

**Sanjay Ghodawat University Kolhapur
Maharashtra, India**



Ph.D. Entrance Test (SGU-PET) Syllabus



Sanjay Ghodawat University Kolhapur
Kolhapur - Sangli Highway, Atigre, Dist: Kolhapur (MH) - 416118
Contact: +91 90110 39800, 90110 22567, 98222 55410
email: registrar@sanjayghodawatuniversity.ac.in
website: www.sanjayghodawatuniversity.ac.in

Ph.D. Entrance Test (SGUPET-2021) 2021-22 Syllabus**Section – I: Research Methodology (50% Weightage)****(Common to All)**

Chapter	Content
Chapter 1	Fundamentals of Research, Aims and objectives of research, Types of research – basic, novel and applied research. Tools for searching research topic – books, journals, internet, discussions etc. Research hypothesis, Steps in research design, Research process, Literature review
Chapter 2	Research Aptitude Qualities of a researcher, Logical reasoning, Test for intelligence, Basic mathematics. Ethics in research – plagiarism
Chapter 3	Research methods a) Formulating a research problem, features of good research designs, scientific, developing a research plan b) Methods: Experiments, surveys, Questionnaires, Interviews, Telephone Surveys, mail surveys, Case Studies, Participant and non participant observation, observational trials c) Sampling design: Census and sample surveys, implication of sample design, types of sample design d) Method of sample collection: Collection of primary data, Collection of Secondary data, Sampling distribution, Validation of data e) Processing and analysis of data: Statistics in research, Measures of central tendency, measures of dispersion, measures of asymmetry, Simple regression analysis, use of computers in research, Hypothesis testing, Chi-square test, Students 't test, ANOVA test f) Interpretation and report writing: preparation of tables and graphs, Observation writing and its interpretation, Report format
Chapter 4	Research methods a) Laboratory experiments, field trials, use of instruments, observations b) Interviews, Questionnaire surveys, Telephone survey, mail Survey, Postal survey, and checklists. Design of experiments.
Chapter 5	Report writing, contents of research report, Intellectual property rights and patenting. Patent registration, patent search, process of patenting.
References:	<ol style="list-style-type: none">1. Research Methodology: The aims, Practices and ethics of science By Peter Pruzan- Springer2. Principles and Techniques of Biochemistry and molecular Biology by Keith Wilson and John Wolker3. Research Methodology methods and Techniques (second revised edition) by C. R. Kothari, New Age Publishers.

Ph.D. Entrance Test (SGUPET-2021) 2021-22 Syllabus

Section – II: Civil Engineering (Weightage 50%) (Subject Specific)

Chapter	Content
Chapter 1	Strength of materials Introduction, Properties of Materials, Stress, Strain, Hooke's law, Poisson's Ratio, Stress–Strain Diagram for structural steel and non ferrous materials, Principle of superposition, Total elongation of tapering bars of circular and rectangular cross sections, volumetric strain, expression for volumetric strain, Elastic constants, Relationships among elastic constants, Stresses in composite bars, Thermal stresses in simple and compound bars. Types of beams, loadings and supports, Shearing force, bending moment
Chapter 2	Fluid mechanics Definition of Fluid, Systems of units, properties of fluid: Mass density, Specific weight, Specific gravity, Specific volume, Viscosity, Cohesion, Adhesion, Surface tension, & capillarity. Newton's law of viscosity. Capillary rise in a vertical tube and between two plane surfaces Definition of pressure, Pressure at a point, Pascal's law, Variation of pressure with depth. Types of pressure. Vapor pressure. Measurement of pressure using simple, differential & inclined manometers. Introduction to Mechanical and electronic pressure measuring devices.
Chapter 3	Environmental Engineering Systems of water supply, Objectives of water quality management, Water quality parameters – Physical, chemical and Microbiological, Sampling, Water quality analysis (IS: 3025 and IS: 1622), Drinking water standards BIS & WHO guidelines. Health significance of Fluoride, Nitrates and heavy metals like Mercury, Cadmium, Arsenic etc and toxic / trace organics, water borne diseases, Objectives of Water Treatment, Flow chart of treatment units, Aeration Principles, types; Sedimentation- theory, types
Chapter 4	Geotechnical Engineering Formation of soil – types of soil – clay mineralogy and soil structure: Soil-Water system, Electrical diffuse double layer, adsorbed water, base-exchange capacity, Common clay minerals in soil and their structures- Index Properties- Three phase system of soil and their relationships – Grain size analysis – Stoke's law and hydrometer analysis – Consistency of soils –Determination of consistency indices – Classification of coarse grained and fine grained soil as per BIS
Chapter 5	Transportation Engineering Importance of transportation, comparison of various modes of transportation, importance and scope of highway engineering, highway planning and alignment, importance of highway geometric design and scope of traffic engineering, principles of urban transportation, mass transit facilities,

	integration of different modes of transportation
Chapter 6	Project Management Optimization Techniques, Concrete Technology, Construction Materials, Linear and non linear programming Techniques, Legal Aspects in Construction Industry. Project planning and Control, Project cost control
References:	<ol style="list-style-type: none"> 1. R.C. Hibbeler, Mechanics of Materials, 8thEdition, Prentice Hall, 2011 2. P. N. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, :Standard Book House, 2010. 3. Geotechnical Earthquake Engineering, S. L. Kramer, Pearson Publication. 4. Hira Gupta, Operations Research, S. Chand Publications, 2010. 5. S. K. Garg, Water Supply Engineering, Khanna Publications, 2010 6. B. C. Punmia, Waste Water Engineering, Laxmi Publications, 2011. 7. S.Timoshenko, Strength of Materials,Part –I, D.VanNostrandCompany,Newyork. 8. Chitkara K.K., Construction Project Management, Tata Mcgraw Hill Education Pvt. Ltd. 9. Kadiyali L.R., Transportation Engineering, Khanna Publishing Co.

