

**THE OXFORD COLLEGE OF PHARMACY, BANGALORE**

**Course outcomes**

**COURSE: B. PHARMACY**

**I SEMESTER**

**HUMAN ANATOMY AND PHYSIOLOGY (THEORY)**

CO	Description
CO1	Understand the structure and functions of various organs of the human body.
CO2	Appreciate the coordinated working pattern of different organs of each system.
CO3	Understand interlinked mechanisms in the maintenance of normal functioning of human body.
CO4	Understand the role of hormones in maintaining the body's homeostasis.
CO5	Correlate and apply the knowledge.

**HUMAN ANATOMY AND PHYSIOLOGY (PRACTICAL)**

CO	Description
CO1	Handle various basic laboratory equipments and apparatus
CO2	Demonstrate practical knowledge of human gross and microscopic anatomy.
CO3	Identify the various tissues and organs associated with the different organ systems.
CO4	Perform haematological experiments
CO5	Record vital parameters

**PHARMACEUTICAL ANALYSIS (THEORY)**

CO	Description
CO1.	understand the principles of volumetric and electro chemical analysis
CO2.	carryout various volumetric and electrochemical titrations
CO3.	develop analytical skills
CO4.	Understand about errors and impurities in analysis

**PHARMACEUTICAL ANALYSIS (PRACTICAL)**

CO	Description
CO1.	understand the principles of volumetric and electro chemical analysis
CO2.	carryout Preparation and standardization of various compounds
CO3.	Understand about limit tests for impurities
CO4.	Understand about Assays of different compounds

### PHARMACEUTICS I (THEORY)

CO	Description
CO1	Describe the history of pharmacy, development of pharmacy profession and industry in India.
CO2	Describe various routes of drug administration, concept of dosage forms, unit operations involved in preparation of these dosage forms.
CO3	Describes alternative system of medicines.
CO4	Explain the factors which influence the design of pharmaceutical dosage forms.
CO5	Summarize the factors influencing formulation of various dosage form like solution.

### PHARMACEUTICS I (PRACTICAL)

CO	Description
CO1	Explain formulation and labelling of aromatic water, glycerides, syrups, elixirs and powder preparations.
CO2	Perform pharmaceutical calculations to determine the parameters.
CO3	Describe use of ingredients in formulation and category of formulation.
CO4	Compare various monophasic preparations depending upon their formulation.
CO5	Selection of suitable package material (container-Closure) for the preparation.

### PHARMACEUTICAL INORGANIC CHEMISTRY (THEORY)

CO	Description
CO1	To know the sources of impurities
CO2	To understand the methods to determine the impurities in inorganic drugs and pharmaceuticals
CO3	To understand the medicinal and pharmaceutical importance of inorganic compounds
CO4	To understand the radioactivity in pharmaceuticals.

### PHARMACEUTICAL INORGANIC CHEMISTRY (PRACTICAL)

CO	Description
CO1	To know to perform the limit test.
CO2	To know to perform the purity test
CO3	To know the preparation of inorganic drugs and pharmaceuticals
CO4	To know the methods of identification test.

### REMEDIAL BIOLOGY (THEORY)

CO	Description
CO1	Know the salient features of five kingdoms of life.
CO2	Understand the basic components of anatomy and physiology of plant.
CO3	Understand the basic components of anatomy and physiology of animal with respect to human
CO4	Understand the role of hormones in maintaining the body's homeostasis.
CO5	Appreciate the coordinated working pattern of different organs.

### REMEDIAL BIOLOGY PRACTICAL

CO	Description
CO1	Handle various basic laboratory equipments and apparatus
CO2	Learn various mounting techniques
CO3	Identify gross human anatomy
CO4	Identify various tissues through microscopy
CO5	Perform haematological experiments

## II SEMESTER

### HUMAN ANATOMY AND PHYSIOLOGY-II ( THEORY )

CO1	Understand the structure and functions of various organs of the human body.
CO2	Appreciate the coordinated working pattern of different organs of each system.
CO3	Understand interlinked mechanisms in the maintenance of normal functioning of human body.
CO4	Understand the role of hormones in maintaining the body's regulatory mechanisms..
CO5	To describe various homeostatic mechanisms and their imbalances.

### HUMAN ANATOMY AND PHYSIOLOGY-II (PRACTICAL)

CO	Description
CO1	Handle various basic laboratory equipment's and apparatus
CO2	Demonstrate practical knowledge of human gross and microscopic anatomy.
CO3	Demonstrate various tissues and organs associated with the different organ systems.
CO4	Perform various sensory experiments
CO5	Perform vital parameters

### PHARMACEUTICAL ORGANIC CHEMISTRY-I (THEORY)

CO	Description
CO1.	To write the structure, name and the type of isomerism of the organic compound
CO2.	To write the reaction, name the reaction and orientation of reactions
CO3.	Account for reactivity/stability of compounds,
CO4.	To identify/confirm the identification of organic compound

### PHARMACEUTICAL ORGANIC CHEMISTRY-I (PRACTICAL)

CO	Description
CO1.	To write the structure, name and the type of isomerism of the organic compound
CO2.	To write the reaction, name the reaction and orientation of reactions
CO3.	Account for reactivity/stability of compounds,
CO4.	To identify/confirm the identification of organic compound

### BIOCHEMISTRY (THEORY)

CO	Description
CO1	To understand the catalytic role of enzymes.
CO2	To know the therapeutic and diagnostic application of enzymes.
CO3	To understand the catabolism of nutrient molecules in physiological and pathological conditions
CO4	To understand the genetic organization

### BIOCHEMISTRY (PRACTICAL)

CO	Description
CO1	To know to perform the qualitative analysis of unknown compounds
CO2	To know to perform the quantitative estimation of unknown compounds with different methods.
CO3	To know to perform the identification test
CO4	To know the preparation of buffer solutions

### PATHOPHYSIOLOGY (THEORY)

CO	Description
CO1	Define medical terminology with respect to pathophysiology aspects.
CO2	Discuss the etiology of various diseases on different organ systems.
CO3	Discuss the pathogenesis of various diseases on different organ systems.
CO4	Relate and analyze the clinical manifestations to pathophysiology of various diseases
CO5	Describe the Etio-pathogenesis of various diseases

### ENVIRONMENTAL SCIENCES (THEORY)

CO	Description
CO1	Impart basic knowledge about the environment and its allied problems.
CO2	Develop an attitude of concern for the environment.
CO3	Participate in environment protection and improvement.
CO4	Create awareness about environmental problems among learners.
CO5	Acquire skills to help the concern individual in identifying and solving environmental problems.

### III SEMESTER

#### PHARMACEUTICAL ORGANIC CHEMISTRY-II (THEORY)

CO	Description
CO1	To know the structure, name and the type of isomerism of the organic compound.
CO2	To know the reaction, name there action and orientation of reactions.
CO3	To understand the reactivity/stability of compounds.
CO4	To know to prepare organic compounds.
CO5	To know the Chemistry of fats and oils

#### PHARMACEUTICAL ORGANIC CHEMISTRY-II (PRACTICAL)

CO	Description
CO1	To understand the principle of quantitative determination of organic compounds.
CO2	To know the analysis of the oils and fats.
CO3	To know the synthesis of organic compounds.
CO4	To know the purification techniques.

