

Pimpri Chinchwad University

Ph.D. Entrance Exam Syllabus

Chemistry

Unit No	Title of the Unit	Topics/Subtopics Covered
Unit-1	Organic Reaction Mechanism and Stereochemistry	Ionization of carbon hydrogen bond and prototopy, Base and acid catalyzed halogenation of ketones, keto-enol equilibria, structure and rate in enolisation, concerted and carbanion mechanism for tautomerism, carbanion character in phenoxide and pyrrolyl anions, hydrolysis of haloforms, Aldol, Mannich, Cannizzaro, Darzens, Dieckmann, Claisen Baylis-Hillman reactions, Knoevenagel, benzoin condensation, alkylation of enolates, Conjugate additions, Gattermann Koch synthesis and stereochemistry
Unit 2	Carbohydrates Medicinal Chemistry	Introduction of sugars, Conformations of monosaccharides, Conformations of the five membered rings, conformations of the six memberd rings, the anomeric effect. Modified monosaccharides, Reactions of open chain form of the sugars and reactions of the cyclic form of the sugar Drug Discovery and Development Pharmacokinetics Prodrugs and Drug Metabolism
Unit 3	Principles of Physical Chemistry	Molecular and Thermodynamic Principles Fundamentals of Physical and Quantum Chemistry Chemical Energetics and Molecular Structure Quantum Mechanics, Thermodynamics, and Electrochemistry
Unit 4	Organometallic Reactions and Catalysis	Reactions involving gain and loss of ligands: ligand dissociation and substitution, oxidative addition, reductive elimination, nucleophilic displacement, reactions involving modification of ligands: insertion, carbonyl insertion, 1-2 insertion, hydride elimination, abstraction, organometallic catalysis: Hydroformylation, Monsanto acetic acid process, Wacker Process, Hydrogenation by Willkinsons catalyst, Olefin metathesis, heterogeneous catalysis: Ziegler Natta Polymerization, Water gas reduction
Unit 5	Spectroscopy	IR Spectroscopy ¹ H NMR Spectroscopy ¹³ C NMR Spectroscopy Mass Spectrometry

Books Recommended:

1. Spectrometric Identification of Organic Compounds by R. M. Silverstein, F. X. Webster, D. Kiemle, 6th Ed. John Wiley and Sons.
2. One and Two dimensional NMR Spectroscopy by Atta-Ur-Rehman, Elsevier (1989)
3. Spectroscopy of organic molecule-PS Kalsi, Wiley, Esterna, New Delhi.

4. Mass Spectrometry Basics by Christopher G. Herbert Robert A.W. Johnstone
5. Organic Chemistry – J. Clayden, N. Greeves, S. Warren and P. Wothers (Oxford Press)
6. Physical chemistry by Peter Atkins, Julio De Paula, 11th Edition , 2018, Oxford University Press
7. Principals of Physical chemistry by Puri Sharma Pathania, 48th edition, Vishal Publishing Co.
8. Physical chemistry by GM borrow, 5 th edition , 2006, Mc Graw Hill Education
9. Quantum chemistry by Ira Levine, 6th Edition
10. Quantum chemistry by R.K. Prasad, 4 th Edition
11. Physical chemistry by biological sciences by Raymond Chang (Page Number 113, 135, 141)
12. Principles of Physical Chemistry by Marron and Prouton, 4 th edition
13. Physical Chemistry - A Molecular Approach by by Donald A. McQuarrie, John D. Simon (20 August 1997)
14. Organic Chemistry - Morrison and Boyd carbohydrate 7th Edition (2011)

Computer Science and Applications

Unit No	Title of the Unit	Topics/Subtopics Covered
Unit-1	Programming, Data Structures and Algorithms	Programming Concepts, Object-Oriented Programming, Algorithms and Flowcharts, Recursion, Time and Space Complexity, Arrays, Linked Lists, Stacks, Queues, Trees, Graphs, Hashing, Searching and Sorting Techniques, Greedy and Dynamic Programming Techniques.
Unit-2	Operating Systems	Multiprogramming, Multiprocessing and Multitasking, Processes and Threads, CPU Scheduling, Synchronization and Mutual Exclusion, Critical Section Problem, Resource Allocation, Deadlocks, Memory Management, Virtual Memory, Paging, Segmentation, Fragmentation, I/O Scheduling, Unix/Linux and Windows Operating Systems.
Unit-3	Database Management Systems	Database Concepts and Architecture, Data Models, Entity-Relationship Model, Relational Data Model, Relational Algebra, SQL, Integrity Constraints, Database Security, Normalization, Transaction Processing, Concurrency Control, Recovery Techniques, Distributed Databases, Cloud Databases and NoSQL Databases.
Unit-4	Computer Networks and Information Security	OSI Reference Model, TCP/IP Model, LAN, MAN, WAN and Wireless Networks, Hubs, Bridges, Switches, Routers and Gateways, Routing Concepts, Virtual Circuits, Tunnelling, Fragmentation, Domain Name System (DNS), Electronic Mail, World Wide Web (WWW), Firewalls, Cryptography, Symmetric and Asymmetric Key Cryptography, Digital Signatures, Authentication and Network Security.
Unit-5	Theoretical Foundations of Computing	Finite Automata, Regular Expressions, Context-Free Grammars, Pushdown Automata, Turing Machines, Computability and Decidability, Compiler Fundamentals including Lexical Analysis, Parsing, Syntax Directed Translation and Code Generation.
Unit-6	Data Analytics and Intelligent Computing	Data Warehouse Environment, Dimensional Modelling, ETL (Extract, Transform and Load), Online Analytical Processing (OLAP), Business Intelligence (BI), Data Preprocessing, Knowledge Representation, Association Rule Mining, Classification, Clustering, Artificial Intelligence Fundamentals, Machine Learning Concepts, Neural Networks, Deep Learning Basics, Cloud Computing Concepts, Distributed Computing Concepts and Cyber Security Fundamentals.