P Ph.D. Entrance Test (SGUPET-2021) 2021-22 Syllabus

Section – II: Electronics Engineering (Weightage 50%)(Subject Specific)

Chapter	Content
Chapter 1	Networks Network graphs: matrices associated with graphs; incidence, fundamental cut set and fundamental circuit matrices. Solution methods: nodal and mesh analysis. Network theorems: superposition, Thevenin and Norton’s maximum power transfer, Wye-Delta transformation. Steady state sinusoidal analysis using phasors. Linear constant coefficient differential equations; time domain analysis of simple RLC circuits, Solution of network equations using Laplace transform: frequency domain analysis of RLC circuits. 2-port network parameters: driving point and transfer functions. State equations for networks
Chapter 2	Electronic Devices Energy bands in silicon, intrinsic and extrinsic silicon. Carrier transport in silicon: diffusion current, drift current, mobility, and resistivity. Generation and recombination of carriers. p-n junction diode, Zener diode, tunnel diode, BJT, JFET, MOS capacitor, MOSFET, LED, p-i-n and avalanche photo diode, Basics of LASERS. Device technology: integrated circuits fabrication process, oxidation, diffusion, ion implantation, photolithography, n-tub, p-tub and twin-tub CMOS process

Chapter 3	Analog Circuits Small Signal Equivalent circuits of diodes, BJTs, MOSFETs and analog CMOS. Simple diode circuits, clipping, clamping, rectifier. Biasing and bias stability of transistor and FET amplifiers. Amplifiers: single-and multi-stage, differential and operational, feedback, and power. Frequency response of amplifiers. Simple op-amp circuits. Filters. Sinusoidal oscillators; criterion for oscillation; single transistor and op-amp configurations. Function generators and wave-shaping circuits, 555 Timers. Power supplies.
Chapter 4	Digital Circuits and Microprocessors Boolean algebra, minimization of Boolean functions; logic gates; digital IC families (DTL, TTL, ECL, MOS, CMOS). Combinatorial circuits: arithmetic circuits, code converters, multiplexers, decoders, PROMs and PLAs. Sequential circuits: latches and flip-flops, counters and shift registers. Sample and hold circuits, ADCs, DACs. Semiconductor memories. Microprocessor(8085): architecture, programming, memory and I/O interfacing.
Chapter 5	Signals & Systems Definitions and properties of Laplace transform, continuous-time and discrete time Fourier series, continuous-time and discrete-time Fourier Transform, DFT and FFT, z-transform. Sampling theorem, Linear Time-Invariant (LTI) Systems: definitions and properties; causality, stability impulse response, convolution, poles and zeros, parallel and cascade structure, frequency response, group delay, phase delay. Signal transmission through LTI systems
Chapter 6	Digital Signal Processing Review of discrete time signals and systems, system properties, discrete LTI system, impulse response, convolution, system representation by difference equation, natural and forced responses, Review of Fourier transform, DTFT, DTFS and Z-transform, DFT and circular convolution, Basic concepts of IIR and FIR filters
Chapter 7	Electromagnetics Elements of vector calculus: divergence and curl; Gauss's and stoke's theorems, Maxwell's equations: differential and integral forms. Wave equation, pointing vector. Plane waves: propagation through various media; reflection and refraction; phase and group velocity; skin depth. Transmission lines: characteristic impedance; impedance transformation; Smith chart; Impedance matching; Sparameters, pulse excitation. Waveguides: modes in rectangular waveguides; boundary conditions; cut-off frequencies; dispersion relations. Basics of propagation in dielectric waveguide and optical fibers.

	Basics of Antennas: Dipole antennas; radiation pattern; antenna gain.
Chapter 8	<p>Digital Communication</p> <p>Sampling theorem, quantization, quantization noise and signal to noise ratio analysis in PCM, DPCM and DM, Baseband transmission, intersymbol interference, Nyquist criterion for zero ISI, wave shaping and correlative coding, Linear equalization, decision feedback equalization, maximum likelihood sequence estimation, Digital modulation techniques-BPSK, FSK, QPSK, MSK, matched filter receiver and probability of error analysis in BPSK, FSK and QPSK.</p>
Chapter 9	<p>Control Systems</p> <p>Basic control system components; block diagrammatic description, reduction of block diagrams. Open loop and closed loop (feedback) systems and stability analysis of these systems. Signal flow graphs and their use in determining transfer functions of systems; transient and steady state analysis of LTI control systems and frequency response. Tools and techniques for LTI control system analysis: root loci, Routh-Hurwitz criterion, Bode and Nyquist plots. Control system compensators: elements of lead and lag compensation, elements of Proportional- Integral Derivative (PID) control. State variable representation and solution of state equation of LTI control systems.</p>
References:	<ol style="list-style-type: none"> 1. Network Analysis & Synthesis, Ghosh, 1E, TMH, 2010. 2. Networks and Systems, D Roy Choudhury, New Age Publication, 2008. 3. Millman's Electronic Devices & Circuits, SIE 4th Edition, Millman&Halkias, McGraw-Hill Education,2015 4. Semiconductor Physics And Devices by Donald A. Neamen 5. Elements of Electromagnetics by Matthew N.O. Sadiku, 6. Electromagnetic waves and Radiating Systems by Jordon and ballmain, Antenna Theory by Balanis 7. Digital Logic and Computer Design by M.Morris Mano 8. Analog and Digital Communication System by Simon Haykin 9. Principle of Communication System by Taub& Schillings 10. Modern digital and analog Communications system by BP Lathi 11. Analog Electronics, Electronics devices and circuits – Donald A Neaman, 12. Microelectronics Circuits by Sedra& Smith 13. Electronic Devices and Circuit Theory by Robert L Boylestad&Nashelsky 14. Control Systems Engineering by NormamNise 15. Control Systems by Nagarath and Gopal 16. Signals & Systems By Alan V. Oppenheim 17. Digital Signal Processing by S.K Mitra

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Section – II: Mechanical Engineering (50% Weightage)(Subject Specific)

Chapter	Content
Chapter 1	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.
Chapter 2	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
Chapter 3	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.
Chapter 4	Fluid Mechanics Fluid properties; fluid statics, manometer, 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.
Chapter 5	Thermodynamics Zeroth, First and Second laws of thermodynamics; thermodynamic system and processes; Carnot cycle. Irreversibility and availability; behavior 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. 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.
Chapter 6	Materials Structure and properties of engineering materials, heat treatment, stress-strain diagrams for engineering materials.
Chapter 7	Metal Casting: Design of patterns, moulds and cores; solidification and cooling; riser and gating design, design considerations.

