

**THE APOLLO UNIVERSITY  
CHITTOOR, ANDHRA PRADESH**



**Ph.D. Entrance Exam Syllabus**

## Contents

COMMON PAPER – I.....	3
Research Methodology.....	4
SCHOOL OF HEALTH SCIENCES.....	6
APOLLO INSTITUTE OF PHARMACEUTICAL SCIENCES.....	13
SCHOOL OF TECHNOLOGY.....	20
CSE.....	21
ECE.....	22
English Language and Literature.....	24
Mathematical Sciences.....	25
SCHOOL OF MANEGMENT.....	27
Management.....	28

**SYLLABUS FOR Ph.D. ENTRANCE EXAM**

**COMMON PAPER – I**

**RESEARCH METHODOLOGY**

**Common paper for all**

# Research Methodology

## Unit 1: Foundations of Research

- **Research Basics**
  - Definition, objectives, and significance of research.
  - Types of research: Basic, applied, and translational research.
  - Interdisciplinary research and its importance.
- **Research Problem Identification**
  - Defining a research problem.
  - Criteria for selecting and formulating a research problem.
  - Role of literature review in defining research problems.

## Unit 2: Research Methodology

- **Research Design**
  - Types of research designs: Descriptive, exploratory, experimental, and longitudinal.
  - Hypothesis: Types, formulation, and testing.
- **Sampling Techniques**
  - Probability sampling: Simple random, stratified, cluster.
  - Non-probability sampling: Convenience, quota, purposive.
  - Determination of sample size.
- **Data Collection**
  - Primary and secondary data.
  - Tools for data collection: Questionnaires, interviews, and observations.
  - Ethical considerations in data collection.

## Unit 3: Data Analysis and Interpretation

- **Quantitative Analysis**
  - Descriptive statistics: Mean, median, mode, standard deviation.
  - Inferential statistics: Hypothesis testing, t-tests, chi-square, ANOVA.
  - Basics of regression and correlation.
- **Qualitative Analysis**
  - Coding, categorization, and thematic analysis.
  - Grounded theory and content analysis.
- **Use of Software**
  - Introduction to SPSS, Jamovi, R, or other statistical tools.
  - Basics of qualitative analysis software like ATLAS.ti.

#### **Unit 4: Research Ethics and Publication**

- **Research Ethics**
  - Ethical principles in research: Informed consent, confidentiality, and integrity.
  - Plagiarism: Definition, detection, and prevention.
  - Ethical approval and institutional review boards (IRBs).
- **Research Writing and Publication**
  - Structure of a research paper: Abstract, introduction, methodology, results, discussion, and conclusion.
  - Referencing styles: APA, MLA, and Vancouver.
  - Basics of academic publishing: Peer review process and impact factors.

#### **Unit 5: Intellectual Property and Emerging Trends**

- **Intellectual Property Rights (IPR)**
  - Types: Patents, trademarks, copyrights, and trade secrets.
  - Role of IPR in academic and industrial research.
- **Emerging Trends in Research**
  - Big data and analytics in research.
  - Artificial Intelligence and machine learning applications.
  - Open-access publishing and research visibility.

#### **Recommended Resources**

1. *Research Methodology: Methods and Techniques* by C.R. Kothari.
2. *The Craft of Research* by Wayne C. Booth.
3. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* by John W. Creswell.
4. *Statistics for Research* by George Argyrous.

**Paper – II**

**SCHOOL OF HEALTH SCIENCES**

For all candidates applied under the School

## Paper- II

# Basics of Health Sciences

### UNIT I:

#### ➤ Cell Biology

- Prokaryotic cell, cell divisions, cell cycle, cell organelles, cytoskeleton and cell signaling & signal transduction. Gametes and gametogenesis, Fertilization and zygote formation, Early development and germ layers, Organogenesis
- Techniques in cell biology: Flow cytometry, microscopy, and culture methods

#### ➤ Molecular Biology

- Structure and function of DNA, RNA, and proteins, Gene expression and regulation: Transcription, translation, and epigenetics
- Molecular cloning and recombinant DNA technology
- Techniques: PCR, electrophoresis, blotting methods, and CRISPR-Cas9

#### ➤ Molecular Genetics and Pathology

- Mendelian and non-Mendelian inheritance patterns
- Genetic disorders: Chromosomal, single-gene, and multifactorial diseases
- Molecular mechanisms of disease: Oncogenes, tumor suppressor genes, and genetic mutations
- Molecular diagnostics: Biomarkers and next-generation sequencing

### UNIT II:

#### ➤ Anatomy and Physiology

- Gross and microscopic anatomy of major organ systems (Integumentary, Skeletal, Muscular, Nervous, Cardiovascular, Lymphatic, Respiratory, Digestive, Urinary, Endocrine, Reproductive Systems)
- Homeostasis and physiological regulatory mechanisms
- Common Diseases of Body Systems

#### ➤ Biomedical Sciences

- Basics of Enzymes and coenzymes, enzyme kinetics, carbohydrate metabolism, lipid metabolism, amino acid and protein metabolism, nucleic acid & nucleotide metabolism and the urea cycle, the citric acid cycle (Kreb's cycle / TCA cycle),

vitamins and minerals, electron transport and oxidative phosphorylation.