Books Recommended

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, *Introduction to Algorithms*, MIT Press.
2. Mark Allen Weiss, *Data Structures and Algorithm Analysis in C++*, Pearson Education.
3. Abraham Silberschatz, Peter B. Galvin and Greg Gagne, *Operating System Concepts*, Wiley.
4. Andrew S. Tanenbaum and Herbert Bos, *Modern Operating Systems*, Pearson Education.
5. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, *Database System Concepts*, McGraw-Hill.
6. Ramez Elmasri and Shamkant B. Navathe, *Fundamentals of Database Systems*, Pearson Education.
7. Andrew S. Tanenbaum and David J. Wetherall, *Computer Networks*, Pearson Education.
8. William Stallings, *Cryptography and Network Security: Principles and Practice*, Pearson Education.
9. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, *Introduction to Automata Theory, Languages and Computation*, Pearson Education.
10. Alfred V. Aho, Monica S. Lam, Ravi Sethi and Jeffrey D. Ullman, *Compilers: Principles, Techniques and Tools*, Pearson Education.
11. Jiawei Han, Micheline Kamber and Jian Pei, *Data Mining: Concepts and Techniques*, Morgan Kaufmann.
12. Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, Pearson Education.

Electronic Engineering

Unit No	Title of the Unit	Topics/Subtopics Covered
Unit 1	Electronic Devices	Energy bands in intrinsic and extrinsic semiconductors, equilibrium carrier concentration, direct and indirect band-gap semiconductors. Carrier Transport: Diffusion current, drift current, mobility and resistivity, generation and recombination of carriers, Poisson and continuity equations. PNjunction, Zenerdiode, BJT, MOS capacitor, MOSFET, LED, photo diode and solar cell.
Unit 2	Analog Circuits Diode Circuits	Clipping, clamping and rectifiers. BJT and MOSFET Amplifiers: Biasing, AC coupling, small signal analysis, frequency response. Current mirrors and differential amplifiers. Op-amp Circuits: Amplifiers, summers, differentiators, integrators, active filters, Schmitt triggers and oscillators.
Unit 3	Digital Circuits Number Representations	Integer and floating-point- numbers. Combinatorial circuits: Boolean algebra, minimization of functions using Boolean identities and Karnaugh map, logic gates and their static CMOS implementations, arithmetic circuits, code converters, multiplexers, decoders. Sequential Circuits: Latches and flip-flops, counters, shift-registers, finite state machines, propagation delay, setup and hold time, critical path delay. Data Converters: Sample and hold circuits, ADCs and DACs. Semiconductor Memories: ROM, SRAM, DRAM. Computer Organization: Machine instructions and addressing modes, ALU, data-path and control unit, instruction pipelining.
Unit 4	Control Systems	Basic control system components; Feedback principle; Transfer function; Block diagram representation; Signal flow graph; Transient and steady-state analysis of LTI systems; Frequency response; Routh-Hurwitz and Nyquist stability criteria; Bode and root-locus plots; Lag, lead and lag-lead compensation; State variable model and solution of state equation of LTI systems.
Unit 5	Communications Random Processes	Auto correlation and power spectral density, properties of white noise, filtering of random signals through LTI systems. Analog Communications: Amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, super heterodyne receivers. Information Theory: Entropy, mutual information and channel capacity theorem. Digital Communications: PCM, DPCM, digital modulation schemes (ASK, PSK, FSK, QAM),

		bandwidth, inter-symbol interference, MAP, ML detection, matched filter receiver, SNR and BER. Fundamentals of error correction, Hamming codes, CRC.
Unit 6	Electromagnetics Maxwell's Equations	Differential and integral forms and their interpretation, boundary conditions, wave equation, Poynting vector. Plane Waves and Properties: Reflection and refraction, polarization, phase and group velocity, propagation through various media, skin depth. Transmission Lines: Equations, characteristic impedance, impedance matching, impedance transformation, S-parameters, Smith chart. Rectangular and circular waveguides, light propagation in optical fibers, dipole and monopole antennas, linear antenna arrays.

Electrical Engineering

Unit No.	Title of the Unit	Topics/Subtopics Covered
1	Power Systems	Transmission lines, corona loss, Ferranti effect, power system stability, circuit breakers, per-unit system, economic dispatch, HVDC, load frequency control
2	Control Systems	Feedback systems, block diagram reduction, transfer functions, stability analysis, frequency response, controllers (P, PI, PID)
3	Electrical Machines	DC machines: back EMF, armature reaction; Transformers: core lamination, no-load current; Induction motors: slip, torque; Synchronous machines
4	Power Electronics	Diodes, SCRs, TRIACs, choppers, inverters, rectifiers, triggering and commutation, power control techniques
5	Measurements Basics, Number Systems, and Logic Gates	Electrical quantities measurement, instrument types (PMMC, MI), error analysis, basic circuit laws, phasor concepts, three-phase systems and Number systems (Binary, Octal, Decimal, Hexadecimal), Binary arithmetic, 1's and 2's complements, Boolean algebra, Logic gates, Truth tables, DeMorgan's laws

Clinical Psychology

Unit No	Title of the Unit	Topics/Subtopics Covered
Unit-1	Introduction to Clinical Psychology	Historical Evolution and Scope of Clinical Psychology Biological Bases of Behavior: Brain-Behavior Relationships Psychopathology: Classification (DSM-5-TR & ICD-11), Etiology, and Diagnosis. Personality Theories and Development Across the Lifespan. Psychological Assessment: Intelligence, Personality, Neuropsychological Assessments, Case History Formulation and Clinical Interviews. Cultural, Gender, and Social Contexts of Mental Health Ethical Principles and Professional Conduct (APA/RCI Guidelines).
Unit 2	Psychotherapeutic Approaches and Intervention Models	Cognitive Behavioral Therapy (CBT), Dialectical Behavior Therapy (DBT) Psychodynamic and Humanistic Therapies Family and Couples Therapy Group Therapy and Community-Based Interventions Trauma-Informed Care and Crisis Intervention Mindfulness, ACT, and Third-Wave Therapies Cross-cultural Adaptations of Therapy.
Unit 3	Research Methodology, Biostatistics, and Clinical Trials in Psychology	Research Designs in Clinical Psychology: RCTs, Longitudinal, Qualitative Psychological Measurement: Validity, Reliability, Item Analysis. Ethical Clearance, Informed Consent, and Confidentiality in Clinical Research. Human Clinical Trials: Protocols, Risk Assessment, Ethical Review. Advanced Biostatistics: Regression, MANOVA, Factor Analysis. Software Use: SPSS, R, NVivo for Mixed Methods Research. Meta-analysis, Systematic Reviews, and Practice Guidelines.
Unit 4	Neuropsychology, Psychopharmacology, and Rehabilitation	Brain Disorders: Stroke, TBI, Dementias, Epilepsy, and Neurodevelopmental Disorders. Neuropsychological Assessment and Cognitive Profiling Psychopharmacology: Mechanisms, Side Effects, Drug-Psychotherapy Interactions. Neuroplasticity and Recovery Models Psychiatric Rehabilitation and Cognitive Remediation Integrative Approaches: Yoga, Biofeedback, Art & Music Therapy Disability Certification and NeuroLegal Interface.

