 1999, Fundamentals of Mathematical Statistics, Sultan Chand & Sons Educational Publishers, New Delhi.
12. Grewal P.S., Methods of Statistics Analysis, Sterling Publishers Pvt. Ltd., New Delhi.
13. Bruce W. Tuckman, Statistics in Psychology and Education.

List of Statistics books:

1. **Statistics : Schaum's Outlines** by Spiegel, Murray R & other, publisher McGraw Hill Education, New Delhi
2. **Introductory Probability and Statistical Applications** by Meyer, Paul L, Publisher, Oxford & IBH co., New Delhi
3. **Using IBM® SPSS® Statistics** by Aldrich, James O & Cunningham, James B. Publisher, Sage publication, New Delhi.
4. **Statistical Method** by S P Gupta, publisher Sultan Chand & Sons, New Delhi