- Units and calculations used in the laboratory, measurements of pH, buffers, precautions in the use of radioactive materials, principles and operation of instruments used in biochemical research, spectro- photometers, centrifuges, scintillation counters, protein estimation. Preparation of bacteriological media, sterilization growth and characterization of bacteria. Introduction to UV spectroscopy, CD spectroscopy and electrophoresis, protein and nucleic acid model building.
- Microbial taxonomy and diversity, evolution and genomics. Bacterial cell structure and function, bacterial physiology and nutrition. Understanding and combating bacterial pathogenesis, antibiotics, mechanisms of drug resistance. Innate Immune System, Adaptive Immune System, Antigens, Antibodies, Humoral and Cell Mediated Immune Mechanisms, Antigen-Antibody Interactions, Vaccine, Advances in Stem Cells and Regenerative medicine and tissue engineering
- Genetic testing: Karyotyping, structural aberrations, gene therapy, Clinical genetics and genetic counselling
- Principles and design of diagnostic and therapeutic devices
- Categories of biomedical devices: Diagnostic, therapeutic, monitoring, and assistive devices.

### **UNIT III:**

#### **➤ Allied Health Sciences**

- Principles of X-ray, CT, MRI, Ultrasound, and PET scans.
- Overview of diagnostic tools: ECG, EEG, and other monitoring devices.
- Role and functionality of medical devices: Ventilators, pacemakers, and dialysis machines.
- Emerging technologies: Wearable devices, IoT in healthcare.
- Basics of clinical testing: Hematology, biochemistry, microbiology and pathology.

#### **➤ Hospital-acquired infections and diseases**

- Basic concepts about infection, immunity and standard precautions.
- Sterilization, Disinfection procedures and its applications.

- Concepts of diseases, classification of lesions and inflammation and repair.
- Systemic disorders: coronary heart disease, bronchial asthma, emphysema, bronchiectasis, auto-immune disease, diseases of urinary system, reproductive system and central nervous system.
- Hospital-acquired infection, source, routes of spread, preventive measures and precautions. Hospital waste management, handling, treating of health care waste and disposal.
- Important communicable diseases:- Tuberculosis, Leprosy, HIVAIDS, Hepatitis-B and C, Food poisoning- risk factors and prevention.
- Non-communicable diseases:- CHD, Obesity, Diabetes, Hypertension, Cancer- risk factors and prevention.
- Principles of exercise therapy and rehabilitation.
- Kinesiology and biomechanics.
- Musculoskeletal: Rehabilitation techniques for fractures, arthritis, and sports injuries.
- Neurological: Stroke, spinal cord injuries, Parkinson's disease management.
- Cardiopulmonary: COPD rehabilitation, chest physiotherapy.
- Ergonomics, pediatric, and geriatric care.

#### UNIT IV:

##### ➤ **Emergence of Psychology**

- **Historical Foundations:** Structuralism, Functionalism, Behaviorism, Gestalt, Humanistic Psychology; **Research Methods:** Experimental, correlational, and qualitative research; reliability and validity; **Measurement and Scaling:** Psychometric principles, item analysis, and test construction; **Biological Basis of Behavior:** Nervous system, endocrine system, genetics, and behavior.

##### ➤ **Cognitive and Affective Processes**

- **Cognitive Psychology:** Psychometry, Perception, attention, memory, language, problem-solving, decision-making; **Learning Theories:** Classical and operant conditioning, social learning; **Motivation and Emotion:** Theories of motivation, physiological basis, and emotional regulation.

##### ➤ **Developmental and Social Psychology**

- **Development Across Lifespan:** Cognitive, social, and emotional development;

**Social Psychology:** Attitudes, group dynamics, leadership, aggression, prosocial behavior; **Cultural and Cross-Cultural Perspectives:** Cultural influences on behavior

➤ **Personality and Applied Psychology (Health and Counseling)**

- **Personality Theories:** Trait, psychodynamic, humanistic, cognitive-behavioral perspectives; **Mental Health and Psychopathology:** Classification (DSM, ICD), anxiety, mood, and personality disorders; **Therapeutic Approaches:** CBT, psychoanalysis, humanistic and mindfulness-based therapies; **Health Psychology:** Chronic illness, behavioral interventions for lifestyle changes. **Counseling Process and Skills:** Stages of counseling (rapport building, goal setting, termination), Counseling Skills, Assessment Tools and Techniques in counselling.

➤ **Emerging Trends and Psychological Testing**

- **Emerging Areas:** Neuropsychology, positive psychology, AI in psychology; **Psychological Testing:** Intelligence, personality, aptitude, attitude, and interest tests; **Recent Trends:** Digital mental health interventions, virtual reality in therapy, global mental health initiatives.

➤ **Public Health**

- **Environmental Health:** Environmental hazards and sources, exposure pathway, air pollution and health effects, water pollution and health, sanitation, food safety, vectors and disease, solid wastes, noise and its effects, climate change and impact on environment and health, heat exposure and effects, indoor air quality, occupational diseases, environmental disasters, emerging environmental problems and diseases, global burden of disease concept, India burden of disease estimates
- **Epidemiology and Biostatistics:** Proportion, ratio, incidence, prevalence, odds ratio, relative risk, attributable risk, attributable fraction, ecological study, cross sectional study, cohort study, case control study, randomised controlled trials, selection bias, information bias, confounding, disease surveillance, public health screening, sensitivity and specificity, methods of organizing and presenting data, elements of data analysis, mean, median, mode, range, standard deviation, coefficient of variation, scales of measurements, continuous scale, ordinal scale, probability, data distribution, sampling techniques, sample size, probability distributions