	<p>Forming: Plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk (forging, rolling, extrusion, and drawing) and sheet (shearing, deep drawing, and bending) metal forming processes; principles of powder metallurgy.</p> <p>Joining: Physics of welding, brazing and soldering; adhesive bonding; design considerations in welding.</p>
Chapter 8	<p>Machining and Machine Tool Operations</p> <p>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.</p>
Chapter 9	<p>Metrology and Inspection</p> <p>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.</p>
Chapter 10	<p>Industrial Engineering: Work Study and Method study, Micromotion study and Time study. Productivity Measurement. Ergonomics Anthropometry Work station Design, Job evaluation and Merit Rating.</p>
References:	<ol style="list-style-type: none">1. R.C. Hibbeler, Mechanics of Materials, 8th Edition, Prentice Hall, 20112. M. F. Spott, Design of Machine Elements, Prantice Hall Inc.3. W T Thomson, Theory of Vibration and Application, CBS Publishers and Distributors Pvt. Ltd4. Dr.R.K. Bansal: Fluid Mechanics and Hydraulic Machines, 9thEdn, Laxmi Publications, 2010.5. Cenegal Y. A. and Boles M. A, Thermodynamics an Engineering approach, Tata McGraw, 20116. P.N Rao, Manufacturing Technology, Volume I & II, Tata Mc Graw Hill7. H. S. Shan, Manufacturing Processes: Casting, Forming and Welding8. ILO, Introduction to Work Study Oxford & IBH Publishing Co., New Delhi (2006)9. William F. Smith, JavadHashemi, Material Science and Engineering (In Si Units),10. Raghavendra N. V.Engineering Metrology and Measurements11. R. S. Khurmi, Theory of Machines, S Chand Publication

Ph.D. Entrance Test (SGUPET-2021) 2021-22 Syllabus**Section – II: Computer Science and Engineering (50% weightage)
(Subject Specific)**

Chapter	Content
Chapter 1	Digital Logic Boolean algebra. Combinational and sequential circuits. Minimization. Number representations and computer arithmetic (fixed and floating point).
Chapter 2	Computer Organization and Architecture Machine instructions and addressing modes. ALU, data-path and control unit. Instruction pipelining. Memory hierarchy: cache, main memory and secondary storage; I/O interface (interrupt and DMA mode).
Chapter 3	Programming and Data Structures Programming in C. Recursion. Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs
Chapter 4	Algorithms Searching, sorting, hashing. Asymptotic worst case time and space complexity. Algorithm design techniques: greedy, dynamic programming and divide-and-conquer. Graph search, minimum spanning trees, shortest paths.
Chapter 5	Theory of Computation Regular expressions and finite automata. Context-free grammars and push-down automata. Regular and context-free languages, pumping lemma. Turing machines and undecidability.
Chapter 6	Compiler Design Lexical analysis, parsing, syntax-directed translation. Runtime environments. Intermediate code generation.
Chapter 7	Operating System Processes, threads, inter-process communication, concurrency and synchronization. Deadlock. CPU scheduling. Memory management and virtual memory. File systems. Section 8: Databases ER-model. Relational model: relational algebra, tuple calculus, SQL. Integrity constraints, normal forms. File organization, indexing (e.g., B and B+ trees). Transactions and concurrency control.
Chapter 8	Computer Networks Concept of layering. LAN technologies (Ethernet). Flow and error control techniques, switching. IPv4/IPv6, routers and routing algorithms (distance vector, link state). TCP/UDP and sockets, congestion control. Application layer protocols (DNS, SMTP, POP, FTP, HTTP). Basics of Wi-Fi. Network security: authentication, basics of public key and private key cryptography, digital signatures and certificates, firewalls.
References:	<ol style="list-style-type: none">1. Algorithms: Introduction to Algorithms by Rivest, Cormen, Stein, Leiserson, MIT Press Operating System: "Operating System Concepts" by Galvin, Silberschatz. WILEY Publishers2. Theory of Computation: "Introduction to Automata Theory, Languages and Computation" by Hopcroft, Ullman. Pearson Education

	<ol style="list-style-type: none">3. Computer Networks: "Computer Networking: A top-down approach" by Kurose-Ross. Pearson Education4. "Computer Networks" by Tanenbaum, Prentice Hall5. Computer Organisation: "Computer Organisation" by Carl Hamacher. McGraw Hill Programming:6. "Computer Systems: A Programmer's Perspective", Randal E. Prentice Hall "Java: The Complete Reference, 8th Edition", Herbert Schildt. McGraw Hill7. Database Systems: "Database System Concepts" by Korth. McGraw Hill8. Compiler Design: "Principles of Compiler Design" by Aho and Ullman. Narosa Publishing House9. Digital Logic: "Digital Logic and Design" by Morris Mano. Pearson Education, Prentice Hall10. Software Engineering: "Software Engineering: A Practitioner's Approach" by Pressman. Prentice
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Ph.D. Entrance Test (SGUPET-2021) 2021-22 Syllabus**Section – II: Electrical Engineering (50% weightage)****(Subject Specific)**

Chapter	Content
Chapter 1	Power Electronics: Power Semiconductor devices and characteristics, Single Phase and Three Phase AC-DC Converters and applications, Operation of buck, boost and buck boost converters, operation of inverters – 180 degree mode, Sinusoidal PWM Technique, Application of Power Electronics converters in Renewable Energy Sources.
Chapter 2	Electrical Machines: DC Machine – Separately Excited, Series, Shunt and Compound Machine, Theory and operation of single and three phase transformers, Induction machines – squirrel cage and wound rotor, Salient Pole and Non- Salient Pole Synchronous Machine, Methods of speed control of dc and induction machines, Operation and Application of Permanent Magnet Synchronous Machine, Brush Less DC Machine.
Chapter 3	Power Systems: Transmission lines, Series and shunt compensation, Per-unit quantities, Bus admittance matrix, Gauss-Seidel and Newton-Raphson load flow methods, Voltage and Frequency control, Power factor correction, Symmetrical components, Symmetrical and unsymmetrical fault analysis, Principles of over-current, differential and distance protection; Circuit breakers, System stability concepts, Equal area criterion. Power Quality issues in Power System and Grid

Chapter 4	Control Systems: Transfer function of a dynamic system, positive and negative feedback, transient and steady state response, Routh-Hurwitz and Nyquist criteria, Bode plots, Root loci, Stability analysis, lead, lag and lead-lag compensation, P, PI and PID controllers, State space model, State transition matrix, eigen values.
References:	<ol style="list-style-type: none"> 1. I.J. Nagrath and M. Gopal, "Control System Engineering", New age international (P) Ltd, 5th edition, 2014. 2. Nagarath & Kothari "Electrical Machines", TMH Publications, 5th Edition. 3. Bimbhra, P.S., "Electrical Machinery", Khanna Publishers 7th Edition 4. Rashid Muhammad, H., "Power Electronics: Circuits, Devices and Applications", 2nd Edition, Prentice-Hall, 1998. 5. Allen. J. Wood and Bruce F. Wollenberg, "Power Generation, Operation and Control", John Wiley & Sons, Inc., 2003. 6. Abhijit Chakrabarti, Sunita Halder, "Power System Analysis Operation and Control", PHI learning Pvt. Ltd., New Delhi, Third Edition, 2010.