Unit 5	Contemporary Issues, Policy, IPR, and Innovations in Mental Health	National and International Mental Health Policies (MHCA 2017, WHO, UNCRPD) Psychology and Law: Forensic Psychology, Expert Testimony, Malingering
		Intellectual Property Rights (IPR) in Clinical Tools & Interventions Digital Mental Health: AI, VR Therapies, Mobile Apps, e-Counseling Ethics of Technology Use in Therapy and Data Privacy Global Mental Health, Humanitarian Psychology, and Climate Psychology Advocacy, Leadership, and Mental Health Literacy Campaigns.

Books Recommended:

1. Clinical Psychology: Science, Practice, and Culture by Andrew M. Pomerantz
2. Abnormal Psychology by Ronald J. Comer
3. Cognitive Behavior Therapy: Basics and Beyond by Judith S. Beck
4. Handbook of Clinical Psychology by Michel Hersen & Alan M. Gross
5. The American Psychiatric Publishing Textbook of Psychiatry by Robert E. Hales et al.
6. Neuropsychological Assessment by Muriel D. Lezak et al.

Nutrition and Dietetics

Unit No	Title of the Unit	Topics/Subtopics Covered
Unit-1	Foundations of Human Nutrition and Dietetics (<i>The Roots</i>)	Nutrient Metabolism: Macronutrients and Micronutrients Nutritional Biochemistry and Human Physiology Life Cycle Nutrition (Prenatal to Geriatric) Nutrition Assessment Techniques (Anthropometry, Biochemical, Clinical, Dietary) Dietary Guidelines and Cultural Dietary Patterns Functional Foods and Traditional Diets in Health Socioeconomic and Cultural Influences on Food Choices.
Unit 2	Advanced Clinical Nutrition & Diet Therapy (<i>The Science of Healing</i>)	Nutrition in Non-Communicable Diseases (CVD, Diabetes, CKD, Cancer) Nutrition in Critical Care and Intensive Care Units (ICU) Nutritional Genomics & Personalized Dietetics Immunonutrition and Gut Microbiota in Disease Nutritional Management of Eating Disorders Therapeutic Diets and Artificial Nutrition Support (Enteral/Parenteral) Clinical Case Mapping & Evidence-Based Practice.

Unit 3	Research Methodology, Biostatistics, and Human Clinical Trials (<i>The Research Mind</i>)	Advanced Research Designs in Nutrition (Observational, Interventional, RCTs) Ethics in Human Nutrition Research (ICMR Guidelines) Human Clinical Trials: Phases, Protocol Development, Ethics Committees Nutritional Epidemiology and Population Surveillance Biostatistical Tools and Data Analysis in SPSS/R Systematic Reviews, Meta-Analysis and Evidence Synthesis Grant Writing & Research Proposal Development.
Unit 4	Nutraceuticals, Functional Foods & Regulatory Affairs (<i>The Interface of Innovation</i>)	Bioactive Compounds: Polyphenols, Probiotics, Omega-3s, etc. Nutraceutical Development: From Farm to Capsule Functional Foods and Fortification Programs. Regulatory Guidelines: FSSAI, Codex, FDA, EFSA Food Labeling, Claims, and Scientific Substantiation Pharmacokinetics of Nutrients Industry-Academia Collaborations and Translational Research
Unit 5	Nutrition Policy, IPR, and Future Frontiers (<i>The Global Thinker</i>)	National and International Nutrition Policies (POSHAN, WHO frameworks) Food Security, Sustainability & Climate-Responsive Nutrition. IPR in Nutrition Science: Patents, Copyrights, Trademarks. Tech in Nutrition: AI, Blockchain, Mobile Health & Wearables. Emerging Trends: Precision Nutrition, Cellular Agriculture, Space Nutrition. Community-Based Nutrition Interventions & Impact Evaluation. Communication for Behavior Change in Nutrition.

Books Recommended:

1. Advanced Nutrition and Human Metabolism by Sareen Gropper & Jack Smith
2. Krause's Food & the Nutrition Care Process by L. Kathleen Mahan & Janice L. Raymond
3. Modern Nutrition in Health and Disease by A. Catharine Ross et al.
4. Essentials of Human Nutrition by Jim Mann & A. Stewart Truswell
5. Clinical Nutrition and Dietetics by F.P. Antia & Shobha A. Kurpad
6. Public Health Nutrition: From Principles to Practice by Mark Lawrence & Tony Worsley

English

Unit No	Title of the Unit	Topics/Subtopics Covered
Unit-1	Foundations of Linguistics	- Definition, scope, and branches of linguistics - Descriptive vs prescriptive linguistics - Structuralism (Saussure, Bloomfield) and Generative Grammar (Chomsky) - Language universals and typology - Competence vs performance - Langue and parole - Synchronic and diachronic linguistics -Major schools of linguistic thought: Prague School, London School, American Structuralism
Unit 2	Phonetics and Phonology	- Organs of speech and the speech mechanism - Classification and transcription of speech sounds (IPA) - Phonemes, allophones, minimal pairs - Suprasegmental features: stress, intonation, rhythm - Syllable structure and phonotactics - Phonological rules and distinctive features -Connected speech processes (assimilation, elision, liaison)
Unit 3	Semantics and Pragmatics	-Meaning types: lexical, grammatical, denotative, connotative -Semantic relations: synonymy, antonymy, hyponymy, polysemy, homonymy - Componential and structural semantics - Sense and reference -Theories of meaning: referential, truth-conditional, use theory -Pragmatics: deixis, implicature, presupposition, context - Speech act theory (Austin, Searle) - Discourse and conversation analysis
Unit 4	Stylistics and Discourse Analysis	- Definition and scope of stylistics - Levels of stylistic analysis: phonological, lexical, syntactic, semantic - Foregrounding, deviation, parallelism - Cohesion and coherence in texts - Literary and non-literary discourse - Critical discourse analysis (Fairclough, van Dijk) - Register, code-switching, idiolect, sociolect - Corpus stylistics and computational tools

Unit 5	William Shakespeare Language, Themes and Critical Perspectives	-Shakespeare's role in shaping the English language -Language features: word coinages, iambic pentameter, rhetorical devices - Thematic studies: power, ambition, gender, identity, fate -Linguistic and stylistic features of tragedies, comedies, histories -Selected texts: Hamlet, Macbeth, King Lear, Othello, The Tempest -Shakespeare and literary criticism: feminist, psychoanalytic, cultural materialist, postmodern readings -Shakespeare in performance and adaptations
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Books Recommended:

1. Course in General Linguistics – Ferdinand de Saussure

Aspects of the Theory of Syntax – Noam Chomsky

The Sounds of the World's Languages – Ladefoged & Maddieson

Principles of Phonetics – John Laver

Meaning in Language – Alan Cruse

Style in Fiction – Geoffrey Leech & Mick Short

The Routledge Handbook of Stylistics – Michael Burke (Ed.)