#### PHYSICAL PHARMACEUTICS I (THEORY)

CO	Description
CO1	Describe the principles of solubility and partition coefficient. Explain physical principles of states of matter and phase rule critical solution temperature.
CO2	Understand of physicochemical properties of drugs including refractive index, dielectric constant, states of matter. Appreciate the physicochemical Properties in formulation.
CO3	Explain the role of surfactants, interfacial phenomenon and thermodynamics
CO4	Describe the concept of complexation and protein binding. Understand the process of adsorption of drugs.
CO5	Understand the pH, Buffers, isotonicity of drug molecules in manufacturing pharmaceutical dosage forms and maintaining stability

### PHYSICAL PHARMACEUTICS I (PRACTICAL)

CO	Description
CO1	Perform solubility studies for different drugs and know the effect of temperature on solubility. Understand the Partition of drug between lipid and polar solvents.
CO2	Determine pKa values of drugs and understand its importance in solvent selection. Perform and determine the percentage composition of drugs in immiscible solvents
CO3	Estimate HLB values of various surfactants and select the various ratios of surfactants to obtain ideal HLB. Understand the effects of surfactants on surface tension and determine it.
CO4	To understand the solubility complexes by stability method. Understand the effect of pH in complexation. Understand adsorption of drugs on various adsorbents and drugs.

### PHARMACEUTICAL MICROBIOLOGY (THEORY)

CO	Description
CO1	Understand methods of identification, cultivation and preservation of various microorganisms
CO2	know the importance of sterilization in microbiology and pharmaceutical industry
CO3	Learn sterility testing of pharmaceutical products.
CO4	Carry out the microbiological standardization of Pharmaceuticals
CO5	Understand the cell culture technology and its applications in pharmaceutical industries.

### PHARMACEUTICAL MICROBIOLOGY (PRACTICAL)

CO	Description
CO1	To recall different techniques of sterilization
CO2	To demonstrate various staining methods – Simple, gram staining and acid fast staining
CO3	To interpret the results of microbial testing
CO4	To estimate the amount of biomass in the given sample
CO5	To choose the correct method to evaluate the microbes to be tested.

### PHARMACEUTICAL ENGINEERING (THEORY)

CO	Description
CO1	To know various unit operations used in pharmaceutical industries.
CO2	To understand the material handling techniques.
CO3	To perform various processes involved in pharmaceutical manufacturing process.
CO4	To carry out various test to prevent environmental pollution.
CO5	To appreciate and comprehend significance of plant lay out design for optimum use of resources.
CO6	To appreciate the various preventive methods used for corrosion control in pharmaceutical industries

### PHARMACEUTICAL ENGINEERING (PRACTICAL)

CO	Description
CO1	Operate various equipment of different unit operations
CO2	Evaluate the size distribution of particles in formulation
CO3	Identify the effects of various factors affecting unit operations
CO4	Verify different laws of size reduction
CO5	Determine the efficiency of unit operations

**IV SEMESTER**  
**PHARMACEUTICAL ORGANIC CHEMISTRY- III (THEORY)**

CO	Description
CO1.	Understand the methods of preparation and properties of organic compounds
CO2.	Explain the stereo chemical aspects of organic compounds and stereo chemical reactions
CO3.	Know the medicinal uses and other applications of organic compounds
CO4.	Know the importance of Heterocyclic compounds of drugs.

**MEDICINAL CHEMISTRY-I (THEORY)**

CO	Description
CO1	To understand the chemistry of drugs with respect to their pharmacological activity.
CO2	To understand the drug metabolic pathways.
CO3	To know the adverse effect and therapeutic value of drugs.
CO4	To know the Structural Activity Relationship(SAR) of different class of drugs.
CO5	To know the chemical synthesis of some drugs.

**MEDICINAL CHEMISTRY-I (PRACTICAL)**

CO	Description
CO1	To know to perform the assays of important drugs.
CO2	To know the preparation of medicinally important compounds.
CO3	To know the preparation of medicinally important intermediate compounds.
CO4	To know to determine partition coefficients



### PHYSICAL PHARMACEUTICS II (THEORY)

CO	Description
CO1	Explain the concepts of rheological sciences and flow properties of pharmaceutical preparations, Apply the principles of rheology.
CO2	Describe the factors leading to Preparation, stability and instability of dispersion /colloidal systems
CO3	Discuss the effect of particle size distribution of powders on the manufacture of dosage forms. Apply the principles of micromeritics.
CO4	Outline the principles of chemical kinetics in stability testing of drugs. Apply the principles of chemical kinetics and study the expiry date's reaction rate constants.
CO5	Apply the principles of stability and course dispersion in the formulation development and evaluation of dosage forms like suspensions and emulsions.

### PHYSICAL PHARMACEUTICS II (PRACTICAL)

CO	Description
CO1.	Understand the flow properties and estimate viscosity of Newtonian/Non-Newtonian liquids.
CO2.	Understand the effect of suspending agents on sedimentation volume.
CO3.	Understand the particle size using various methods sieve method, microscopic method.
CO4.	Understand various order of reactions like first, Second reaction kinetics.
CO5.	Estimate various flow properties of powders like angle of repose, porosity.

### PHARMACOLOGY-I THEORY

CO	Description
CO1	Know basics of pharmacology like history, scope & general principles.
CO2	Classify the various routes of administration with advantages and dis-advantages.
CO3	Understand the process of new drug discovery and development of drug.
CO4	Understand the basics of pharmacokinetic and pharmacodynamics and signal transduction mechanism of various receptors.
CO5	Understand the concept of adverse drug reactions and drug toxicity so that it can get minimize.

### PHARMACOLOGY-I PRACTICAL

CO	Description
CO1	Handle commonly used instruments in experimental pharmacology.
CO2	Study CPCSEA and OECD guidelines.
CO3	Demonstrate the various routes of drug administration and euthanasia techniques in laboratory animals.
CO4	Demonstrate blood and other body fluids collection techniques in experimental animals.
CO5	Perform preliminary screening experiments.

### PHARMACOGNOSY & PHYTOCHEMISTRY –I (THEORY)

CO	Description
CO1	know the techniques in the cultivation and production of crude drugs
CO2	know the crude drugs, their uses and chemical nature
CO3	Know the evaluation techniques for the herbal drugs
CO4	Carry out the microscopic and morphological evaluation of crude drugs
CO5	Acquire all skills used in Plant tissue culture

### PHARMACOGNOSY & PHYTOCHEMISTRY –I ( PRACTICAL )

CO	Description
CO1	Know the analysis of crude drugs.
CO2	Understand the Cellular structure of crude drugs.
CO3	Evaluate the crude drugs by quantitative evaluation methods.
CO4	Evaluate the crude drugs by Physical methods of evaluation.
CO5	Evaluate the crude drugs by Chemical methods of evaluation.