- **Health Policy and Management:** Globalization and health, economic evaluation of health, health care systems, health economics, cost benefit and cost-effective analysis, health insurance, health care financing, health sector reforms, national health programs in India, policies and program formulation, implementation of health programs, monitoring and analyzing program outcomes, resource allocation
- **Occupational Safety and Health:** Types of industrial process, elements of industrial safety, elements of Industrial hygiene, chemical, physical and biological hazards and risks, psychosocial hazards and risks, ergonomics, control methods of hazards, disaster management, environmental protection acts, permissible limits of exposure, standards and guidelines, factories act, OSHA, ACGIH, element environmental management systems.
- **Environmental and Research Ethics:** Ethical issues in epidemiology, responsible conduct of research, conflict of interest, privacy and confidentiality, data access and management, plagiarism

## **UNIT V:**

### **➤ Integrated Healthcare Sciences**

- Interdisciplinary approaches to healthcare delivery
- Models of integrated care: Primary, secondary, and tertiary healthcare
- Delivery of community health services: rural, and urban, Health schemes: ESI, CGHS, Health insurance

### **➤ Current Trends in Health Sciences**

- Advances in genome and proteome databases, genomic mapping, sequence search databases, multiple protein sequences and their alignment, predictive modeling and comparative genome analysis
- Personalized medicine and genomics
- Artificial intelligence and machine learning in healthcare
- Telemedicine and digital health solutions

### **➤ Global Health Challenges and Innovations**

- Impact of climate change, urbanization on health, global burden of disease concept, India burden of disease estimates
- Addressing global pandemics and antimicrobial resistance
- Innovations in healthcare systems and health equity

### **➤ Ethics in Health Sciences Research**

- Ethical principles: Beneficence, non-maleficence, autonomy, and justice
- Ethics in clinical research: Confidentiality, informed consent, and resource allocation
- Ethical challenges in public health: Vaccination mandates, quarantine, and global health initiatives.

### **Recommended Textbooks and References**

- Guyton and Hall Textbook of Medical Physiology
- Lehninger Principles of Biochemistry
- Introduction to Biomedical Engineering by John Enderle
- Fundamentals of Nursing by Patricia Potter
- Principles of Rehabilitation Medicine by Joel DeLisa
- Orthopedic Physical Assessment by David Mage
- Shaffer, D. R., & Kipp, K. - *Developmental Psychology: Childhood and Adolescence*
- Baron, R. A., & Branscombe, N. R. - *Social Psychology*
- Hurlock, E. B. - *Developmental Psychology*
- Mangal, S. K. - *General Psychology*
- Environmental Health, From Global to Local, Howard Frumkin, John Wiley & Sons, Inc.SFO, CA, ISBN 0-7879-7383-1
- Parks Textbook Of Preventive & Social Medicine- 24th Edition, 2017by Park K
- The occupational Environment: Its Evaluation, Control, and Management, 2nd Edition, AIHA Press, ISBN 1-931504-43-1: Chapter 1, 3, 20, 21, 24, 28, 32
- ICMR. Ethical guidelines for biomedical research on human participants.  
[https://www.iitm.ac.in/downloads/ICMR\\_Ethical\\_Guidelines\\_2017.pdf](https://www.iitm.ac.in/downloads/ICMR_Ethical_Guidelines_2017.pdf) Accessed on August 9, 2018

**Paper – II**

**APOLLO INSTITUTE OF  
PHARMACEUTICAL SCIENCES**

## Paper- II

# Basics of Pharmaceutical Sciences

### UNIT 1: PHARMACEUTICS

- Introduction to Physical pharmacy
- Micromeritics and Powder Rheology, Surface and Interfacial Phenomenon, Viscosity and Rheology, Dispersion Systems, Complexation, Kinetics and Drug Stability, Importance of microbiology in pharmacy Identification of Microbes, Control of microbes by physical and chemical methods, Sterilization, Immunology and Immunological Preparations, Antibiotics.
- Introduction to pharmaceutical jurisprudence & ethics
- An elaborate study of the followings: Pharmaceutical Ethics; Pharmacy Act 1948; Drugs and Cosmetics Act 1940 and Rules 1945; Medicinal & Toilet Preparations (Excise Duties) Act 1955; Narcotic Drugs & Psychotropic Substances Act 1985 & Rules; Drugs Price Control Order.
- Introduction to dispensing, community pharmacy and Hospital Pharmacy
- Incompatibilities: Physical and chemical incompatibilities, inorganic incompatibilities including incompatibilities of metals and their salts, non- metals, acids, alkalis, organic incompatibilities. Purine bases, alkaloids, pyrazolone derivatives, amino acids, quaternary ammonium compounds, carbohydrates, glycosides, anesthetics, dyes, surface active agents, correction of incompatibilities. Therapeutic incompatibilities. Organization and Structure of hospital pharmacy; Hospital Formulary; Drug Store Management and Inventory Control; Drug distribution Systems in Hospitals; Drug Information Services.
- Importance of unit operations in manufacturing
- Fluid Flow, Heat transfer, Evaporation, Distillation, Drying, Size Reduction, Mixing, Filtration and Centrifugation, Crystallization, Dehumidification and Humidity Control, Refrigeration and Air Conditioning, Materials of Construction, Material Handling Systems.
- Dosages Forms, designing & evaluation
- Liquid Dosage Forms; Semisolid Dosage Forms; Suppositories; Extraction and Galenical Products; Blood Products and Plasma Substitutes; Pharmaceutical Aerosols; Ophthalmic Preparations; Capsules; Micro-encapsulation; Tablets; Coating of Tablets; Parenteral Products; Cosmeticology and Cosmetic Preparations.
- Packaging of Pharmaceutical Products
- Designing of dosage forms; Pre-formulation studies, Study of physical properties of drug like physical form, particle size, shape, density, wetting, dielectric constant. Solubility, dissolution and organoleptic properties and their effect on formulation, stability and bioavailability. Study of chemical properties of drugs like hydrolysis, oxidation, reduction, racemization, polymerization etc.,

and their influence on formulation and stability of products. Study of pro-drugs in solving problems related to stability, bioavailability and elegance of formulations. Design, development and process validation methods for pharmaceutical operations involved in the production of pharmaceutical products with special reference to tablets, suspensions. Stabilization and stability testing protocol for various pharmaceutical products. ICH Guidelines for stability testing of formulations. Performance evaluation methods.