Language and Power – Norman Fairclough

The Oxford Shakespeare: Complete Works – Edited by Wells & Taylor

Shakespeare After All – Marjorie Garber

School of Management

Unit No	Title of the Unit	Topics/Subtopics Covered
Unit 1	General Management	• Evolution of management thought • Management functions: Planning, Organizing, Leading, Controlling • Managerial roles and skills • Strategic management concepts • Corporate governance and ethics
Unit 2	Marketing Management	• Marketing concepts and philosophies • Consumer behavior analysis • Market segmentation and targeting • Marketing mix (4Ps) • Branding and positioning strategies • Integrated marketing communications • Digital marketing trends
Unit 3	Human Resource Management (HRM)	• HRM concepts and functions • Recruitment and selection processes • Training and development strategies • Performance management systems • Compensation and benefits • Industrial relations and labor laws • Employee engagement and retention
Unit 4	Financial Management	• Financial statement analysis • Cost and management accounting • Capital budgeting techniques • Financial planning and control • Working capital management • Risk management in finance • Corporate finance strategies
Unit 5	Organizational Behavior	• Individual and group behavior in organizations • Motivation theories and applications • Leadership styles and theories • Communication patterns in organizations • Conflict resolution and negotiation • Organizational culture and climate • Change management processes

Unit 6	Strategic Management	• Strategic planning and implementation • SWOT analysis and competitive advantage • Business-level and corporate-level strategies • Mergers, acquisitions, and alliances • Corporate social responsibility (CSR) • Sustainability and ethical considerations
Unit 7	Operations Management	• Production and operations strategies • Supply chain management • Inventory and materials management
		• Quality control and assurance • Project management techniques • Operations research applications
Unit 8	Economics for Managers	• Microeconomic concepts relevant to business • Macroeconomic indicators and their impact • Market structures and pricing strategies • Economic policies and their effects on business • Global economic environment

Books Recommended:

1. Principles of Management by P. C. Tripathi & P. N. Reddy
2. Marketing Management by Philip Kotler and Kevin Lane Keller
3. Principles of Marketing by Philip Kotler and Gary Armstrong
4. Human Resource Management by Gary Dessler
5. Principles of Corporate Finance by Richard A. Brealey, Stewart C. Myers, and Franklin Allen
6. Financial Management for Decision Makers by Peter Atrill
7. Organizational Behavior by Stephen P. Robbins and Timothy A. Judge
8. Strategic Management: Concepts and Cases by Fred R. David
9. Operations Management by William J. Stevenson
10. Managerial Economics by William F. Samuelson and Stephen G. Marks

Mathematics

Unit No	Title of the Unit	Topics/Subtopics Covered
Unit-1	Real & Complex Analysis	Real Analysis: Sequences and series, limits and continuity, uniform convergence, Riemann integration. Complex Analysis: Analytic functions, Cauchy's theorem, residues.
Unit 2	Algebra (Linear & Abstract)	Vector spaces, basis, linear transformations, eigenvalues/ eigenvectors. Groups, rings, fields, homomorphisms, polynomial rings.
Unit 3	Topology and Functional Analysis	Metric spaces, open and closed set, compactness, connectedness. Banach and Hilbert spaces, Hahn-Banach theorem, bounded linear operators
Unit 4	Differential Equations & Numerical Methods	ODEs: First and second-order equations, systems of ODEs. PDEs: Classification, separation of variables. Numerical methods for equations and integration.
Unit 5	Advanced Topics in Mathematics	Measure theory, Lebesgue integration, logic and set theory, probability, statistics, calculus of variations, graph theory, mathematical modelling basics.

Books Recommended:

1. Walter Rudin – Principles of Mathematical Analysis
2. Tom M. Apostol – Mathematical Analysis
3. Lars Ahlfors – Complex Analysis
4. Shanti Narayan & M.D. Raisinghania – Elements of Real Analysis
5. Satish Shirali & Harikishan L. Vasudeva – Real Analysis
6. P.K. Jain & Khalil Ahmad – Metric Spaces
7. M.L. Khanna – Complex Variables
8. P.B. Bhattacharya, S.K. Jain, S.R. Nagpaul – Basic Abstract Algebra
9. V.K. Khanna & S.K. Bhambri – A Course in Abstract Algebra
10. T.S. Bhatia – Linear Algebra and Multivariable Calculus
11. K.C. Prasad & K.B. Datta – Modern Algebra
12. M.D. Raisinghania – Ordinary and Partial Differential Equations
13. S.S. Sastry – Introductory Methods of Numerical Analysis
14. G. Balasubramanian & M. Ramaswamy – Differential Equations
15. H.K. Dass & Rama Verma – Advanced Engineering Mathematics