**V SEMESTER**  
**MEDICINAL CHEMISTRY-II (THEORY)**

CO	Description
CO1.	Understand the chemistry of drugs with respect to their pharmacological activity
CO2.	Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
CO3.	Know the Structural Activity Relationship of different class of drugs
CO4.	Study the chemical synthesis of selected drugs

**INDUSTRIAL PHARMACY I (THEORY)**

CO	Description
CO1.	Understand the concepts of various pharmaceutical dosage forms and their manufacturing techniques.
CO2.	Know various considerations in development of pharmaceutical dosage forms
CO3.	Understand rationale behind use of ingredients for formulation
CO4.	Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality
CO5.	Know the stability study and its standard evaluation procedure for better storage conditions.

**INDUSTRIAL PHARMACY I (PRACTICAL)**

CO	Description
CO1.	State the correct use of various equipment's in Pharmaceutics laboratory relevant to tablets, capsules & coating.
CO2.	Explain formulation, evaluation and labelling of tablets & capsules and other dosage forms
CO3.	To understand all the related and practical aspect of dosage form development.
CO4.	To formulate and evaluate solid, liquid and semisolid dosage forms
CO5.	To evaluate the containers for pharmaceutical dosage form

### PHARMACOLOGY-II (THEORY)

CO	Description
CO1	Understand the mechanism of drug action of Drugs
CO2	Know the Drugs Relevance in the treatment of different infectious diseases
CO3	Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments
CO4	Demonstrate the various receptor actions using isolated tissue preparation
CO5	Appreciate correlation of pharmacology with related medical sciences

### PHARMACOLOGY-II PRACTICAL

CO	Description
CO1	Study the basic requirements for performing isolated tissue experiments
CO2	Demonstrate drug effects using computer models
CO3	Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments
CO4	Demonstrate the various receptor actions using isolated tissue preparation
CO5	Perform dose calculation graphically

### PHARMACOGNOSY AND PHYTOCHEMISTRY-II (THEORY)

CO	Description
CO1	Outline the metabolic pathway in higher plants and their biogenetic studies.
CO2	Study the pharmacognostic study of secondary metabolites like alkaloids, glycosides, tannins, volatile oils.
CO3	Demonstrate the different types and steps involved in isolation, identification, and analysis of phytoconstituents like terpenoids, glycosides, alkaloids, and resins.
CO4	Plan the industrial production, estimation, and utilization of Phytoconstituents.
CO5	Assess the crude drug by modern methods of extraction, spectroscopy, chromatography, isolation, and purification.

### PHARMACOGNOSY AND PHYTOCHEMISTRY-II (PRACTICAL)

CO	Description
CO1	Remember the wide variety of the crude drugs and their sources by morphological characteristics.
CO2	Identify the powder mixture and to report the types of adulterants and substitutes present.
CO3	Analyse and evaluate the powdered crude drugs samples by morphological and microscopical characters.
CO4	Isolate the drug from given crude drug sample.
CO5	Predict the crude drug by performing chromatographic technique.

### PHARMACEUTICAL JURISPRUDENCE (THEORY)

CO	Description
CO1.	Know the Pharmaceutical legislations and their implications in the development and marketing
CO2.	Know various Indian pharmaceutical Acts, Laws and schedule
CO3.	Know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
CO4.	Know code of ethics during the pharmaceutical practice.
CO5.	Know the offences and penalties in the Act.

### VI SEMESTER

### MEDICINAL CHEMISTRY-III (THEORY)

CO	Description
CO1.	Understand the importance of drug design and different techniques of drug design.
CO2.	Understand the chemistry of drugs with respect to their biological activity.
CO3.	Know the metabolism, adverse effects and therapeutic value of drugs.
CO4.	Know the importance of SAR of drugs.

### MEDICINAL CHEMISTRY-III (PRACTICAL)

CO	Description
CO1	To know to perform the assays of important drugs.
CO2	To know the preparation of medicinally important compounds.
CO3	To learn the usage of Chem Draw and newer methods of synthesis.
CO4	Determination of physiological properties using drug design software.

### PHARMACOLOGY-III (THEORY)

CO	Description
CO1	Understand the mechanism of drug action Of Drugs
CO2	Know the Drugs Relevance in the treatment of different infectious diseases
CO3	comprehend the principles of toxicology
CO4	Know the treatment of various poisonings
CO5	Appreciate correlation of pharmacology with related medical sciences.

### PHARMACOLOGY-III PRACTICAL

CO	Description
CO1	Calculate doses for laboratory animals
CO2	Perform toxicity studies following standard guidelines
CO3	Estimate biochemical parameters in body fluids
CO4	Demonstrate effect of drugs using computer models
CO5	Apply statistical methods for interpretation of experimental results

### HERBAL DRUG TECHNOLOGY (THEORY)

CO	Description
CO1	Understand raw material as source of herbal drugs from cultivation to herbal drug product.
CO2	know the WHO and ICH guidelines for evaluation of herbal drugs.
CO3	know the herbal cosmetics, natural excipients.
CO4	Know the various nutraceuticals/herbs and their health benefits and interactions.
CO5	Appreciate patenting of herbal drugs, GMP.

### HERBAL DRUG TECHNOLOGY (PRACTICAL)

CO	Description
CO1	Perform the preliminary phytochemical screening of crude drugs.
CO2	Determine the alcohol content in various Ayurvedic formulations.
CO3	know the alkaloid content, phenolic content determination.
CO4	Know the monograph analysis of herbal drugs from Pharmacopoeias.
CO5	Know the preparation of various cosmetic formulations and evaluate them.

### BIOPHARMACEUTICS & PHARMACOKINETICS (THEORY)

CO	Description
CO1.	Understand the basic concepts in biopharmaceutics and pharmacokinetics.
CO2.	Use plasma data and derive the pharmacokinetic parameters to describe the process of drug absorption, distribution, metabolism and elimination.
CO3.	Critically evaluate biopharmaceutical studies involving drug product equivalency
CO4.	Design and evaluate dosage regimens of the drugs using pharmacokinetic and biopharmaceutical parameters
CO5.	Defect potential clinical pharmacokinetic problems and apply basic pharmacokinetic principles to solve them

### PHARMACEUTICAL BIOTECHNOLOGY (THEORY)

CO	Description
CO1	Understand the importance of enzymes in pharmaceutical industry
CO2	Application of Biotechnology in the field of genetic engineering
CO3	Understand the importance of fermentation and its applications in pharmaceutical industry.
CO4	Appreciate the importance of microorganisms in industrial production of pharmaceutical products
CO5	Correlate and apply the knowledge

### PHARMACEUTICAL QUALITY ASSURANCE (THEORY)

CO	Description
CO1.	Understand the importance of quality in pharmaceutical products.
CO2.	Know the importance of good practices such as GMP, GLP etc
CO3.	Know the factors affecting the quality of pharmaceutical is explored.
CO4.	Understands the regulatory aspects of pharmaceutical and various documentation process
CO5.	Know the process involved in manufacturing of pharmaceuticals different section/department and activity

## VII SEMESTER

### **INSTRUMENTAL METHOD OF ANALYSIS (THEORY)**

CO	Description
CO1.	Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis
CO2.	Understand the applications in drug analysis
CO3.	Understand the chromatographic separation and analysis of drugs.
CO4.	Understand the spectroscopic separation and analysis of drugs.