- Biopharmaceutics & Pharmacokinetics
- Introduction to biopharmaceutics; Pharmacokinetics, Clinical Pharmacokinetics, Bioavailability and bioequivalence.

## UNIT 2: PHARMACEUTICAL CHEMISTRY

- Inorganic Pharmaceutical Chemistry
- Importance of inorganic compounds in pharmacy and medicine; Gastrointestinal Agents, Major Intra- and Extra-cellular electrolytes, Essential and Trace Elements, Topical Agents, Gases and Vapours, Dental Products, Miscellaneous Agents; Pharmaceutical Aids Used in Pharmaceutical Industry; Acids, Bases and Buffers, Inorganic Radiopharmaceuticals.
- Physical Chemistry and its importance in pharmacy
- The Liquid State, Solutions, Thermodynamics; Thermochemical equations; Phase rule; Adsorption; Photochemistry; Kinetics; Quantum Mechanics.
- Organic Chemistry and its importance in pharmacy
- Stereochemistry, Stereoselective and stereospecific reactions; Structure, Nomenclature, Preparation and Reactions of: Nucleophilic and Electrophilic Aromatic Substitution Reactions; Elimination reactions; Conservation of Orbital Symmetry and Rules: Neighbouring group effects; Catalysis by transition metal complexes; Heterocyclic Compounds.
- Biochemistry
- Enzymes; Co-enzymes; The Citric Acid Cycle; Lipids Metabolism: Biological Oxidation; Metabolism of ammonia and nitrogen containing monomers; Purine biosynthesis; Biosynthesis of Nucleic Acids: Mutation.
- Medicinal Chemistry
- Drug metabolism and Concept of Prodrugs; Principles of Drug Design (Theoretical Aspects): Synthetic Procedures, Mode of Action, Uses, Structure Activity Relationships including Physicochemical Properties of the Following Classes of Drugs: Autacoids; Steroidal Drugs; Drugs acting on the central nervous system; Diuretics; Cardiovascular drugs; Thyroid and Anti thyroid drugs; Insulin and oral hypoglycaemic agents; Microbial Transformations; Enzyme Immobilization.

## UNIT 3: PHARMACEUTICAL ANALYSIS

- Fundamentals of volumetric analysis
- Acid Base Titrations; Oxidation Reduction Titrations; Precipitation Titrations; Gravimetric Analysis; Non-aqueous titrations; Complexometric titrations; Extraction procedures including separation of drugs from excipients; Potentiometry; Conductometry; Coulometry; Polarography; Amperometry.

- Chromatography
  - Chromatography, Theoretical Aspects, Basic Instrumentation, Elements of Interpretation of Spectra.
- Quantitative and qualitative Analytical Techniques
  - Ultraviolet and visible spectrophotometry, Fluorimetry, Infrared spectrophotometry, Nuclear Magnetic Resonance spectroscopy [proton technique only], Mass Spectrometry (EI & CI only), Flame Photometry, Atomic Absorption Spectroscopy, X-ray Diffraction Analysis, Radioimmunoassay.
- Quality assurance
  - GLP, ISO 9000, TQM, Quality Review and Quality documentation, Regulatory control, regulatory drug analysis, interpretation of analytical data, Validation, quality audit: quality of equipment, validation of equipment, validation of analytical procedures.

#### UNIT 4: PHARMACOLOGY

- Pathophysiology of common diseases
  - Basic Principles of Cell Injury and Adaptations; Basic Mechanisms involved in the process of inflammation and repair, Immunopathophysiology. Pathophysiology of Common Diseases: Asthma, diabetes, rheumatoid arthritis, gout, ulcerative colitis, neoplasia, psychosis, depression, mania, epilepsy, acute and chronic renal failure, hypertension, angina, congestive heart failure, atherosclerosis, myocardial infarction, congestive heart failure, peptic ulcer, anaemias, hepatic disorders, tuberculosis, urinary tract infections and sexually transmitted diseases.
- Fundamentals of general pharmacology
  - Pharmacology of Peripheral Nervous System; Pharmacology of Central Nervous System; Pharmacology of Cardiovascular System; Drugs Acting on the Hemopoietic System; Drugs acting on urinary system; Autacoids; Drugs Acting on the Respiratory System; Drugs acting on the Gastrointestinal Tract; Pharmacology of Endocrine System.
- Chemotherapy
  - General Principles of Chemotherapy, Bacterial resistance; Sulfonamides and cotrimoxazole, Antibiotics- Penicillins, Cephalosporins, Aminoglycosides, Chloramphenicol, Macrolides, Tetracyclines, Quinolones, fluoroquinolones and Miscellaneous antibiotics; Chemotherapy of tuberculosis, leprosy, fungal diseases, viral diseases, HIV and AIDS, urinary tract infections and sexually transmitted diseases, malaria, amoebiasis and other protozoal infections and Anthelmintics. Chemotherapy of malignancy and immunosuppressive agents.
- Principles of Toxicology
  - Basic Concepts of Pharmacotherapy; Clinical Pharmacokinetics and individualization of Drug therapy, Drug delivery systems and their Biopharmaceutics & Therapeutic considerations, Drugs used during infancy and in the elderly persons (Pediatrics & Geriatrics), Drugs used during pregnancy, Drug induced diseases, The basics of drug interactions,

General principles of clinical toxicology, Common clinical laboratory tests and their interpretation. Important Disorders of Organs, Systems and their Management: Cardio-vascular disorders- Hypertension, Congestive heart failure, Angina, Acute myocardial infarction, Cardiac arrhythmias. CNS Disorders; Respiratory disease, Gastrointestinal Disorders, Endocrine Disorders, Infectious Diseases, Joint and Connective tissue disorders, Neoplastic Diseases.