Mechanical Engineering

Unit No	Title of the Unit	Topics/Subtopics Covered
Unit-1	Engineering Mechanics & Materials:	<i>Engineering Mechanics</i> - Trusses and frames; free body diagrams and equilibrium, virtual work; impulse and momentum (linear and angular), kinematics and dynamics of particles & of rigid bodies in plane motion and energy formulations, collisions. <i>Mechanics of Materials</i> - Elastic constants, Stress and strain, Poisson's ratio, thin cylinders, shear force and bending moment diagrams, deflection of beams, bending and shear stresses, torsion of circular shafts, energy methods, Euler's theory of columns, thermal stresses, testing of materials with universal testing machine, strain gauges and rosettes, testing of hardness and impact strength. <i>Engineering Materials</i> - Phase diagrams, structure and properties of engineering materials, heat treatment, stress-strain diagrams for engineering materials.
Unit 2	Machine Design	<i>Machine Design</i> - Design for static and dynamic loading, Failure theories, fatigue strength and the S-N diagram, gears, shafts, rolling and sliding contact bearings, springs, brakes and clutches. <i>Vibrations</i> - Effect of damping, Free and forced vibration of single degree of freedom systems, resonance, vibration isolation, critical speeds of shafts.
Unit 3	Fluid Mechanics and Thermal Engineering	<i>Thermodynamics</i> - Properties of pure substances, thermodynamic systems and processes, the behaviour of ideal and real gases, calculation of work and heat in various processes, zeroth and first laws of thermodynamics, the second law of thermodynamics, thermodynamic relations and thermodynamic property charts and tables, availability and irreversibility. <i>Fluid Mechanics</i> - Fluid statics, properties, manometry, buoyancy, stability of floating bodies, forces on submerged bodies, control-volume analysis of mass, fluid acceleration, momentum and energy, differential equations of continuity and momentum, dimensional analysis, Bernoulli's equation, viscous flow of incompressible fluids, elementary turbulent flow, boundary layer, flow through pipes, bends and fittings and head losses in pipes. <i>Applications</i> - Power Engineering, I.C. Engines, Refrigeration and air-conditioning and Turbomachinery <i>Heat-Transfer</i> - One dimensional heat conduction, modes of heat transfer, lumped parameter system, unsteady heat conduction, dimensionless parameters in free and forced convective heat transfer, thermal boundary layer, heat transfer correlations for flow over flat plates and through pipes, heat exchanger performance, effect of turbulence, LMTD & NTU methods; Stefan-Boltzmann law, radiative

		heat transfer, Wien's displacement law, view factors, black and grey surfaces and radiation network analysis.
Unit 4	Manufacturing Engineering	Casting, Forming and Joining Processes - Casting, Different types of patterns, moulds and cores, Different types of castings, solidification and cooling, riser & gating system, fundamentals of hot and cold working processes, Plastic deformation and various forming processes of bulk (drawing, rolling, forging, extrusion) and sheet (deep drawing, shearing, bending), metal forming processes, brazing, Principles of welding, soldering & adhesive bonding. Machining & Machine Tool Operations - Basic machine tools, Mechanics of machining, single and multi-point cutting tools, tool life and wear, tool geometry and materials, the economics of machining, principles of work holding, principles of non-traditional machining processes, Computer Integrated Manufacturing - Concepts of CAD/CAM and their integration tools. Metrology and Inspection - Linear and angular measurements, Limits, fits and tolerances & comparators; gauge design, interferometry, alignment and testing methods, form and finish measurement, tolerance analysis in manufacturing and assembly.
Unit 5	Industrial Engineering	Production Planning and Control - Aggregate production planning, Operations Research - Simplex method, linear programming, transportation, network flow models, assignment, simple queuing models and PERT & CPM. Inventory Control - Safety stock inventory control systems, Deterministic models.

Books Recommended:

1. W.M Kays and M.E. Crawford, "Convective Heat and Mass Transfer", McGraw Hill Intl.
2. D. Brian Spalding, "Combustion and mass Transfer", 1st edition, Pergamon Press, 1979
3. T Cebeci, "Convective Heat Transfer", Springer
4. ASHRAE HANDBOOKS (i) Fundamentals (ii) Refrigeration
5. Threlkeld J.L., "Thermal Environmental Engineering", Prentice Hall
6. Dossat R.J., Principles of Refrigeration, Pearson Education Asia
7. I.C. Engines Fundamentals/Heywood/Mc Graw Hill
8. I.C. Engines /Ferguson/John Wiley (WE & Exclusive)
9. Engineering Mechanics of Composite Materials by Isaac and M Daniel, Oxford University Press, 1994.
10. Analysis and performance of fibre Composites by B. D. Agarwal and L. J. Broutman, Wiley-Interscience, New York, 1980.
11. Hassan El-Hofy, "Advanced Machining Processes – Non-Traditional and Hybrid Machining Processes", Mc-Graw Hill, London, 2005
12. Brown J., "Advanced Machining Technology Handbook", Mc-Graw Hill, New York, 1998

13. Operations Management, Theory and Problems” by Joseph G. Monks, Mc Grow Hill book Company-Koga.
14. Production and Operations Management” by Chary, TaTa Mc Grow
15. Mechanical Behaviour of by Thomas H. Courtney / 2nd Edition, McGraw Hill,2000.

Civil Engineer

Sr No	Specialisations	Content Covered
1	Structural Engineering	• Strength of Materials (Stress, Strain, Elastic Constants, Torsion) • Shear Force, Bending Moment & Deflection of Beams • Analysis of Plane Trusses & Strain Energy • Columns, Arches, Influence Lines & Moment Distribution • Reinforced Cement Concrete (RCC) Design • Steel Structure Design (Connections, Beams, Columns, Plate Girders & Roof Trusses)
2	Environmental Engineering	• Water Supply Engineering (Sources, Demand Forecasting, Water Quality) • Water Treatment Processes & Unit Operations • Water Distribution Systems & Disinfection • Wastewater Characteristics & Treatment Processes • Sewage Treatment Units & Sludge Management • Waste Disposal Systems & Waste Stabilization Ponds
3	Geotechnical Engineering	• Soil Properties & Compaction • Soil Water, Permeability & Seepage • Stress Distribution in Soils • Earth Pressure Theories • Consolidation & Compressibility of Soils • Shear Strength & Laboratory Testing
4	Water Resources Engineering	• Fluid Properties & Hydrostatics • Fluid Dynamics & Pipe Flow • Open Channel Flow & Hydraulic Systems • Dimensional Analysis & Boundary Layer Theory • Hydrology & Hydro-Meteorology • Precipitation, Evaporation, Infiltration & Hydrologic Design
5	Transportation Engineering	• Transportation Planning & Highway Alignment • Traffic Engineering & Intelligent Transport Systems • Highway Geometric Design • Pavement Materials & Testing

Sr No	Specialisations	Content Covered
		• Flexible & Rigid Pavement Design • Highway Construction, Maintenance & Recycling
6	Construction Materials & Concrete Technology	• Cement: Manufacturing, Properties & Types • Aggregates & Admixtures • Fresh Concrete Properties & Workability Tests • Hardened Concrete: Strength & Durability • Concrete Production (Batching, Mixing, Placing, Curing) • Quality Control & Concrete Mix Design

Books Recommended:

1. **Strength of Materials** by S. Ramamrutham, 17th Edition, Dhanpat Rai Publications.
2. **Reinforced Concrete Design** by S. Unnikrishna Pillai and Devdas Menon, 3rd Edition, Tata McGraw-Hill Education.
3. **Design of Steel Structures** by N. Subramanian, 2nd Edition, Oxford University Press.
4. **Water Supply Engineering** by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, 3rd Edition, Laxmi Publications.
5. **Wastewater Engineering: Treatment and Resource Recovery** by Metcalf & Eddy, 5th Edition, McGraw-Hill Education.
6. **Principles of Geotechnical Engineering** by Braja M. Das, 9th Edition, Cengage Learning.
7. **Soil Mechanics and Foundation Engineering** by K. R. Arora, 7th Edition, Standard Publishers Distributors.
8. **Engineering Hydrology** by K. Subramanya, 5th Edition, McGraw-Hill Education.
9. **Fluid Mechanics and Hydraulic Machines** by R. K. Rajput, 3rd Edition, S. Chand Publishing.
10. **Highway Engineering** by S. K. Khanna, C. E. G. Justo and A. Veeraragavan, 10th Edition, Nem Chand & Bros.
11. **Traffic Engineering and Transport Planning** by L. R. Kadiyali, 8th Edition, Khanna Publishers.
12. **Concrete Technology** by M. S. Shetty, Revised Edition, S. Chand Publishing.

Codes and Standards Recommended:

1. **IS 456: 2000** – Plain and Reinforced Concrete – Code of Practice, Bureau of Indian Standards (BIS).

2. **IS 800: 2007** – General Construction in Steel – Code of Practice, Bureau of Indian Standards (BIS).
3. **IS 875 (Parts 1–5)** – Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Bureau of Indian Standards (BIS).
4. **IS 10262: 2019** – Concrete Mix Proportioning – Guidelines, Bureau of Indian Standards (BIS).
5. **IS 1893 (Part 1): 2016** – Criteria for Earthquake Resistant Design of Structures, Bureau of Indian Standards (BIS).
6. **IS 383: 2016** – Coarse and Fine Aggregate for Concrete – Specification, Bureau of Indian Standards (BIS).
7. **IRC: 37-2018** – Guidelines for the Design of Flexible Pavements, Indian Roads Congress.
8. **IRC: 58-2015** – Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, Indian Roads Congress.
9. **CPHEEO Manual on Water Supply and Treatment**, Ministry of Housing and Urban Affairs, Government of India, Latest Edition.
10. **CPHEEO Manual on Sewerage and Sewage Treatment Systems**, Ministry of Housing and Urban Affairs, Government of India, Latest Edition.

Pharmacy

Unit No	Title of the Unit	Topics/Subtopics Covered
Unit-1	Pharmaceutics	- Preformulation Studies, Concept & Models for NDDS:(transdermal DDS,Targeted DDS), pharmacokinetics. - Kinetic principles and stability testing
Unit 2	Pharmaceutical Chemistry	- Reaction Mechanisms, Microwave assisted synthesis & Structural elucidation of final compounds. Molecular basis of drug action and new drug development and lead optimization, Prodrugs. - Combinational chemistry - Computer-Aided Drug design
Unit 3	Pharmacology	- Pharmacokinetics and Pharmacodynamics - Receptor Pharmacology & Mechanisms - Drugs acting on CNS, ANS & CVS, Chemotherapy, - Endocrine Pharmacology - Organization of screening (Pharmacological)
Unit 4	Pharmacognosy	- Methods and Principles of extraction, - Elucidation of biosynthetic pathway - WHO guidelines for herbal drugs standardization - Plant Tissue Culture & its applications
Unit 5	Pharmaceutical Analysis	- Spectroscopic Methods of Analysis- IR, NMR, MASS - Chromatographic Techniques- HPLC, GC, HPTLC - Hyphenated Techniques- LC-MS, GC-MS,

Books Recommended:

1. Biopharmaceutics and Pharmacokinetics-A Treatise by D. M. Brahmkar and Sunil B. Jaiswal
2. Essentials of Medical Pharmacology by K. D. Tripathi
3. Dr Alagarsamy's Textbook of Medicinal Chemistry, Volume I & II
4. A Textbook of Organic Chemistry. By Arun Bahl & BS Bahl
5. Cooper And Gunns Dispensing For Pharmaceutical Students
6. Pharmaceutics, The Science & Dosage Form Design by M. E. Aulton.
7. Pharmaceutical Dosage Form and Drug Delivery System by H.C. Ansel
8. Organic Chemistry by Clayden, Greeves, Warren and Wothers.
9. Principles of Medicinal Chemistry by William Foye
10. Spectrometric Identification of Organic compounds by Robert M Silverstein
11. Burger's Medicinal Chemistry & Drug Discovery
12. Pharmacological Basis of Therapeutics by Goodman and Gilman.

Physics

Unit No	Title of the Unit	Topics/Subtopics Covered
Unit-1	Mathematical Physics	Matrices; Vector calculus; curvilinear coordinates; PDEs (Laplace, Poisson, wave equation); Green's functions; tensors; eigenvalue problems, Hilbert spaces
Unit 2	Atomic & Molecular physics	Quantum states, quantum numbers, Pauli's exclusion principle, and Spin-orbit coupling, Zeeman, Paschen–Back, Stark effects, diatomic molecules: rotational spectra (rigid/non-rigid rotator) Vibrational spectra (harmonic/anharmonic), Rotation–vibration coupling, electronic spectra, Franck–Condon principle
Unit 3	Condensed Matter Physics	Crystal systems and Bravais lattices, Miller indices and X-ray diffraction, Reciprocal lattice and Brillouin zones, Crystal binding: ionic, covalent, metallic, Van der Waals, Band theory: Kronig–Penney model, Bloch theorem, Effective mass, density of states, Fermi energy and Fermi surface Hall effect and electrical conductivity, magnetic properties, Properties of a superconductor
Unit 4	Experimental Techniques and Data Analysis	Precision, accuracy, sensitivity, resolution, Static and dynamic characteristics of instruments, Signal-to-noise ratio, Transducers and sensors, Data acquisition systems, vacuum techniques and pressure measurement, thin film deposition methods (CVD, PVD, sputtering), Optical methods: interferometry, polarimetry, spectrometry, Electrical and magnetic property measurement setups
Unit 5	Modern Physics	Nuclear properties: mass, binding energy, radius, spin, isospin, Radioactive decay laws, Nuclear models (liquid drop, shell model), Nuclear reactions and Q-value, Fission, Fusion reactions, Classification of particles: leptons, mesons, baryons, Maxwell's equations (differential and integral forms), Poynting vector, energy and momentum in EM fields

Books Recommended:

1. Arfken, G.B., Weber, H.J. and Harris, F.E., 2013. *Mathematical Methods for Physicists*. 7th ed. Amsterdam: Academic Press.
2. Boas, M.L., 2006. *Mathematical Methods in the Physical Sciences*. 3rd ed. New York: Wiley.
3. Mathews, J. and Walker, R.L., 1970. *Mathematical Methods of Physics*. 2nd ed. New York: W.A. Benjamin.