### **INSTRUMENTAL METHOD OF ANALYSIS (PRACTICAL)**

CO	Description
CO1.	Perform quantitative analysis of drugs using various analytical instruments
CO2.	Perform qualitative analysis of drugs using various analytical instruments
CO3.	Understand the applications in drug analysis
CO4.	Understand the chromatographic & spectroscopic separation and analysis of drugs.

### **INDUSTRIAL PHARMACY II (THEORY)**

CO	Description
CO1.	Know the process of pilot plant and scale up of pharmaceutical dosage forms
CO2.	Understand the process of technology transfer from lab scale to commercial batch
CO3.	Know different Laws and Acts that regulate pharmaceutical industry
CO4.	Understand the approval process and regulatory requirements for drug products

### **PHARMACY PRACTICE (THEORY)**

CO	Description
CO1	Gain knowledge about the various pharmaceutical care services and study about the changing scenario of pharmacy practice services in India
CO2	Understand the different patient related activities such as patient counselling and dispensing safe and suitable medications
CO3	Learn about various pharmacy activities such as dispensing of prescription and OTC drugs and understand about different minor ailments and treatment for these ailments
CO4	Understand in detail the concepts of essential drug concept and rational drug therapy To appreciate store management and inventory control



### **NOVEL DRUG DELIVERY SYSTEM (THEORY)**

CO	Description
CO1.	Understand various approaches for development of novel drug delivery systems
CO2.	Understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems
CO3.	Understand the formulation and evaluation of Novel drug delivery system
CO4.	Understand concept of Transdermal drug delivery system
CO5.	Understand the fundamentals of controlled release drug delivery

### **VIII SEMESTER**

#### **BIOSTATISTICS & RESEARCH METHODOLOGY (THEORY)**

CO	Description
CO1.	Understand the applied statistical principles in drug development and clinical pharmacy.
CO2.	Understand the applications of descriptive statistics, statistical graphics, statistical thinking and decision making with the aid of, probability theory, sampling size, parametric and non-parametric tests, correlations and regressions.
CO3.	Appreciate statistical techniques in solving the problems.
CO4.	Discern and understand the requirements of Clinical testing of drugs, and testing of hypothesis.
CO5.	Know the operation of M.S. Excel, SPSS, R and MINITAB®, DoE (Design of Experiment)

#### **SOCIAL & PREVENTIVE PHARMACY (THEORY)**

CO	Description
CO1.	Acquire high consciousness/realization of current issues related to health and pharmaceutical problems within the country and worldwide.
CO2.	Evaluation of public health and social problems of the sick.
CO3.	Have a critical way of thinking based on current healthcare development
CO4.	Evaluate alternative ways of solving problems related to health and pharmaceutical issues.
CO5.	Health promotion and health education

### QUALITY CONTROL AND STANDARDISATION OF HERBALS (THEORY)

CO	Description
CO1	Know WHO guidelines for quality control of herbals
CO2	Know quality assurance in herbal drug industry
CO3	Know the regulatory approval process and their registration in Indian and international markets
CO4	Appreciate EU and ICH guidelines for quality control of herbal drugs
CO5	Stability testing, and standardisation of herbal products

### CELL AND MOLECULAR BIOLOGY (THEORY)

CO	Description
CO1	Understand cell and molecular biology history, cellular functioning and composition.
CO2	Describe the cellular membrane structure and function and chemical foundations of cell biology
CO3	Understand the genetic aspects in detail
CO4	Describe protein structure and function.
CO5	Describe basic molecular genetics mechanisms.
CO6	Understand the cell cycle and its applications in diseases

### COSMETICS SCIENCE (THEORY)

CO	Description
CO1.	Understand the key ingredients used in cosmetics and cosmeceuticals
CO2.	To understand the building blocks for various formulations. Controversial ingredients in cosmetics.
CO3.	Understand herbal cosmetics and challenges in formulating them.
CO4.	Understand herbal cosmetics and challenges in formulating them.
CO5.	To know Current technologies in the market

### ADVANCED INSTRUMENTATION TECHNIQUES (THEORY)

CO	Description
CO1.	Understand the advanced instruments used and its applications in drug analysis
CO2.	Understand the chromatographic separation and analysis of drugs.
CO3.	Understand the calibration of various analytical instruments
CO4.	Know analysis of drugs using various analytical instruments.

## PHARMACOVIGILANCE (THEORY)

CO	Description
CO1	Understand safety monitoring of medicine, role of WHO and PvPI in safety monitoring
CO2	Analyze the ADR reported with various methods of causality assessment & manage the reported ADR
CO3	Know Establishment & operation of Pharmacovigilance, Vaccine Pharmacovigilance programme in hospitals, in industries & in national level
CO4	Learn to communicate and generate the data in Pharmacovigilance & ICH guidelines for Pharmacovigilance.

**COURSE-M.PHARMACY**

**BRANCH-PHARMACEUTICS**

**I SEMESTER**

**MODERN PHARMACEUTICAL ANALYSIS (THEORY-COMMON SUBJECT)**

CO	Description
CO1.	The analysis of various drugs in single dosage form
CO2.	The analysis of various drugs in combination dosage form
CO3.	Theoretical skills of the instrumentation
CO4.	Understand the applications of various advance analytical techniques

**MODERN PHARMACEUTICAL ANALYSIS (PRACTICAL-COMMON SUBJECT)**

CO	Description
CO1.	Practical skills of the instrumentation
CO2.	The analysis of various drugs in single dosage form
CO3.	The analysis of various drugs in combination dosage form
CO4.	Understand the applications of various advance analytical techniques

**MODIFIED RELEASED DRUG DELIVERY SYSTEMS (THEORY)**

CO	Description
CO1.	Knowing about the principles and technology used in the design of sustained release and controlled release drug delivery systems
CO2.	Learn the criteria for selection of polymers in the formulation development of different modified release drug delivery systems
CO3.	Knowing the different approaches for the development of different dosage forms like gastro retentive, osmotic controlled released, ocular, transdermal, mucoadhesive buccal and protein and peptide drug delivery systems
CO4.	Evaluation of developed modified released drug delivery systems.
CO5.	Development of single and multiple shot vaccines with its adjuvants and its importance in vaccine drug delivery systems

### MODERN PHARMACEUTICS (THEORY)

CO	Description
CO1	Understand the elements of pre-formulation studies
CO2	Understand the optimization techniques in pharmaceutical formulation and processing
CO3	Understand the Pharmaceutical Validation, policies of current good manufacturing practices
CO4	Understand the concept of Total Quality Management
CO5	Understand the Physics of tablet compression, Dissolution parameters and Pharmacokinetic parameter and linearity Concept of significance

### REGULATORY AFFAIRS (THEORY)

CO	Description
CO1.	Understand the Concepts of Regulatory approvals process and documentation in EU, US FDA, TGA, MHRA, IMPD, ICH guidelines.
CO2.	The Regulatory guidance's and guidelines for filing and approval process. Generic drugs NDA, ANDA. Submission of global documents in CTD/ eCTD formats
CO3.	Preparation of Dossiers and their submission to regulatory agencies in different countries. Post approval regulatory requirements for actives and drug products
CO4.	Clinical trials requirements for approvals for conducting clinical trials. Pharmacovigilance and process of monitoring in clinical trials.