#### UNIT 5 - PHARMACOGNOSY

- Source
  - Sources of Drugs, Classification of Drugs; Study of medicinally important plants belonging to the families with special reference to: Apocynaceae, Solanaceae, Rutaceae, Umbelliferae, Leguminosae, Rubiaceae, Liliaceae, Graminae, Labiatae, Cruciferae, Papaveraceae. Cultivation, Collection, Processing and Storage of Crude Drugs; Quality Control of Crude Drugs.
- Introduction to Active Constituents of Drugs
  - Systematic Pharmacognostic study of the followings: Carbohydrates and derived products; Lipids; Resins; Tannins; Volatile Oils; Fibers.
- Phytochemical Screening
  - Study of the biological sources, cultivation, collection, commercial varieties, chemical constituents, substitutes, adulterants, uses, diagnostic macroscopic and microscopic features and specific chemical tests of following groups of drugs.
  - Glycoside Containing Drugs: Saponins, Cardioactive glycosides, Anthraquinone cathartics.
- Alkaloid Containing Drugs: Pyridine-piperidine, Tropane, Quinoline and Isoquinoline, Indole, Imidazole, Steroidal, Alkaloidal Amine, Glycoalkaloid, Purines.
  - Studies of Traditional Drugs
- Common vernacular names, botanical sources, morphology, chemical nature of chief constituents, pharmacology, categories and common uses and marketed formulations of following indigenous drugs: Amla, Kantkari, Satavari, Tylophora, Bhilawa, Kalijiri, Bach, Rasna, Punamava, Chitrack, Apamarg, Gokhru, Shankhapushpi, Brahmi, Adusa, Atjuna, Ashoka, Methi, Lahsun, Palash, Guggal, Gymnema, Shilajit, Nagarmotha and Neem. The holistic concept of drug administration in traditional systems of medicine. Introduction to ayurvedic preparations like Arishtas, Asvas, Gutikas, Tailas, Chumas, Lehyas and Bhasmas.
  - General Techniques of Biosynthetic Studies and Basic Metabolic Pathways/ Biogenesis
- Brief introduction to biogenesis of secondary metabolites of pharmaceutical importance. Terpenes, Carotenoids, Glycosides, Alkaloids, Lignans, quassanoids and flavonoids.
  - Role of plant-based drugs on National economy
- A brief account of plant-based industries and institutions involved in work on medicinal and aromatic plants in India. Utilization and production of phyto-

constituents such as quinine, calcium sennosides, podophyllotoxin, diosgenin, solasodine, and tropane alkaloids. Utilization of aromatic plants and derived products with special reference to sandalwood oil, mentha oil, lemon grass oil, vetiver oil, geranium oil and eucalyptus oil. World-wide trade in medicinal plants and derived products with special reference to diosgenin (disocorea), taxol (Taxus spp) digitalis, tropane alkaloid containing plants, Papain, cinchona, Ipecac, Liquorice, Ginseng, Aloe, Valerian, Rauwolfia and plants containing laxatives. Plant bitters and sweeteners.

➤ Plant Tissue Culture

- Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance. Applications of plant tissue culture in pharmacognosy. Edible vaccines.

### Books Recommended

1. The Science and Practice of Pharmacy by Remington
  2. Bentley and Driver's Text Book of Pharmaceutical Chemistry by Atherden L M
  3. Foyes principles of Medicinal chemistry.
  4. Textbook of Pharmacognosy by Trease and Evans, 16th edition.
  5. Ross and Wilson Anatomy and Physiology in Health and Illness, International Edition 12th Edition
  6. Robbins & Cotran Pathologic Basis of Diseases, by Vinay Kumar Abul Abbas Jon Aster, 9th edition
  7. A Textbook of Pharmacy Practice, by Dr. K.G. Revikumar and Dr. B.D. Miglani
  8. A Textbook of Clinical Pharmacy Practice: Essential Concepts and Skills by G. Parthasarathi, Karin Nyfort-Hansen, Milap C. Nahata.
  9. Merchant & Quadry's A Text Book Of Hospital Pharmacy by Dr.R.K.Goyal, Dr.R.K.Parikh, Dr.Mayur M.Patel.
  10. Hospital Pharmacy by H. P. Tipnis, Bajaj Amrita 1st Edition.
  11. Hospital and Clinical Pharmacy, by Mohammed Ali, 1st Edition
  12. Wilson and Gisvold text book of organic medicinal and pharmaceutical chemistry
  13. Drug Screening methods- preclinical evaluation of new drugs - S K Gupta
  14. Pharmacognosy – C K Kokate, A P Purohit, s B Gokhale, 40th edition
- Reference books
1. Biochemistry by Dr. U. Satyanarayana, Dr. U. Chakrapani, 3rd edition
  2. Essentials of Medical Pharmacology by Tripathi DK
  3. Pharmcognosy: An Indian Perspective by Mangathayaru K
  4. Dispensing for Pharmaceutical Students by Carter S
  5. Introduction to Pharmaceutical Dosage Forms by Ansel H C
  6. The Theory and Practice of Industrial Pharmacy by Lachman L, Lieberman
  7. Inorganic and medicinal and pharmaceutical chemistry – Wilson and sonie
  8. Physical chemistry- Bahl and Tuli
  9. Textbook of physical chemistry - Ashutoskar
  10. Organic chemistry by Morrison and Boyd
  11. Textbook of medicinal chemistry – Dr Alagarsamy- Vol I and II
  12. Practical pharmaceutical chemistry by Beckett and Stenlake