Ph.D. Entrance Test (SGUPET-2021) 2021-22 Syllabus**Section – II: Management (50% Weightage)(Subject Specific)**

Chapter	Content
Chapter 1	Introduction to Business Administration Managerial Economics -Demand analysis-Production Functions-Cost-output relations - Market Structures-Pricing theories-Advertising-Macro-economics National Income Concepts-Infrastructure-management and Policy-Business Environment-Capital Budgeting.
Chapter 2	Theories & Schools of Thoughts The concept and significance of organizational behavior-skills & roles in an organization-classical, Neo-classical and modern theories of organizational structure-Organizational design-Understanding and managing individual behaviour, Personality-Perception-Values-Attitudes-Learning-Motivation. Understanding & managing group behavior, Process-Inter- personal & group dynamics-Communication-Leadership-Managing Change-Managing Conflicts.
Chapter 3	Human Resource Management Concepts & perspectives in HRM: HRM in changing environment, Human resource planning-Objectives, Process & Techniques-Job analysis- job description- Selecting Human Resources-Induction, Training & Development-Exit policy & Implications-Performance Appraisal & Evaluation-Potential Assessment-Job Evaluation-Wage Determination-Industrial Relations & Trade Unions-Dispute Resolutions & Grievance Management – Labour Welfare

	&Social Security Measures.
Chapter 4	Financial Management Financial management-Nature & scope – Valuation concepts & Valuation of securities – Capital budgeting decisions – Risk analysis – Capital structure & cost of Capital – Dividend policy – Determinants – long- term & short term financing instruments – Mergers & Acquisitions.
Chapter 5	Marketing Management Marketing Environment & Environment scanning: Marketing Information systems & Marketing Research: Understanding Consumer & Industrial markets: Demand Measurement & Forecasting: Market segmentation – Targeting & positioning: Product decisions, Product mix, Product life cycle: New product development: Branding & packaging: Pricing methods & strategies. Promotion decisions – Promotion mix: Advertising: Personal selling: Channel management: Vertical marketing systems: Evaluation & control of marketing effort: Marketing of services: Customer relation management: Uses of internet as a marketing medium – other related issues like branding, market development, Advertising & Retailing on the net. New issues in Marketing, Advertisement, Social Media.
Chapter 6	Production Management Role & scope of production management: Facility location: Layout planning & analysis: Production planning & control – Production process analysis: Demand forecasting for Operations; Determinants of product mix: Production scheduling: Work measurement: Time & Motion study: Statistical Quality Control. Role & scope of Operations Research: Linear programming: Sensitivity analysis: Duality: Transportation model: Inventory control: Queuing theory: Decision theory: Markov analysis PERT/CPM.
Chapter 7	Operation Research Probability theory: Probability distributions – Binomial, Poisson, Normal & Exponential; Correlation & regression analysis; Sampling theory; sampling distributions; Tests of Hypothesis; large & small samples; t, z, f, Chi-square tests.
Chapter 8	IT and Systems Use of Computers in Managerial applications; Technology issues and Data processing in organization; Information Systems; MIS & Decision making; System analysis & design; Trends in Information Technology; Internet & Internet based applications.
Chapter 9	Strategic Management Concept of corporate strategy; Components of strategy formulations; Ansoff's growth vector; BCG Model; Porter generic strategies; Competitor analysis; Strategic dimensions and group mapping: Industry analysis; Strategy in Industry evolution, fragmentation, maturity and decline; Competitive Strategy & Corporate Strategy; Trans nationalization of world economy; Managing cultural diversity; Global entry strategies; Globalization of financial system

	&services; Managing International business; Competitive advantage of national; RTP & WTO.
Chapter 10	<p>International Business</p> <p>India’s Foreign Trade & policy; Export Promotion policies; Trade agreements with other countries; Policy & performance of export Zones & Export Oriented Units; Exports incentives. International marketing logistics; International logistical structures; Export Documentation frame-work; Organization of shipping services; Chartering practices; Marine cargo insurance.</p> <p>International financial environment; Foreign exchange markets; Determination of exchange rates; Exchange risk measurement; International investment; International capital markets; International Credit Rating agencies & Implication of their ratings.</p> <p>WTO & Multilateral trade agreements pertaining to trade in goods: Trade in services & TRIPS; Multilateral Environmental Agreements (MEAs); International Trade Blocks- NAFTA, ASEAN, SAARC, EU, WTO & Dispute settlement Mechanism.</p> <p>Technology monitoring; Emerging opportunities for global business.</p>
References:	<ol style="list-style-type: none"> 1. Managerial Economics –D M Mithani, 5/e, Himalaya Publication. 2011. 2. Managerial Economics – D N Dwivedi, 7/e, Vikas Publication. 2008 3. Essentials of Management-Koontz, 8/e, McGraw Hill 4. Fred Luthans - ‘Organisational Behavior’, McGraw Hill Publishing Company, New York, 2011. 5. Human Resource Management by Gary Dessler 6. Financial Management - Khan M. Y.& Jain P. K, 6/e, TMH, 2011. 7. Financial Management - Prasanna Chandra, 8/e, TMH, 2011. 8. Marketing Management: A South Asian Perspective – Philip Kotler, Kevin Lane Keller, Abraham Koshy, MithileshwarJha, 14/e, Pearson 9. Production and Operations Management: Prof. K. Ashwathappa, K Sridhar Bhat, Himalaya Publications 10. Strategic Management: An Integrated Approach - Charles W. L. Hill, Gareth R. Jones, Cengage Learning. 11. Business Policy and Strategic Management – SubbaRao P, HPH. 12. Aswathappa, INTERNATIONAL BUSINESS, Tata Mc Graw Hill publications, New Delhi 13. Operations Research: An Introduction by HamdyTaha, Pearson 14. Operations Research by H N Wagner, Prentice hall. 15. Optimization in Operations Research by Ronald Rardin, Pearson Education Inc. 16. Operations Research by R. Paneerselvam, Prentice Hall of India Pvt. Ltd. 17. Quantitative Techniques in Management by N D Vohra, McGraw-Hill 18. Information Technology Management By Raner ,Potter and Turban. 19. IT for Management- Making connections for strategic advantage- Turban, McLean and Wetherbe

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Section – II: PHYSICS (School of Science) (50% Weightage)(Subject Specific)