### PHARMACEUTICS PRACTICAL I (PRACTICAL)

CO	Description
CO1.	Development of formulation to prepare different modified release drug delivery systems.
CO2.	Selection suitable excipients including polymers with therapeutic agents for the preparation of modified release drug delivery systems.
CO3.	Study of preformulating parameters of drug in the development of formulation
CO4.	Evaluation of prepared dosage forms.
CO5.	Comparative studies of different formulated dosage forms and optimisation with respect to standard post preparation parameters.

## II SEMESTER

### NANO TECHNOLOGY & TARGETED DDS (THEORY)

CO	Description
CO1.	The various approaches for development of novel drug delivery
CO2.	The criteria for selection of drugs and polymers for the development of DDS systems.
CO3.	The formulation and evaluation of novel drug delivery systems.
CO4.	The targeting the drug delivery to specific organ, cells for better efficacy.

### ADVANCED BIOPHARMACEUTICS & PHARMACOKINETICS (THEORY)

CO	Description
CO1	Understand the basic concepts in Biopharmaceutics and pharmacokinetics.
CO2	Understand the critical evaluation of Biopharmaceutic studies involving drug product equivalency.
CO3	Understand the use raw data and derive the pharmacokinetic models and parameters the best describes the process of drug absorption, distribution, metabolism and elimination
CO4	Understand the design and evaluation of dosage regimens of the drugs using pharmacokinetic and Biopharmaceutic parameters and potential clinical pharmacokinetic problems and the principles to solve them
CO5	To understand the concepts of bioavailability and bioequivalence of drug products and their significance.
CO6	Understand various pharmacokinetic parameters, their significance & its applications.

### COMPUTER AIDED DRUG DISCOVERY (THEORY)

CO	Description
CO1.	History of computers in Pharmaceutical Research & Development
CO2.	Computational modelling of drug disposition
CO3.	Computers in preclinical development
CO4.	Optimization Techniques in Pharmaceutical Formulation
CO5.	Artificial Intelligence & robotics

### COSMETICS & COSMECEUTICALS (THEORY)

CO	Description
CO1	Understand the key ingredients used in cosmetics and cosmeceuticals.
CO2	To understand the building blocks for various formulations. Controversial ingredients in cosmetics.
CO3	Understand herbal cosmetics and challenges in formulating them.
CO4	Get scientific knowledge to develop cosmetics with desired Safety, stability, and efficacy.

### PHARMACEUTICS PRACTICAL II (PRACTICAL)

CO	Description
CO1	Development of formulation to prepare different modified release drug delivery systems.
CO2	Selection suitable excipients including polymers with therapeutic agents for the preparation of modified release drug delivery systems.
CO3	Study of preformulating parameters of drug in the development of formulation
CO4	Evaluation of prepared dosage forms.
CO5	Comparative studies of different formulated dosage forms and optimisation with respect to standard post preparation parameters.

### PHARMACEUTICS PRACTICAL III (PRACTICAL)

CO	Description
CO1.	Design experiments based on QbD for optimization of drug delivery.
CO2.	Analyse & predict pharmacokinetic parameters using software's.
CO3.	Evaluate computational modelling of drug disposition
CO4.	Formulate & evaluate various nano carriers for drug delivery
CO5.	Evaluate computer simulations in pharmacodynamics.

## **BRANCH- PHARMACOGNOSY**

### **I<sup>st</sup> SEMESTER**

#### **ADVANCED PHARMACOGNOSY (THEORY)**

CO	Description
CO1	Know the advances in the cultivation and production of drugs
CO2	Know the various Phyto-pharmaceuticals and their source & utilization and medicinal value.
CO3	Know the various nutraceuticals/herbs and their health benefits
CO4	Know the recent advances in research in marine drugs.
CO5	Know the WHO and AYUSH for evaluation of Herbal drugs and interactions

#### **PHYTOCHEMISTRY (THEORY)**

CO	Description
CO1	To know the biosynthetic pathway for different classes of phytoconstituents and their properties
CO2	To know the general process of natural product drug discovery
CO3	To know the process isolation, purification and identification of phytoconstituents
CO4	To Know the phytochemical fingerprinting of different Phytoconstituents
CO5	To understand different in vitro and in Vivo method of pharmacological screening and toxicity studies

#### **INDUSTRIAL PHARMACOGNOSTICAL TECHNOLOGY (THEORY)**

CO	Description
CO1	Know the requirements for setting up of the herbal /natural drug industry
CO2	To know and understand the guidelines for quality of herbal/natural medicines and regulatory issues
CO3	To know patenting /IPR of herbals/natural drugs and trade of raw and finished materials
CO4	To know stability testing of herbal medicines which ensures the maintenance of herbal Medicines, its safety, quality, and efficacy throughout the shelf life
CO5	To know a commercial herbal medicinal product complies with the regulatory requirements for safety, quality and efficacy



## PHARMACOGNOSY I (PRACTICAL)

CO	Description
CO1	To demonstrate the finger printing profile of different phytoconstituents using HPTLC technique
CO2	To demonstrate the HPLC technique for phytoconstituents
CO3	To perform phytochemical screening to know different types of secondary metabolites
CO4	To study the monographic analysis of oils
CO5	To understand different concepts of extraction, their identification and formulation techniques

## II SEMESTER

### MEDICINAL PLANT BIOTECHNOLOGY (THEORY)

CO	Description
CO1	To understand the plant biotechnology in terms of genome and molecular biology
CO2	To use the biotechnological techniques like tissue culture techniques for obtaining natural products/medicinal plants
CO3	To use the biotechnological techniques improving the quality of natural products/medicinal plants
CO4	To know the process of biotransformation and transgenic plants
CO5	To Know the process of fermentation technology for pharmaceutical important drugs obtained from Plants

### ADVANCED PHARMACOGNOSY – II (THEORY)

CO	Description
CO1	Know the validation of herbal remedies
CO2	Know the methods of detection of adulteration and evaluation techniques for the herbal drugs
CO3	Know the Ethnobotany and Ethnopharmacology
CO4	know the Analytical Profiles of herbal drugs
CO5	know the methods of screening of herbals for various biological properties

### INDIAN SYSTEMS OF MEDICINE (THEORY)

CO	Description
CO1	Understand the basic principles of various Indian systems of medicine.
CO2	Know the clinical research of traditional medicines, Current Good Manufacturing Practice of Indian systems of medicine and formulation.
CO3	Focus on clinical research of traditional medicines, quality assurance and challenges in monitoring the safety of herbal medicines.
CO4	Know formulation development of various systems of medicine.
CO5	Know shelf life and stability studies of formulations.