13. Pharmaceutical titrimetric analysis- A.A.Napoleon
14. Organic spectroscopy - Silverstein
15. Anthony's Textbook of Anatomy & Physiology, by Kevin Patton Gary Thibodeau, 21st Edition.
16. Pathophysiology: Concepts of Altered Health States, by Carol Mattson Porth, Glenn Matfin. Eighth Edition.
17. Practice of Hospital, Clinical and Community Pharmacy Practice by Mohd. Aqil
18. Hospital Pharmacy by Stephens Martin, Second edition

**Paper – II**

**SCHOOL OF TECHNOLOGY**

## Paper – II

# CSE

### **Section – I: Foundations of Computation & Programming**

Discrete Structures, Models of computation, Trees & Graphs, Computer Arithmetic, Representation of Integers, Floating point representation. Programming in C: Elements of C– Tokens, identifiers, data types in C, Control structures in C, Sequence, selection and iteration(s), Structured data types in C-arrays, struct, union, string, and pointers. O – O Programming Concepts, C++ Programming: Elements of C++ – Tokens, identifiers. Variables and constants, Datatypes, Operators, Control statements. Functions parameter passing, Class and objects, Constructors and destructors, Overloading, Inheritance, Templates, Exception handling.

**Section - II: Relational Database Design and SQL** E-R diagrams, Normalizations, SQL: Data Definition Language (DDL), Data Manipulation Language (DML), Data Control Language (DCL) commands. Database objects, Data ware housing and Datamining, Data structures, File structures.

**Computer Networks & Security:** Network fundamentals, Reference Models, Data Communication & Transmission, Internetworking, Routing & Routing algorithms, Congestion control. Network Security: Cryptography-public key, secret key, Domain Name System (DNS) – Electronic Mail and Worldwide Web (WWW), Resource Records, Name servers, and Servers.

### **Section – III: Software Engineering, Compilers and Operating System:**

Process Models, Requirements Engineering, Building the Analysis Model, Software Metrics, Design Engineering, Testing Strategies, Testing Tactics. Assembly language fundamentals (8085 based assembly language programming), Assemblers-2-pass and single-pass. Macros and macroprocessors, Linkage editing, Text editors, Programming Environments, Debuggers and program generators, Compilation and Interpretation, Bootstrap compilers, Phases of compilation process, Lexical analysis, Context free grammars, Parsing and parse trees, Code Generation, Code Optimization, Multiprogramming, Memory Management, Concurrent Processing, Scheduling, UNIX system.

**Section IV: Current Trends and Technologies:** The topics of current interest in Computer Science and Engineering shall be covered. The experts shall use their judgement from time to time to include the topics of popular interest, which are expected to be known, now included: Machine Learning, Artificial Intelligence & Data Science: Basics & Advanced Python, Data handling, Engineering with python, Supervised and Unsupervised algorithms, Cloud Computing: Overview, Models, Trends, Security & Monitoring, Internet of Things: Overview, Sensors and Devices, Connectivity, Data Processing, User Interface, Protocols, Smart Cities, Cyber Security: Network Security Essentials, Cybersecurity Threats and Attacks, Passwords, MFA and Good practices, Using Firewalls, VPN, IDS, Protecting devices, Security when online, Physical Security, Policies and procedure.

## Paper – II

# ECE

**UNIT 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

### **UNIT 2. ELECTRONIC CIRCUITS, Digital systems, Microprocessor & Microcontroller, Embedded System Design**

**Analog Electronics:** BJT and CMOS circuits and amplifiers, Operational amplifiers: Ideal opamp, practical opamp, inverting configuration, non-inverting configuration, differential configuration, practical opamp parameters, open-loop and closed-loop frequency response, gain-bandwidth product, slew rate, CMRR. Adder, integrators, differentiators, voltage comparators, Schmitt trigger, peak detector

**Digital electronics:** Digital circuits: 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, CPLD, FPGAs. Sequential circuits: latches and flip-flops, counters and shift-registers. Sample and hold circuits, ADCs, DACs. Semiconductor memories,

**Embedded Systems:** Basics of Embedded systems, Microprocessor and Microcontroller Architecture, Basics of Programming.

### **UNIT 3. COMMUNICATION ENGINEERING**

**Electromagnetic fields:** Maxwell's equations, electromagnetic fields, Sparameters, basic Transmission line equations, impedance transformers, basics of antennas, antenna specifications

**Analog communications :** Analog modulation schemes – AM, FM, PM, spectrum analysis, superheterodyne receivers, Random process and Noise

**Digital communications :** sampling – quantization – encoding – aliasing – Nyquist rate - Modulation schemes PAM, PCM, PSK, FSK, QAM and higher order of modulation techniques and their error performance – pulse shaping, matched filter.

### **UNIT 4. CONTROL SYSTEMS AND PROCESS CONTROL**

Feedback principles. Signal flow graphs. Transient Response, steady-state errors. Routh and Nyquist criteria. Bode plot, root loci. Time delay systems. Phase and gain margin. State space representation of systems. Mechanical, hydraulic and pneumatic system components. Synchro pair, servo and step motors. On-off, cascade, P, P-I, P-I-D, feed forward and derivative controller, Fuzzy controllers.