4. Bransden, B.H. and Joachain, C.J., 2003. *Physics of Atoms and Molecules*. 2nd ed. Harlow: Pearson Education.
5. Foot, C.J., 2005. *Atomic Physics*. 1st ed. Oxford: Oxford University Press.
6. Herzberg, G., 1950. *Molecular Spectra and Molecular Structure: I. Spectra of Diatomic Molecules*. 2nd ed. New York: Van Nostrand Reinhold.
7. Banwell, C.N. and McCash, E.M., 1994. *Fundamentals of Molecular Spectroscopy*. 4th ed. New York: McGraw-Hill.
8. Kittel, C., 2005. *Introduction to Solid State Physics*. 8th ed. Hoboken: Wiley.
9. Kachhava, C.M., 1990. *Solid State Physics: Structures and Properties of Materials*. 1st ed. New Delhi: Tata McGraw-Hill.
10. Bevington, P.R. and Robinson, D.K., 2003. *Data Reduction and Error Analysis for the Physical Sciences*. 3rd ed. Boston: McGraw-Hill.
11. Taylor, J.R., 1997. *An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements*. 2nd ed. Sausalito: University Science Books.
12. Harris, D.C. and DeLucia Jr., F.C., 2009. *Symmetry and Spectroscopy: An Introduction to Vibrational and Electronic Spectroscopy*. Reprint ed. New York: Dover Publications.
13. Krane, K.S., 1987. *Introductory Nuclear Physics*. 1st ed. New York: Wiley.
14. Cohen, B.L., 1971. *Concepts of Nuclear Physics*. 1st ed. New York: McGraw-Hill.
15. Perkins, D.H., 2000. *Introduction to High Energy Physics*. 4th ed. Cambridge: Cambridge University Press.
16. Griffiths, D.J., 2013. *Introduction to Electrodynamics*. 4th ed. Boston: Pearson.

Biochemistry

Unit no.	Title	Topics
1	Advanced Molecular Biochemistry and Cellular Processes	Molecular Basis of Life Biomolecular Structure and Function Protein Folding and Stability Protein–Protein and Protein–Ligand Interactions Enzyme Structure, Mechanism, and Regulation Cellular Bioenergetics Membrane Structure and Transport Cell Signaling Pathways
2	Advanced Metabolism and Omics Technologies:	Advanced Carbohydrate Metabolism Lipid Metabolism Amino Acid and Nitrogen Metabolism Nucleotide Metabolism Metabolic Integration and Regulation Hormonal Regulation of Metabolism Clinical Biochemistry
3	Computational Biochemistry and Systems Biology:	Bioinformatics in Biochemistry Biological Databases Protein Sequence Analysis Protein Structure Prediction Molecular Modeling Molecular Docking Molecular Dynamics Simulations Drug–Target Interaction Analysis Systems Biology
4	Translational Biochemistry and Biomedical Innovation	Molecular Basis of Human Diseases Cancer Biochemistry Neurochemical Disorders Cardiovascular Biochemistry Endocrine Biochemistry Immunochemistry Nutritional Biochemistry Precision Medicine Pharmacogenomics

5	Research Design, Scientific Communication, and Future Directions in Biochemistry	Identification of Research Problems Advanced Experimental Design Research Methodology in Microbiology Grant Proposal Writing Advanced Biostatistics Scientific Writing and Publication Systematic Reviews and Meta-analysis Publication Ethics Responsible Conduct of Research Metaanalysis Publication Ethics
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Suggested Textbooks

1. Lehninger Principles of Biochemistry
2. Harper's Illustrated Biochemistry
3. Biochemistry

Reference Books

1. Principles of Biochemistry
2. Molecular Cell Biology
3. Voet and Voet's Biochemistry

Recommended Online Resources

1. National Center for Biotechnology Information
2. [ExPASy Bioinformatics Resource Portal](#)
3. [Kyoto Encyclopedia of Genes and Genomes \(KEGG\)](#)

Biotechnology

Unit no.	Title	Topics
1	Foundations of Modern Biotechnology	Evolution of Biotechnology Classical versus Modern Biotechnology Cellular and Molecular Basis of Biotechnology Central Dogma and Beyond Systems Biology Synthetic Biology Precision Biotechnology Genome Engineering.
2	Advanced Molecular Technologies and Omics Sciences	Recombinant DNA Technology CRISPR-Cas Genome Editing Gene Therapy Stem Cell Technology Single Cell Biology Genomics Transcriptomics Proteomics Metabolomics Epigenomics Microbiomics
3	Bioinformatics, Computational Biotechnology and Artificial Intelligence	Computational Biology Structural Bioinformatics Functional Genomics Protein Modeling Molecular Docking Molecular Dynamics Machine Learning in Biotechnology Artificial Intelligence in Drug Discovery Big Data Analytics
4	Translational Biotechnology and Innovation:	Industrial Biotechnology Agricultural Biotechnology Medical Biotechnology Environmental Biotechnology Marine Biotechnology Microbial Biotechnology
5	Research Design, Communication and Scientific Future Biotechnology:	Research Problem Identification Experimental Design Grant Proposal Development Research Methodology Advanced Statistical Methods

		Scientific Writing Systematic Reviews Meta-analysis Publication Ethics
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Learning resources

Suggested Textbooks

1. Molecular Biotechnology: Principles and Applications of Recombinant DNA
2. Lehninger Principles of Biochemistry
3. Biotechnology: Applying the Genetic Revolution

Reference Books

1. Principles of Gene Manipulation and Genomics
2. Bioinformatics and Functional Genomics
3. Bioprocess Engineering Principles

Recommended Online Resources

1. National Center for Biotechnology Information
2. [European Bioinformatics Institute \(EMBL-EBI\)](#)
3. [KEGG Database](#)