Chapter	Content
Chapter 1	Mathematical Methods of Physics Vector algebra and vector calculus; Linear algebra, matrices, Cayley Hamilton theorem, eigenvalue problems; Linear differential equations; Special functions (Hermite, Bessel, Laguerre and Legendre); Fourier series, Fourier transform and Laplace transform; Elements of complex analysis: Laurent series-poles, residues and evaluation of integrals; Elementary ideas about tensors; group theory numerical methods, probability.
Chapter 2	Classical Mechanics Newton's laws; Phase space dynamics, stability analysis; Central-force motion; Two-body collisions, scattering; Rigid body dynamics, non-inertial frames Variational principle, Lagrangian and Hamiltonian formalisms and equations of motion; Poisson brackets and canonical transformations; cyclic coordinates; Periodic motion, small oscillations and normal modes; Special theory of relativity, Lorentz transformations, relativistic kinematics and mass-energy equivalence.
Chapter 3	Electromagnetic Theory Electrostatics: Gauss' Law and its applications; Laplace and Poisson equations, boundary value problems; Magnetostatics: Biot-Savart law, Ampere's theorem, electromagnetic induction; Maxwell's equations in free space and linear isotropic media; Scalar and vector potentials; Gauge invariance; Electromagnetic waves in free space, dielectrics, and conductors; Reflection and refraction, polarization, Fresnel's Law, interference, coherence, and diffraction; Dispersion relations in plasma; Lorentz invariance of Maxwell's equations; Transmission lines and wave guides; Dynamics of charged particles in static and uniform electromagnetic fields; Radiation from moving charges, dipoles and retarded potentials.
Chapter 4	Quantum Mechanics Wave-particle duality; Commutators and Heisenberg's uncertainty principle; Matrix representation; Dirac's bra and ket notation; Schroedinger equation (time-dependent and time-independent); Eigenvalue problems such as particle-in-a-box, harmonic oscillator, etc.; Tunneling through a barrier; Motion in a central potential; Orbital angular momentum, Angular momentum algebra, spin; Addition of angular momenta; Hydrogen atom, spin-orbit coupling, fine structure; Time-independent perturbation theory and applications; Variational method; WKB approximation; Time dependent perturbation theory and Fermi's Golden Rule; Selection rules; Semi-classical theory of radiation; Elementary

	theory of scattering, phase shifts, partial waves, Born approximation; Identical particles, Pauli's exclusion principle, spin-statistics connection; Relativistic quantum mechanics: Klein Gordon and Dirac equations.
Chapter 5	Thermodynamic and Statistical Physics Laws of thermodynamics and their consequences; Thermodynamic potentials, Maxwell relations; Chemical potential, phase equilibria; Phase space, micro- and macrostates; Microcanonical, canonical and grand-canonical ensembles and partition functions; Free Energy and connection with thermodynamic quantities; First- and second-order phase transitions; Classical and quantum statistics, ideal Fermi and Bose gases; Principle of detailed balance; Blackbody radiation and Planck's distribution law; Bose-Einstein condensation.
Chapter 6	Electronics Semiconductor device physics, including diodes, junctions, transistors, field effect devices, homo and heterojunction devices, device structure, device characteristics, frequency dependence and applications; Optoelectronic devices, including solar cells, photodetectors, and LEDs; High-frequency devices, including generators and detectors; Operational amplifiers and their applications; Digital techniques and applications (registers, counters, comparators and similar circuits); A/D and D/A converters; Microprocessor and microcontroller basics.
Chapter 7	Experimental Techniques and data analysis Data interpretation and analysis; Precision and accuracy, error analysis, propagation of errors, least squares fitting, linear and nonlinear curve fitting, chi-square test; Transducers (temperature, pressure/vacuum, magnetic field, vibration, optical, and particle detectors), measurement and control; Signal conditioning and recovery, impedance matching, amplification (Op-amp based, instrumentation amp, feedback), filtering and noise reduction, shielding and grounding; Fourier transforms; lock-in detector, box-car integrator, modulation techniques.
Chapter 8	Atomic & Molecular Physics Quantum states of an electron in an atom; Electron spin; Stern-Gerlach experiment; Spectrum of Hydrogen, helium and alkali atoms; Relativistic corrections for energy levels of hydrogen; Hyperfine structure and isotopic shift; width of spectral lines; LS & JJ coupling; Zeeman, Paschen Back & Stark effect; X-ray spectroscopy; Electron spin resonance, Nuclear magnetic resonance, chemical shift; Rotational, vibrational, electronic, and Raman spectra of diatomic molecules; Frank – Condon principle and selection rules; Spontaneous and stimulated emission, Einstein A & B coefficients, lasers.
Chapter 9	Condensed Matter Physics Bravais lattices; Reciprocal lattice, diffraction and the structure factor; Bonding of solids; Elastic properties, phonons, lattice specific heat; Free electron theory and electronic specific heat; Response and relaxation phenomena; Drude model of electrical and thermal conductivity; Hall effect and thermoelectric

	<p>power; Diamagnetism, paramagnetism, and ferromagnetism; Electron motion in a periodic potential, band theory of metals, insulators and semiconductors; Superconductivity, type-I and type-II superconductors, Josephson junctions; Defects and dislocations; Ordered phases of matter, translational and orientational order, kinds of liquid crystalline order; Conducting polymers; Quasicrystals.</p>
<p>Chapter 10</p>	<p>Nuclear and Particle Physics Basic nuclear properties: size, shape, charge distribution, spin and parity; Binding energy, semi-empirical mass formula; Liquid drop model; Fission and fusion; Nature of the nuclear force, form of nucleon-nucleon potential; Isospin; Deuteron problem; Evidence of shell structure, single-particle shell model, Rotational spectra; Elementary ideas of alpha, beta and gamma decays and their selection rules; Nuclear reactions, reaction mechanisms, compound nuclei and direct reactions; Classification of fundamental forces; Elementary particles (quarks, baryons, mesons, leptons); Spin and parity assignments, isospin, strangeness; Gell-Mann-Nishijima formula; C, P, and T invariance and applications of symmetry arguments to particle reactions, parity non-conservation in weak interaction; Relativistic kinematics.</p>
<p>References:</p>	<p>Mathematical Method of Physics</p> <ol style="list-style-type: none"> 1. Mathematical Methods For Physicists, 6th Edition, by Arfken And Weber (Academic Press, 2005). 2. Mathematical Methods for Physics and Engineering, 3rd edition, by Riley K F, Hobson M P and Bence S J, (Cambridge University Press, 2006) 3. Advanced Engineering Mathematics, 10th Edition, by Erwin Kreyszig, (Wiley & Sons, 2010). 4. Mathematical Physics, Revised Edition, by H.K. Dass, (S. Chand, 2008). <p>Classical Mechanics</p> <ol style="list-style-type: none"> 1. Classical Mechanics, by H Goldstein (Addison Wesley 1980). 2. Classical Mechanics, by N C Rana and P S Joag (Tata McGraw Hill 1991). 3. Introduction to Classical Mechanics, by R G Takwale and P S Puranik (Tata McGraw Hill 1999). 4. Classical Mechanics, by Gupta, Kumar and Sharma (Pragati Prakashan 2000). <p>Electromagnetic Theory</p> <ol style="list-style-type: none"> 1. Introduction to Electrodynamics, 4th Edition by David J. Griffiths (Pearson Education, 2014). 2. Foundation of Electrodynamics Theory, 3rd Edition by J.R. Reitz, F.J. Milford and R.W. Christy (Narosa Publication House 1993) 3. Classical Electrodynamics, 2nd Edition by J.D. Jackson (Wiley Eastern) 4. Classical Electrodynamics by S.P. Puri (Tata McGraw Hill, 1990) <p>Quantum Mechanics</p> <ol style="list-style-type: none"> 1. Introduction to Quantum Mechanics, 2nd Edition, by David J. Griffiths (Pearson, 2014)