### **References:**

1. Adel S. Sedra and Kenneth C. Smith, "Microelectronic Circuits", Fifth edition, Oxford University Press, 2004.
2. Schilling, Belove, "Electronic Circuits", Third edition, Tata McGraw-Hill, 2006.
3. Stephen Brown, Zvonko Vranesic, "Fundamentals of Digital Logic with Verilog Design," Tata McGraw Hill Publishing Company Limited, Special Indian Edition, 2007

4. Muhammad Ali Mazidi and Janice Giilispie Mazidi - The 8051 Microcontroller. And Embedded Systems, Prentice Hall.
5. Raj Kamal, "Embedded Systems – Architecture, Programming and Design," Mc Graw Hill Education Pvt. Ltd., 2nd Edition, 2008.
6. Frank Vahid and Tony Givargis, "Embedded System Design – A Unified hardware/ Software introduction," John Wiley and sons, 3rd Edition, 2006.
7. D. M. Pozar "Microwave Engineering", Publisher: Wiley
8. Symon Haykins "Principles of Communication systems", John Wiley
9. Proakis and Salehi "Fundamentals of Communication systems", Pearson Ed
10. I.J.Nagrath and M.Gopal, "Control Systems Engineering", Wiley Eastern Limited, New Delhi, 2008.

## Paper-II

# English Language and Literature

### Unit - 1: British Literature:

**Old English & Middle English:** Chaucer (The Canterbury Tales) - **Renaissance:** Shakespeare (Hamlet, Macbeth) **Romantic Period:** Wordsworth (Preface to Lyrical Ballads), Keats (Ode to a Nightingale), Shelley (Ode to the West Wind)- **Victorian Era:** Tennyson (Ulysses), Dickens (Great Expectations)- **Modern and Postmodern Periods:** Virginia Woolf (Mrs. Dalloway), Eliot (The Waste Land), Beckett (Waiting for Godot).

### Unit - II: Post Colonial Literature & Influence to Indian Diaspora:

**Post-Colonial Literature:** Chinua Achebe - *Things Fall Apart*, Salman Rushdie - *Midnight's Children*, Arundhati Roy - *The God of Small Things*, Girish Karnad – *Hayavadana*, Mulk Raj Anand - *Untouchable*, Raja Rao – *Kanthapura*. Jhumpa Lahiri - *Interpreter of Maladies*. **Diaspora Literature:** V.S. Naipaul: *A House for Mr. Biswas*, Jhumpa Lahiri - *The Namesake*, Bharati Mukherjee: - *Jasmine*, Chitra Banerjee - *Mistress of Spices*.

### Unit – III: Literary Theory and Criticism:

**Forms of Narrative:** First-person, unreliable narrator, stream of consciousness, **Postmodern narrative techniques:** Fragmentation, metafiction **Modern Theories:** Structuralism, Postcolonialism, Feminist Criticism - Matthew Arnold (Study of Poetry), Literary Forms, Literary Terms (A Glossary of Literary Terms - M.H. Abrams)

### Unit IV: English Language Teaching:

**ELT** - Approaches and Methods, Language Acquisition and Learning **Digital Humanities:** Computer Assisted Language Learning (CALL), The role of technology in literature and research - Digital storytelling (Born Digital Novels) - Interactive fiction and hypertext literature.

### Unit - V: Interdisciplinary Perspectives in English: Gender, Culture and Film Studies

Gender Studies in Literature - Key Concepts: Feminist literary theory, Intersectionality in literature, Masculinity studies, Queer theory in literature, Virginia Woolf - *A Room of One's Own*, Simone de Beauvoir - *The Second Sex* (Selections), Judith Butler - *Gender Trouble* (Introduction and key excerpts), Alice Walker - *The Color Purple*, Toni Morrison - *Beloved*.

## Paper-II

# Mathematical Sciences

### UNIT – 1

**Algebra:** Permutations, combinations, pigeon-hole principle, inclusion-exclusion principle, derangements. Fundamental theorem of arithmetic, divisibility in  $\mathbb{Z}$ , congruences, Chinese Remainder Theorem, Euler's  $\phi$ - function, primitive roots. Groups, subgroups, normal subgroups, quotient groups, homomorphisms, cyclic groups, permutation groups, Cayley's theorem, class equations, Sylow theorems. Rings, ideals, prime and maximal ideals, quotient rings, unique factorization domain, principal ideal domain, Euclidean domain. Polynomial rings and irreducibility criteria. Fields, finite fields, field extensions, Galois Theory.

### UNIT – 2

**Analysis:** Elementary set theory, finite, countable and uncountable sets, Real number system as a complete ordered field, Archimedean property, supremum, infimum. Sequences and series, convergence, limsup, liminf. Bolzano Weierstrass theorem, Heine Borel theorem. Continuity, uniform continuity, differentiability, mean value theorem. Sequences and series of functions, uniform convergence. Riemann sums and Riemann integral, Improper Integrals. Monotonic functions, types of discontinuity, functions of bounded variation, Lebesgue measure, Lebesgue integral. Functions of several variables, directional derivative, partial derivative, derivative as a linear transformation, inverse and implicit function theorems. Metric spaces, compactness, connectedness. Normed linear Spaces. Spaces of continuous functions as examples.

**Topology:** Basis, dense sets, subspace and product topology, separation axioms, connectedness and compactness.

### UNIT – 3

**Linear Algebra:** Vector spaces, subspaces, linear dependence, basis, dimension, algebra of linear transformations. Algebra of matrices, rank and determinant of matrices, linear equations. Eigenvalues and eigenvectors, Cayley-Hamilton theorem. Matrix representation of linear transformations. Change of basis, canonical forms, diagonal forms, triangular forms, Jordan forms. Inner product spaces, orthonormal basis. Quadratic forms, reduction and classification of quadratic forms.