Microbiology

Unit no.	Title	Topics
1	Advanced Microbial Biology and Diversity	Evolution of Microorganisms Microbial Taxonomy and Phylogeny Prokaryotic and Eukaryotic Microbiology Archaeal Biology Microbial Physiology and Metabolism Microbial Growth Dynamics
2	Molecular Microbiology and Omics Technologies:	Recombinant DNA Technology CRISPR-Cas Systems Microbial Genomics Comparative Genomics Functional Genomics Transcriptomics Proteomics Metabolomics Metagenomics

3	Computational Microbiology and Systems Biology:	Bioinformatics for Microbiology Biological Databases Genome Annotation Microbial Genome Assembly Comparative Genomic Analysis Protein Structure Prediction Molecular Docking Network Biology Systems Microbiology
4	Translational and Applied Microbiology	Medical Microbiology Clinical Microbiology Antimicrobial Resistance (AMR) Antimicrobial Stewardship Vaccine Development Industrial Microbiology Agricultural Microbiology Environmental Microbiology
5	Research Design, Scientific Communication, and Future Directions in Microbiology	Identification of Research Problems Advanced Experimental Design Research Methodology in Microbiology Grant Proposal Writing Advanced Biostatistics Scientific Writing and Publication Systematic Reviews and Metaanalysis

Learning resources

Suggested Textbooks

1. Brock Biology of Microorganisms
2. Prescott's Microbiology
3. Molecular Genetics of Bacteria

Reference Books

1. Manual of Clinical Microbiology
2. Environmental Microbiology
3. Molecular Microbiology: Diagnostic Principles and Practice

Recommended Online Resources

1. American Society for Microbiology
2. National Center for Biotechnology Information
3. [European Bioinformatics Institute \(EMBL-EBI\)](#)

Research Methodology

Unit No	Title of the Unit	Topics/Subtopics Covered
Unit-1	Fundamentals of Research and Problem Formulation	• Meaning, objectives, and role of research in academic and applied contexts • Classification of research: - o Basic and applied - o Quantitative and qualitative - o Exploratory, descriptive, analytical, and experimental • Scientific approach in conducting research • Identification and formulation of research problems - o Key sources of research problems - o Attributes of a well-defined problem - o Common errors in defining research problems • Hypothesis: - o Types, formulation, and features - o Examples from various disciplines
Unit 2	Research Design and Literature Review	• Understanding the concept, purpose, and elements of research design • Types of research designs: - o Exploratory, descriptive, analytical - o Formal and informal experimental designs • Review of literature: - o Objectives, sources, and search strategies - o Identifying and analyzing research gaps - o Techniques for critical literature review - o Common errors to avoid during literature survey
Unit 3	Data Collection, Sampling, Measurement, and Scaling	• Types of data: - o Primary vs. secondary - o Quantitative vs. qualitative • Data collection techniques: - o Interviews, focus groups, case studies (qualitative) - o Surveys, structured observations, experiments (quantitative) • Sampling methods: - o Probability techniques: Simple random, stratified, systematic - o Non-probability techniques: Judgmental, convenience, snowball - o Sample size estimation and error minimization • Measurement and scaling: - o Levels of measurement: Nominal, ordinal, interval, ratio - o Reliability and validity of instruments and scales

Unit 4	Data Analysis and Interpretation	• Basics of descriptive and inferential statistics • Hypothesis testing and statistical techniques: - o t-test, chi-square test, F-test, ANOVA • Correlation and regression analysis: - o Simple and multiple regression models • Introduction to multivariate techniques: - o Factor analysis, discriminant analysis o Cluster analysis, multidimensional scaling • Interpretation of analytical results and significance levels
Unit 5	Research Documentation, Proposal Writing, and Ethics	• Structure and writing of research reports and theses • Components and format of a research proposal • Identifying research funding opportunities • Proposal development and submission process • Research presentation techniques: - o Oral presentation, academic posters, publications • Research ethics and academic integrity: - o Ethical considerations in research design and reporting o Avoiding plagiarism and ensuring proper citation o Understanding IPR, copyrights, and patents o Regulatory guidelines for ethical research conduct

Books Recommended:

1. C. R. Kothari – Research Methodology: Methods and Techniques
2. Ranjit Kumar – Research Methodology: A Step-by-Step Guide for Beginners
3. Wayne Goddard & Stuart Melville – Research Methodology: An Introduction

LAW

Unit No	Title of the Unit	Topics/Subtopics Covered
Unit-1	Indian Constitution	• Basic Constitutional Principles – constitutionalism, rule of law, separation of powers, basic structure doctrine. • Judicial Review and Constitutional Interpretation – evolving methods of interpretation and role of higher judiciary. • Fundamental Rights and Fundamental Duties – life, liberty, dignity, privacy, and new generation rights. • Federalism and Governance Structure – Centre-State relations, emergency provisions, cooperative federalism, Contemporary Reforms – electoral reforms, institutional accountability, constitutional morality. • Landmark Cases
Unit 2	Jurisprudence	• Schools of Jurisprudence – Natural law, positivism, historical, sociological, realist and critical schools. • Nature and Concept of Law – law, morality, justice, rights, duties, and legal validity. • Legal Reasoning and Interpretation – theories of adjudication and judicial reasoning. • Modern and Critical Legal Theories – feminist jurisprudence, CLS, postmodern legal thought. • Application of Jurisprudence in Contemporary Laws– globalization, technology, ethics, and interdisciplinary approaches.

Unit 3	Criminal Law	• Substantive Criminal Laws V/S Procedural Criminal Laws in India. • Transition from IPC–Cr.P.C to BNS–BNSS–BSA – philosophy and structural reforms, important committees and commissions. • Technology, Electronic Modes of Communication and New Criminal Laws - FIR, arrest, bail, investigation, search and seizure, and rights-based procedure. • Forensic Intervention in BNSS, BSA and BNS • Landmark Cases.
Unit 4	Human Rights Protection Mechanism and International Criminal Law	• National Human Rights Commission and State Human Rights Commission under Human Rights Protection Act, 1993 • Human Rights Protection at international platform- UDHR, ICCPR, ICESCR, UN, etc. • Adversarial V/S Inquisitorial Criminal Justice System with a special reference to Fair Trial • International Criminal Court • Landmark Cases
Unit 5	Contract Law and Law of Torts	• General Principles of Contract Law • Special Contracts and Standard Form Contracts - Use of Technology and AI in Contract Drafting • Torts Law in India- Nature of torts law, Negligence, Liabilities and its types, Defamation, New Consumer Protection Mechanism in India. • Landmark Cases

Unit 6	Business Law	• Corporate governance and laws • Different forms of business entities and special legislations • Competition law • Insolvency • Landmark cases
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