2. Introductory Quantum Mechanics, 4th Edition, by Li boff, (Pearson Education Ltd.).
3. Quantum Mechanics: Concepts and Applications, illustrated, by NouredineZettili (Wiley and Sons, 2009)
4. Quantum Physics, 2nd Edition by H. C. Verma(Surya Publications, 2009).

Thermodynamics and Statistical Physics

1. Statistical and Thermal Physics An Introduction, by S. Loknathan&Gambhir (PHI Learning Pvt. Ltd., 2008)
2. Statistical mechanics, 3rd edition, by R. K. Pathria, (Butterworth-Heinemann publications, 2011).
3. Statistical Mechanics Theory and Applications, by S K Sinha, (Tata McGraw-Hill, 1990).

Electronics & Experimental Methods

1. Electronic Principles, by Malvino (Tata McGraw-Hill Education, 2007).
2. Electronic Devices & Circuits by Millman (Tata McGraw-Hill Education, 2008).
3. Principles of Electronics by V. K. Mehta (S. Chand, 2005).

Atomic & Molecular Physics

1. Fundamentals of molecular spectroscopy, 4th edition, by Colin N.Banwell& Elaine M.McCash, (Tata McGraw –Hill publishing company limited, 2002).
2. Introduction to Atomic Spectra by Harvey Elliot White (McGraw Hill Kogakusha, 1999)

Condensed Matter Physics

1. Introduction to solid state physics, 5th Edition, by C. Kittel, (John Wiley & Sons. Inc., New York 1976).
2. Solid state physics, by N. W. Ashcroft and N. D. Mermin, (HRW International edition 1976).
3. Solid state physics 2nd Edition, by J. S. Blakemore, (Cambridge University Press 1985).

Nuclear and Particle Physics

1. Introductory Nuclear Physics, by Krane Kenneth S.(John Wiley & Sons, 2008)
2. Introduction to Elementary Particles, revised, by David Griffiths (John Wiley & Sons, 2008).

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Section – II: CHEMISTRY (School of Science) (50% Weightage)(Subject Specific)

Chapter	Content
Chapter 1	<p>Physical Chemistry: Basic principles and applications of quantum mechanics – hydrogen atom, angular momentum. Variational and perturbational methods. Basics of atomic structure, electronic configuration, shapes of orbitals, hydrogen atom spectra. Theoretical treatment of atomic structures and chemical bonding. Chemical applications of group theory. Basic principles and application of spectroscopy – rotational, vibrational, electronic, Raman, ESR, NMR. Chemical thermodynamics. Phase equilibria. Statistical thermodynamics. Chemical equilibria. Electrochemistry – Nernst equation, electrode kinetics, electrical double layer, Debye-Hückel theory. Chemical kinetics – empirical rate laws, Arrhenius equation, theories of reaction rates, determination of reaction mechanisms, experimental techniques for fast reactions. Concepts of catalysis. Polymer chemistry. Molecular weights and their determinations. Kinetics of chain polymerization. Solids - structural classification of binary and ternary compounds, diffraction techniques, bonding, thermal, electrical and magnetic properties Collids and surface phenomena. Data analysis.</p>
Chapter 2	<p>Inorganic Chemistry Chemical periodicity. Structure and bonding in homo- and heteronuclear molecules, including shapes of molecules. Concepts of acids and bases. Chemistry of the main group elements and their compounds. Allotropy, synthesis, bonding and structure. Chemistry of transition elements and coordination compounds – bonding theories, spectral and magnetic properties, reaction mechanisms. Inner transition elements – spectral and magnetic properties, analytical applications. Organometallic compounds - synthesis, bonding and structure, and reactivity. Organometallics in homogenous catalysis. Cages and metal clusters. Analytical chemistry- separation techniques. Spectroscopic electro- and thermoanalytical methods. Bioinorganic chemistry – photosystems, porphyrins, metalloenzymes, oxygen transport, electron- transfer reactions, nitrogen fixation. Physical characterisation of inorganic compounds by IR, Raman, NMR, EPR, Mössbauer, UV-, NQR, MS, electron spectroscopy and microscopic techniques. Nuclear chemistry – nuclear reactions, fission and fusion, radio-analytical techniques and activation analysis.</p>
Chapter 3	<p>Organic Chemistry IUPAC nomenclature of organic compounds. Principles of stereochemistry, conformational analysis, isomerism and chirality. Reactive intermediates and</p>