### HERBAL COSMETICS (THEORY)

CO	Description
CO1	Understand the basic principles of various herbal/natural cosmetic preparations
CO2	Know the different herbal drugs used in Skin care preparation
CO3	Know the different herbal drugs used in Hair care preparation
CO4	Know the different herbal raw materials used on cosmetics and its formulation
CO5	Understand the quality control and toxicity studies as per Drug and Cosmetics Act

### PHARMACOGNOSY II (PRACTICAL)

CO	Description
CO1	To understand the concept of herbal cosmetic formulations
CO2	To demonstrate the evaluation of herbal tablets and capsules
CO3	To understand the concepts and prepare dermatological preparations
CO4	To understand the formulation of syrups and some aromatherapy formulations
CO5	To prepare and formulate various dosage forms from different system of medicine

### MEDICINAL PLANT BIOTECHNOLOGY (PRACTICAL)

CO	Description
CO1	To understand the concept of isolation of DNA and RNA
CO2	To demonstrate the estimation of DNA and RNA isolated
CO3	To understand the concepts of immobilization of whole plant cells
CO4	To estimate the different phytoconstituents in herbal raw material
CO5	To estimate the aldehyde content in herbal raw material

**BRANCH-PHARMACOLOGY**  
**I SEMESTER**  
**ADVANCED PHARMACOLOGY (THEORY)**

CO	Description
CO1.	Understand the pathophysiology of certain diseases
CO2.	Know the Pharmacotherapy of certain diseases
CO3.	Understand the mechanism of action of drugs at molecular level
CO4.	Know the adverse effects and contraindications of different classes of drug for their effective use
CO5.	Understand the clinical uses of each drug class

**PHARMACOLOGICAL AND TOXICOLOGICAL SCREENING METHODS-I (THEORY)**

CO	Description
CO1.	Understand the regulations and ethical requirement for the usage of experimental animals
CO2.	Know the various animals used in the drug discovery process
CO3.	Understand good laboratory practices in maintenance and handling of experimental animals
CO4.	Know the various newer screening methods involved in the drug discovery process
CO5.	Appreciate and correlate the preclinical data to humans

**CELLULAR & MOLECULAR PHARMACOLOGY (THEORY)**

CO	Description
CO1.	Explain receptor transduction processes
CO2.	Understand the molecular pathways affected by drugs
CO3.	Appreciate the applicability of molecular pharmacology in drug discovery process
CO4.	Know the various biomarkers involved in diagnosis of various diseases
CO5.	Demonstrate molecular biology techniques in pharmacology studies

**PHARMACOLOGY-I (PRACTICAL)**

CO	Description
CO1.	Handle animals and efficiently perform blood collection
CO2.	Demonstrate various screening methods for different classes of drugs
CO3.	Decide and select feasible experiments for research studies
CO4.	Demonstrate basic molecular biology techniques
CO5.	Demonstrate various in-vitro studies assays

## II SEMESTER

### **ADVANCED PHARMACOLOGY II (THEORY)**

CO	Description
CO1.	Understand the mechanism of action drug at cellular and molecular level
CO2.	Discuss the pathophysiology of certain diseases
CO3.	Understand the pharmacotherapy for certain diseases
CO4.	Know the adverse effects and contraindications of drugs used in treatment of diseases
CO5.	Know the clinical use of various drugs used in in treatment of diseases

### **TOXICOLOGICAL SCREENING METHODS (THEORY)**

CO	Description
CO1.	Understand the significance of toxicity studies in evaluating a new drug entity
CO2.	Explain the various types of toxicity studies
CO3.	Appreciate the importance of ethical requirements for toxicity studies
CO4.	Appreciate the importance of regulatory requirements for toxicity studies
CO5.	Understand the basic requirements to conduct preclinical toxicity studies

### **PRINCIPLES OF DRUG DISCOVERY (THEORY)**

CO	Description
CO1.	Explain the various stages of drug discovery
CO2.	Appreciate the importance of the role of genomics, proteomics and bio-informatics in drug discovery
CO3.	Understand various targets for drug discovery
CO4.	Know various lead seeking and lead optimisation methods
CO5.	Understand the importance of the role of Computer Aided Drug design in drug discovery

### **CLINICAL RESEARCH & PHARMACOVIGILANCE (THEORY)**

CO	Description
CO1.	Understand the types of clinical trial designs and its regulatory requirements
CO2.	Explain the responsibilities of key players involved in clinical trials
CO3.	Execute safety monitoring, reporting and close-out activities
CO4.	Understand the principles of pharmacovigilance and detect adverse drug reactions
CO5.	Perform the adverse drug reaction reporting systems and communication in pharmacovigilance

### **PHARMACOLOGY-II (PRACTICALS)**

CO	Description
CO1.	Demonstrate the effects of drugs on various isolated tissue preparations
CO2.	Perform various preclinical-toxicity studies
CO3.	Design a clinical trial protocol
CO4.	Design an ADR monitoring protocol and perform its reporting
CO5.	Perform in-silico docking and QSAR studies

### **PHARMACOLOGY III (PRACTICALS)**

CO	Description
CO1.	Study the basic requirements of ex-vivo experiments
CO2.	Isolate tissues from rodent species of animals
CO3.	Distinguish between the types of bioassays
CO4.	Demonstrate the agonist and antagonist effect of various drugs on isolated tissue preparations
CO5.	Perform dose calculation through graphical method

### **III SEMESTER**

#### **RESEARCH METHODOLOGY AND BIostatISTICS (THEORY-COMMON SUBJECT)**

CO	Description
CO1	Gain knowledge about the various statistical tools and their application in health care research
CO2	Understand the different patient research methods and designing of experimental methodology
CO3	Learn effective utilization of research methodology and planning clinical research with minimum risk and maximum safety and effectiveness
CO4	Practice different statistical tools and learning the hypothesis testing and finding correlation between various variables found in medical research
CO5	Understand in detail the concepts of statistical application and presenting research to the scientific community in most appropriate manner

## COURSE: PHARM D

### I-YEAR

#### HUMAN ANATOMY AND PHYSIOLOGY (THEORY)

CO	Description
CO1	Understand fundamental knowledge on the structure and functions of the human body.
CO2	Understanding both homeostasis mechanisms and homeostatic imbalances of various body systems.
CO3	Understand the various tissues and organs of the different systems of the human body.
CO4	Understand the blood pressure, heart rate, pulse and Respiratory volumes.
CO5	Appreciate coordinated working pattern of different organs of each system.