**Complex Analysis:** Algebra of complex numbers, the complex plane, polynomials, power series, transcendental functions such as exponential, trigonometric and hyperbolic functions. Analytic functions, Cauchy-Riemann equations. Contour integral, Cauchy's theorem, Cauchy's integral formula, Liouville's theorem, Maximum modulus principle, Schwarz lemma, Open mapping theorem. Taylor series, Laurent series, calculus of residues. Conformal mappings, Mobius transformations.

#### **UNIT – 4**

**Ordinary Differential Equations (ODEs):** Existence and uniqueness of solutions of initial value problems for first order ordinary differential equations, singular solutions of first order ODEs, system of first order ODEs. General theory of homogenous and non-homogeneous linear ODEs, variation of parameters, Sturm- Liouville boundary value problem, Green's function.

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

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

#### **UNIT – 5**

**Calculus of Variations:** Variation of a functional, Euler-Lagrange equation, Necessary and sufficient conditions for extrema. Variational methods for boundary value problems in ordinary and partial differential equations.

**Linear Integral Equations:** Linear integral equation of the first and second kind of Fredholm and Volterra type, Solutions with separable kernels. Characteristic numbers and eigen functions, resolvent kernel.

**Classical Mechanics:** Generalized coordinates, Lagrange's equations, Hamilton's canonical equations, Hamilton's principle and principle of least action, Two-dimensional motion of rigid bodies, Euler's dynamical equations for the motion of a rigid body about an axis, theory of small oscillations.

**Paper – II**

**SCHOOL OF MANEGMENT**

**Paper-II**

# **Management**

**Unit – 1: PRINCIPLES OF MANAGEMENT:**

Management – Introduction- Functions- Importance- Basics of Management theory and practices - Scientific Management Thoughts – Henry Fayol’s 14’s Principles- Peter Drucker- Planning, Organising, Staffing, Leading, Motivating, controlling and reporting – Management Information systems and its applications.

**Unit-2: HUMAN RESOURCES MANAGEMENT:**

Human Resource Management, Leadership, Motivation, Decision Making, Job Analysis & Design- Recruitment & Selection, Training and Development, Performance Management and Appraisal, 360 Degree Feedback, Balanced Score Card, HR Analytics, Career Planning and Development, Stress Management, Organizational Behavior – Process – Group Dynamics- Quality of Work Life- Organisational Behaviour, scope, goals, and Concepts; approaches to OB, emerging challenges of OB; Historical Evaluation of OB- Perception, Attitude and Learning. Organisational dynamics: Organisational Power and Politics, Organisational conflict, conflict management -Managing Change

**Unit – 3: MARKETING & OPERATIONS MANAGEMENT:**

Marketing- Introduction- Types of Marketing- Marketing Mix & Process- Service Marketing- Marketing Research- social media – Digital Marketing- TQM – Deming 14 Principles – Seven Quality Tools- 5’S concepts - Total Productivity Systems, Six sigma – ISO certification Process- Operation Research – Techniques of OR – OR Models – Supply chain Management– Uses and its importance – Strategic Planning and Goal setting, PEST and SWOT analysis- Strategy Formulation and Implementation and its process.

#### **Unit-4: BUSINESS ENVIRONMENT, ACCOUNTING AND FINANCIAL MANAGEMENT**

Business Environment- Inflation and Deflation- Business Laws and Ethics- Business and Technology ethics- Business Process Re-engineering (BPR), Business Process Outsourcing (BPO), Corporate Social Responsibility (CSR), E- Business Applications- AI Technologies in Business- EXIM policy -Accounting concepts – Financial Accounting- Cost Accounting- Management Accounting and its Importance. Financial Management – Working Capital - sources of finance, Investment decisions- Capital Structure decision- Fintech and its recent trends – Digital Money Concepts. - Dividend Policy.

#### **Unit – 5: HOSPITAL & HEALTHCARE MANAGEMENT**

Hospital Planning and Management Principles – Hospital Administration and its roles & responsibilities- Hospital Support Services, Hospital Layouts - Hospital Information Management Systems and its applications – Healthcare technology - Healthcare Quality Assurance and Standards - Health Insurance – Healthcare Delivery Systems - Medical Tourism – Healthcare Laws and Ethics.

#### References:

- Marketing Management – Philip Kotler, McGraw-Hill, 2006.
- Strategic Marketing For Health Care Organizations: Building A Customer-Driven Health System - Philip Kotler, Joel Shalowitz, Robert J.Stevens , Prentice Hall,2008 .
- Financial Management – IM Pandey, Vikas Publishing House Pvt Ltd, 2005.
- Personnel administration and Management – S.L.Goel, (1995) Sterling Publishers,New Delhi.
- Human Resource Management – P.C.Tripathi, (2004) 17th Edition, Sultan Chand and Sons, New Delhi.
- Total Quality Management – James. R. Evens
- Strategic Management in Health care organizations – 3rd edition – Blackwell Publishers
- Personnel and Human resource Management Text and cases. Himalaya

Publishing House Pvt Ltd, 4th Edition. Subbarao. 2009.

- G.D Kunders. 2004 Hospitals-Facilities, Planning & management, NewDelhi:TataMcgraw hill
- Harold Koontz, Heinz Weihrich, Mark V. Cannice, Essentials of Management - An International, Innovation and Leadership Perspective | 11th Edition. (2020). (n.p.): McGraw-Hill Education.

\*\*\*\*\*