	<p>organic reaction mechanisms. Concepts of aromaticity. Pericyclic reactions. Named reactions. Transformations and rearrangements. Principles and applications of organic photochemistry. Free radical reactions.</p> <p>Reactions involving nucleophilic carbon intermediates. Oxidation and reduction of functional groups. Common reagents (organic, inorganic and organometallic) in organic synthesis. Chemistry of natural products such as steroids, alkaloids, terpenes, peptides, carbohydrates, nucleic acids and lipids. Selective organic transformations – chemoselectivity, regioselectivity, stereoselectivity, enantioselectivity. Protecting groups. Chemistry of aromatic and aliphatic heterocyclic compounds. Physical characterisation of organic compounds by IR, UV-, MS, and NMR.</p>
Chapter 4	<p>Interdisciplinary topics</p> <p>Chemistry in nanoscience and technology. Catalysis and green chemistry. Medicinal chemistry. Supramolecular chemistry. Environmental chemistry.</p>
References:	<p>Physical Chemistry</p> <ol style="list-style-type: none"> 1. Physical Chemistry – Thomas Engel & Philip Reid. 2. Principles of Physical Chemistry – Puri, Sharma & Pathania. 3. A text book of Physical Chemistry (Vol-II) – K. L. Kapoor. 4. Chemical Kinetics and Catalysis – Richard Mishel. 5. Quantum Chemistry – Donald A. McQuarrie. 6. Fundamentals of Molecular Spectroscopy – Colin N. Banwell. 7. Physical Chemistry – P. W. Atkins. 8. Physical Chemistry – G. M. Barrow. 9. Instrumental Methods of analysis- H.H . Willard, L.L. Mirrit, J.A. Dean. 10. Principal of Instrumental Analysis- D. Skoog and D. West. 11. Instrumental Method – Skoog, Holler & Crouch. <p>Inorganic Chemistry</p> <ol style="list-style-type: none"> 1. Inorganic Chemistry - J. E. Huheey. 2. Concise Inorganic Chemistry - J. D. Lee. 3. Mechanism of Inorganic Reactions – Fred Basolo, Ralph G. Pearson. 4. Inorganic Chemistry – Catherine E. Housecraft, Alan G. Sharpe. 5. Inorganic Chemistry – Shriver & Atkins. 6. Advanced Inorganic chemistry– F. A. Cotton, R. G. Wilkinson. 7. Structural Inorganic Chemistry – A. F. Wells. 8. Basic Solid State Chemistry–A. R. West. 9. Atomic Structure and Chemical bonding –ManasChanda. <p>Organic Chemistry</p> <ol style="list-style-type: none"> 1. Organic Chemistry - Hendrikson, Cram and Hammond. 2. A guide book to mechanism in Organic chemistry- Peter Sykes 3. Mechanism and Structure in Organic chemistry - B. S. Gould. 4. Stereochemistry of Carbon compounds- E.L.Eliel. 5. Organic Chemistry- R. T. Morrison and R. N. Boyd. 6. Advanced Organic Chemistry - J. March.

	<p>7. Stereochemistry - P. S. Kalsi.</p> <p>8. Organic Synthesis the disconnection approach – Stuart Warren.</p> <p>9. Spectrometric Identification of Org. Compounds – R. M. Silverstein, F. X. Webster.</p> <p>10. Organic Photochemistry – James H. Coxon, B. Halton.</p> <p>11. Analytical Chemistry – G. D. Christain.</p>
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Section – II: English (School of Liberal Arts) (50% Weightage)(Subject Specific)

Chapter	Content
Chapter 1	<p>Topic -I English Literature</p> <ul style="list-style-type: none"> • Middle English Period (c.1066-1500) Works of Geoffrey Chaucer, William Langland, John Gower, Nicholas Udall, Edmund Spenser, Ben Jonson, • The Renaissance (c.1500-1660) Works of Christopher Marlowe, Francis Bacon, Edmund Spenser, William Shakespeare • The Neoclassical Period (1600-1785) Works of William Congreve, John Dryden, Aphra Behn, John Bunyan, John Locke • Romantic Period (c. 1785-1832) Works of Wordsworth, Coleridge, William Blake, Keats, P.B. Shelley, Johann von Goethe, Jane Austen Thomas Grey, Lord Byron, Matthew Lewis, Anne Radcliffe • Victorian Period (c.1832-1901) Works of Elizabeth Browning, Alfred Lord Tennyson, Matthew Arnold, Robert Browning, Charles Dickens, the Brontë sisters, Thomas Hardy • Modern Period (c. 1901-1945) Works of W. B. Yeats, Seamus Heaney, Dylan Thomas, W. H. Auden, Virginia Woolf, and Wilfred Owen • Postmodern Period (c. 1945 onward) T. S. Eliot, Morrison, Shaw, Beckett, Stoppard, Fowles, Italo Calvino, Allen Ginsberg, Pynchon, Zadie Smith, Salman Rushdie
Chapter 2	<p>Topic-II Indian writing in English</p> <p>Works of R. K. Narayan, Rohinton Mistry, Salman Rushdie, Amitav Ghosh, Arundhati Roy, Vikram Seth, Mahesh Dattani,</p>

<p>Chapter 3</p>	<p>Topic-III Critical Theories</p> <ul style="list-style-type: none"> • Conceptual Framework of Contemporary Literary Theory: Historical Background • Structuralism: Language and literature as Structure; Structuralist Narratology; implications of Structuralism for the study of literature • Deconstruction: Critique of logocentricism; undesidability of meaning; difference and dissemination • Psychoanalytic Theory: Discovery of the unconscious: Freud; Deviations from Freudian mapping of the Unconscious: Jung • New Historicism • Feminism
<p>Chapter 4</p>	<p>Topic-IV Basic Concepts in Linguistics Phonetics, Phonology, Morphology, Syntax and Semantics, Linguistics and related disciplines; Sociolinguistics, Stylistics, Pragmatics</p>
<p>Chapter 5</p>	<p>Topic-V English Language Teaching</p> <ul style="list-style-type: none"> • Language Learning Theories: Behaviourism, Cognitivism, Contrastive Analysis Hypothesis Second Language Learning Theories- I: Universal Grammar Hypothesis; Krashen’s Monitor Model; Anderson’s Information Processing Model Second Language Learning • Theories- II: Pidginization/ Acculturation • Learners’ Strategies: Language Learning Strategies and Communication Strategies; Communicative Competence; Interlanguage Hypothesis; Error Analysis • Methods of Language Teaching: Approach, methods and technique; The Grammar Translation Method; Language teaching innovations in the nineteenth century and the Reform Movement; The Direct Method; The Audio-Lingual Method Communicative Language Teaching: Origin of CLT
<p>References:</p>	<ol style="list-style-type: none"> 1. Akmajian, et al. 1995, Linguistics: An Introduction to Language and Communication, Prentice Hall of India: New Delhi. 2. David Lodge, ed.—Modern Criticism and Theory : A reader, London, Longman, 1988, 3. David Lodge, ed.—Twentieth Century Literary Criticism, London, Longman, 1972, 4. Eagleton, Terry. 1996. Literary Theory: An Introduction. 2nd edn.