#### HUMAN ANATOMY AND PHYSIOLOGY (PRACTICAL)

CO	Description
CO1.	Handle various basic laboratory equipments and apparatus
CO2.	Demonstrate practical knowledge of human gross and microscopic anatomy.
CO3.	Identify the various physical contraceptive barriers used for family planning.
CO4.	Perform haematological experiments
CO5.	Record vital parameters

#### PHARMACEUTICS (THEORY)

CO	Description
CO1.	History, development of pharmacy profession in India in academy and pharmaceutical industry development
CO2.	Basics of different dosage forms with its definitions, types of dosage forms and its different routes of administration and surgical aids.
CO3.	Importance of prescription, its parts and handling of prescription with incompatibility in prescription and dosage forms.
CO4.	Importance of calculation in pharmaceutical dosage forms preparation & different calculations.
CO5.	Incompatibility of formulations, Preparation of different dosage forms and its evaluation.

#### PHARMACEUTICS (PRACTICAL)

CO	Description
CO1.	The formulation of dosage forms and its calculation according to required quantity and quality with standard reference.
CO2.	Basic procedure involved in the preparation of different Monophasic, Biphasic and solid dosage forms.
CO3.	The different excipients used in the dosage forms preparation and their role in dosage forms
CO4.	Importance of labelling for dosage forms.

### MEDICINAL BIOCHEMISTRY (THEORY)

CO	Description
CO1	To understand the catalytic activity of enzymes.
CO2	To know the metabolic process of biomolecules in health and illness.
CO3	To know the biochemical principles of organ function test.
CO4	To understand the qualitative analysis and determination of biomolecules in the body fluids

### MEDICINAL BIOCHEMISTRY (PRACTICAL)

CO	Description
CO1	To know to perform the qualitative analysis of unknown compounds
CO2	To know the perform the quantitative estimation of unknown compounds with different methods.
CO3	To know the determine the compounds in serum analysis
CO4	To know the preparation of buffer solutions

### PHARMACEUTICAL ORGANIC CHEMISTRY (THEORY)

CO	Description
CO1	To understand IUPAC/Common system of nomenclature of simple organic compounds belonging to different classes of organic compounds.
CO2	To know some important physical properties of organic compounds.
CO3	To understand free radical/ nucleophilic [alkyl/ acyl/ aryl] / electrophilic substitution, free radical/ nucleophilic / electrophilic addition, elimination, oxidation and reduction reactions with mechanism, orientation of the reaction, order of reactivity, stability of compounds.
CO4	To know some named organic reactions with mechanisms.
CO5	To know methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

### PHARMACEUTICAL ORGANIC CHEMISTRY (PRACTICAL)

CO	Description
CO1.	To know the synthesis of organic compounds.
CO2.	To know some important physical properties of organic compounds
CO3.	To understand free radical/ nucleophilic [alkyl/ acyl/ aryl] / electrophilic substitution, free radical/ nucleophilic / electrophilic addition, elimination, oxidation and reduction reactions with mechanism, orientation of the reaction, order of reactivity, stability of compounds.
CO4.	To understand the uses of stereomodels and inversion of configurations.
CO5	To know systematic qualitative analysis of organic compounds.

## PHARMACEUTICAL INORGANIC CHEMISTRY (THEORY)

CO	Description
CO1	To understand the principles and procedures of analysis of drugs.
CO2	To understand the application of inorganic pharmaceuticals.
CO3	To know the analysis of the inorganic pharmaceuticals their applications.
CO4	To know the importance of inorganic pharmaceuticals in preventing and curing the disease.

## PHARMACEUTICAL INORGANIC CHEMISTRY (PRACTICAL)

CO	Description
CO1	To know to perform the limit test.
CO2	To know to perform the assays of inorganic compounds.
CO3	To know the estimation of mixtures.
CO4	To know the methods of identification test.
CO5	To know the preparation of inorganic drugs and pharmaceuticals.

## II Pharm D

### PATHOPHYSIOLOGY (THEORY)

CO	Description
CO1.	Gain the knowledge of etiology and pathogenesis of the selected disease states
CO2.	Understand the signs and symptoms of the diseases
CO3.	Identify the complications of the diseases
CO4.	Know most commonly encountered pathophysiological state(s) and/or disease mechanism(s)
CO5.	Know the clinical testing requirement of disease mechanisms

### PHARMACEUTICAL MICROBIOLOGY (THEORY)

CO	Description
CO1	Understand the anatomy, identification, growth factors and sterilization of microorganisms
CO2	Know the mode of transmission of disease-causing microorganism, symptoms of disease, and treatment aspect.
CO3	Know cultivation and identification of the microorganisms in the laboratory.
CO4	Understand identification of diseases by performing the diagnostic tests.
CO5	Appreciate the behavior of motility and behavioral characteristics of microorganisms.



### PHARMACOGNOSY AND PHYTOPHARMACEUTICAL (THEORY)

CO	Description
CO1	Understand the basic principles of cultivation, collection, and storage of crude drugs.
CO2	Know the source, active constituents and uses of crude drugs.
CO3	Appreciate the applications of primary and secondary metabolites of the plant.
CO4	Know the methods of adulteration and evaluation of crude drugs.
CO5	Know the chemistry and methods of analysis of primary metabolites.

### PHARMACOGNOSY AND PHYTOPHARMACEUTICAL (PRACTICAL)

CO	Description
CO1	Know the morphological study of various drugs.
CO2	Know to carry out the histological studies of crude drugs.
CO3	Carry out the chemical tests for unorganised drugs.
CO4	Know the methods of analysis of fixed oils and fats.
CO5	Analyse and evaluate the powdered crude drugs samples by morphological and microscopical characters.

### PHARMACOLOGY-I (THEORY)

CO	Description
CO1	Understand the pharmacological aspects of drugs
CO2	Understand the importance of drug discovery by preclinical and clinical trials
CO3	Appreciate the importance of pharmacology subject as a basis of therapeutics.
CO4	Understand the different drugs used with an emphasis on and pharmacokinetic aspects, Therapeutic uses.
CO5	Understanding the therapeutic uses, contraindications & drug interaction.