- Oxford: Basil Blackwell.
5. Jeremy Harmer, *The practice of English Language Teaching* Pearson
 6. Jim Scrivener, *Learning Teaching: The Essential Guide to English Language Teaching*, Mcmillan Books for teachers
 7. Kachru B. B.—*The Indianization of English—The English Language in India*, Delhi, OUP, 1983.
 8. Kachru, B. B.—*The Alchemy of English : The spread, functions and models of non-native Englishes*, Delhi, OUP, 1986
 9. Koach, P. 1983, *English Phonetics and Phonology* (CUP)
 10. Kothari C.R., ‘*Research Methodology – Methods and Techniques*’, New Age International Publishers.
 11. Krishnaswamy, Verma and Nagarajan (1992), *Modern Applied Linguistics* (Macmillan) Leech, G. N. (1983), *Principles of Pragmatics*, London: Longman. Levinson, S. C. (1983), *Pragmatics*, Cambridge: CUP.
 12. Kulkarni Anand and Chaskar Ashok (2013). *Introduction to Literary Theory and Criticism*. Orient Blackswan. Leitch Vincent. B. (ed.): *The Norton Anthology of Theory and Criticism*. W. W. Norton & Company, Inc. 2001.
 13. *Modern British Literature* edited by Kermode and Hollander, Oxford Anthology, 1973
 14. Pauline V. Young, ‘*Scientific Social Surveys and Research*’, Prentice-Hall of India Pvt. Ltd., New Delhi.
 15. Philip Rice & Patricia Waugh—eds. *A Modern Literary Theory: A reader*, third edition. Arnold, 1999
 16. Quirk R, Greenbaum S., Leech G., and Svartvik J. A.— *University Grammar of English*, London, Longman, 1973.
 17. Quirk R.—*The Use of English*, London, Longman, 1962.
 18. Radford, Atkinson and Others (1999), *Linguistics: An Introduction* (CUP) Saeed, John (1997), *Semantics*, Oxford: Blackwell.
 19. *Research in Literature: Philosophy, Areas and Methodology* by Prin. H. V. Deshpande, 820, E, Shahupuri, 4th Lane, Kolhapur
 20. S. Ramaswamy and V. S. Sethuraman, eds.—*The English Critical Tradition*, Volumn II, Delhi, Macmillan, 1977
 21. Sachdeva J.K., *Business Research Methodology*, Himalaya Publishing House, 2nd revised,
 22. Sadhu and Singh, *Research Methodology in Social Sciences*, Himalaya Publishing House, Mumbai.

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Section – II: Pharmaceutics (School of Pharmaceutical Science) (50% Weightage)(Subject Specific)

Chapter	Content
Chapter 1	Drug stability: Reaction kinetics: zero, pseudo-zero, first & second order, units of basic rate constants, determination of reaction order. Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, specific & general acid base catalysis, Simple numerical problems. Stabilization of medicinal agents against common reactions like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention
Chapter 2	Preformulation Studies: Introduction to preformulation, goals and objectives, study of physicochemical characteristics of drug substances. a. Physical properties: Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism b. Chemical Properties: Hydrolysis, oxidation, reduction, racemisation, polymerization BCS classification of drugs Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.
Chapter 3	Pharmacokinetics: Introduction to Pharmacokinetics models, Compartment models, Non compartment models, physiological models, One compartment open model. a. Intravenous Injection (Bolus) b. Intravenous infusion, extra vascular administrations, calculations of Ka, KE. From plasma and urinary excretion data
Chapter 4	Controlled drug delivery systems: Introduction, terminology /definitions and rationale, advantages, disadvantages, selection of drug candidates. Approaches to design controlled release formulations based on diffusion, dissolution and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations Polymers: Introduction, classification, properties, advantages and application of polymers in formulation of controlled release drug delivery systems.
Chapter 5	Non Parametric tests: Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallis test, Friedman Test 157 Introduction to Research: Need for research, Need for design of Experiments, Experiential Design Technique, plagiarism Graphs: Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph

	Designing the methodology: Sample size determination and Power of a study, Report writing and presentation of data, Protocol, Cohorts studies, Observational studies, Experimental studies, Designing clinical trial, various phases
Chapter 6	Design and Analysis of experiments:Factorial Design: Definition, 22, 23 design. Advantage of factorial design Response Surface methodology: Central composite design, Historical design, Optimization Techniques
References:	<ol style="list-style-type: none"> 1. Tutorial pharmacy by Cooper and Gunn. 2. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman&J.B.Schwartz 3. Bio pharmaceuticals and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B.Jaiswal,VallabhPrakashanPitampura, Delhi 4. Pharmacokinetics: By Milo Gibaldi Donald, R. Merce Dekker Inc 5. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001). 6. S.P. Vyas and R.K. Khar, Controlled Drug Delivery -concepts and advances, VallabhPrakashan, New Delhi, First edition 2002. 7. Pharmaceutical statistics- Practical and clinical applications, Sanford Bolton, publisher Marcel Dekker Inc. NewYork. 8. Fundamental of Statistics – Himalaya Publishing House- S.C.Guptha 9. Design and Analysis of Experiments –PHI Learning Private Limited, R. Pannerselvam

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Section – II: Pharmacology (School of Pharmaceutical Science) (50% Weightage)(Subject Specific)

Chapter	Content
Chapter 1	General Pharmacology a. Introduction to Pharmacology- Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, Agonists, antagonists(competitive and non competitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy. b. Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs .Enzyme induction, enzyme inhibition, kinetics of elimination
Chapter 2	Pharmacodynamics- a. Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions signal transduction mechanisms, G-protein–coupled receptors, ion

	<p>channel receptor, transmembrane enzyme linked receptors, transmembrane JAK-STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action.</p> <p>b. Adverse drug reactions.</p> <p>c. Drug interactions (pharmacokinetic and pharmacodynamic)</p> <p>d. Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.</p>
Chapter 3	<p>Pharmacology of drugs acting on cardio vascular system</p> <p>a. Introduction to hemodynamic and electrophysiology of heart.</p> <p>b. Drugs used in congestive heart failure</p> <p>c. Anti-hypertensive drugs.</p> <p>d. Anti-anginal drugs.</p> <p>e. Anti-arrhythmic drugs.</p> <p>f. Anti-hyperlipidemic drugs.</p>
Chapter 4	<p>Principles of toxicology</p> <p>a. Definition and basic knowledge of acute, subacute and chronic toxicity.</p> <p>b. Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity</p> <p>c. General principles of treatment of poisoning</p> <p>d. Clinical symptoms and management of barbiturates, morphine, organophosphorus compound and lead, mercury and arsenic poisoning.</p> <p>Chronopharmacology a. Definition of rhythm and cycles. b. Biological clock and their significance leading to chronotherapy.</p>
Chapter 5	<p>Pharmacology of central nervous system</p> <p>a. Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety agents, anti-manics and hallucinogens.</p> <p>b. Drugs used in Parkinsons disease and Alzheimer's disease.</p> <p>c. CNS stimulants and nootropics.</p> <p>d. Opioid analgesics and antagonists</p> <p>e. Drug addiction, drug abuse, tolerance and dependence.</p>
References:	<ol style="list-style-type: none"> 1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology,. Churchill Livingstone Elsevier 2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata McGraw-Hill 3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics 4. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi. 5. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher 6. Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert,

	<p>7. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins</p> <p>8. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews Pharmacology</p>
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