### COMMUNITY PHARMACY (THEORY)

CO	Description
CO1	Gain knowledge about the various pharmaceutical care services and study about the changing scenario of pharmacy practice services in India
CO2	Understand the different patient related activities such as patient counselling and dispensing safe and suitable medications
CO3	Learn about various pharmacy activities such as dispensing of prescription and OTC drugs and understand about different minor ailments and treatment for these ailments
CO4	Practice different health screening services to be provided for patient care in a community pharmacy setup and learn about community pharmacy and different management skills in community pharmacies such as business and professional practice
CO5	Understand in detail the concepts of essential drug concept and rational drug therapy to appreciate store management and inventory control

### PHARMACOTHERAPEUTICS-1 (THEORY)

CO	Description
CO1	Impart knowledge and skills necessary for contribution to quality use of medicines To study the etiopathogenesis of selected diseases.
CO2	knowledge about the rationality of drug therapy and study the therapeutic approach in the management of diseases.
CO3	Understand controversies in drug therapy and preparation of the individualized therapeutic plan based on diagnosis.
CO4	Learn and apply patient specific parameters in initiating drug therapy and distinguish the management strategies of selected diseases in special populations.
CO5	Study in detail the concepts of essential drug concept and rational drug therapy Assess drug safety monitoring, contraindications and treatment outcomes and modify Treatment plan as needed

### PHARMACOTHERAPEUTICS-1 (PRACTICALS)

CO	Description
CO1	Impart knowledge and skills necessary for contribution to quality use of medicines
CO2	Learn pathophysiology of selected diseases and study about the rationality of drug therapy
CO3	Therapeutic approach in the management of diseases and controversies in drug therapy To prepare the individualized therapeutic plan based on diagnosis
CO4	Understand practical knowledge and interpretation of patient specific parameters in initiating drug therapy
CO5	Monitoring of drug therapy such as alternatives, therapeutic responses produced and adverse effects and learn to apply the concepts of essential drug concept and rational drug therapy

### III-PHARM D

#### PHARMACOLOGY II THEORY

CO	Description
CO1	Understand the mechanism of drug action
CO2	To understand the importance of pharmacokinetics and pharmacodynamics in calculating the drug dosage
CO3	Appreciate the importance of pharmacology subject as a basis of therapeutics
CO4	To understand the novel methods of technology in drug research and development
CO5	To correlate and apply the knowledge therapeutically

#### PHARMACOLOGY II PRACTICAL

CO	Description
CO1	Handle laboratory animals
CO2	Prepare various physiological salt solution for organ study
CO3	Demonstrate various receptor actions using isolated tissue preparations
CO4	Demonstrate isolation of different organs or tissues from the laboratory animals
CO5	Perform dose calculations graphically

#### PHARMACEUTICAL ANALYSIS (THEORY)

CO	Description
CO1.	understand about various chromatographic techniques
CO2.	understand about various electrochemical methods
CO3.	understand about various spectroscopy
CO4.	Gain knowledge about quality assurance

#### PHARMACEUTICAL ANALYSIS (PRACTICAL)

CO	Description
CO1.	understand about various chromatographic techniques
CO2.	understand about various spectroscopy
CO3.	Carryout various titration methods
CO4.	Carryout colorimetric analysis

### PHARMACOTHERAPEUTICS-II (THEORY)

CO	Description
CO1	Obtain brief knowledge of pathophysiology of disease state and understand the rationale drug therapy pharmacological and non-pharmacological therapy).
CO2	Acknowledge skills for contribution to quality & use of medicines.
CO3	Identify the patient-specific parameters in initiating drug therapy, and monitoring therapy (including alternatives, time-course of drugs - its safety and efficacy).
CO4	To put in preparation of individualized therapeutic plans based on diagnosis.
CO5	Understand to apply pharmacotherapy of each disease.

### PHARMACOTHERAPEUTICS-II (PRACTICALS)

CO	Description
CO1	Understand the pharmacotherapy of disease.
CO2	Understand the choice of drug and reduce the duplications and interactions.
CO3	Preparation of individualised therapeutic plans supported diagnosis.
CO4	Correlate and apply the knowledge of pharmacotherapy in treatment monitoring.

### PHARMACEUTICAL JURISPRUDENCE (THEORY)

CO	Description
CO1.	Understand basic principles, purpose, dimensions, significance and relevance of pharmaceutical laws in India.
CO2.	Discuss the purpose, responsibilities, qualifications for membership and the make-up of the Board.
CO3.	Understand various Indian pharmaceutical acts & laws, code of ethics during the pharmaceutical practice.
CO4.	Explain the definitions in the Act, identifying potential offences and relative penalties
CO5.	Learn the various regulatory authorities & agencies governing the manufacturing, sale, research & usage of drugs.
CO6.	Learner knowledge about Patents, procedure for patent application and IPR.

### PHARMACOTHERAPEUTICS-II (PRACTICALS)

CO	Description
CO1	Understand the pharmacotherapy of disease.
CO2	Understand the choice of drug and reduce the duplications and interactions.
CO3	Preparation of individualised therapeutic plans supported diagnosis.
CO4	Correlate and apply the knowledge of pharmacotherapy in treatment monitoring.

### PHARMACEUTICAL JURISPRUDENCE (THEORY)

CO	Description
CO1.	Understand basic principles, purpose, dimensions, significance and relevance of pharmaceutical laws in India.
CO2.	Discuss the purpose, responsibilities, qualifications for membership and the make-up of the Board.
CO3.	Understand various Indian pharmaceutical acts & laws, code of ethics during the pharmaceutical practice.
CO4.	Explain the definitions in the Act, identifying potential offences and relative penalties
CO5.	Learn the various regulatory authorities & agencies governing the manufacturing, sale, research & usage of drugs.
CO6.	Learner knowledge about Patents, procedure for patent application and IPR.

### MEDICINAL CHEMISTRY (THEORY)

CO	Description
CO1.	understand the chemistry of drugs with respect to their pharmacological activity
CO2.	understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
CO3.	know the Structural Activity Relationship (SAR) of different class of drugs
CO4.	write the chemical synthesis of some drugs

### MEDICINAL CHEMISTRY (PRACTICAL)

CO	Description
CO1	To know to perform the assays of important drugs.
CO2	To know the preparation of medicinally important compounds.
CO3	To know the preparation of medicinally important intermediate compounds.
CO4	To know to determine partition coefficients

### PHARMACEUTICAL FORMULATIONS (THEORY)

CO	Description
CO1.	Students will understand the principle involved in formulation of various pharmaceutical dosage forms
CO2.	To prepare various pharmaceutical formulation, perform evaluation of pharmaceutical dosage forms
CO3.	To understand and appreciate the concept of bioavailability and bioequivalence, their role in clinical situations
CO4.	Students will be able to discuss formulation additives for various dosage forms
CO5.	Students will be able to describe the manufacturing methods of solid, semisolid, parenteral and ophthalmic products

### PHARMACEUTICAL FORMULATIONS (PRACTICAL)

CO	Description
CO1	Prepare formulations of different dosage forms as per the batch formula
CO2	Operate different equipment's and instruments used in preparation of dosage forms
CO3	Select suitable packaging container for a dosage form
CO4	Evaluate different dosage forms by performing quality control tests
CO5	Conduct planned experiments and prepare laboratory report in a standard format

### IV Pharm D

### PHARMACOTHERAPEUTICS-III (THEORY)

CO	Description
CO1	Understand the Etio-pathology & clinical parameters of selected gastrointestinal, hematological, neurological and psychiatric diseases.
CO2	Initiate drug therapy, evaluate the therapeutic goals by therapeutic intervention
CO3	Know the controversies in drug therapy.
CO4	Know the effective use of non pharmacological therapeutic interventions in the treatment of specific diseases, conditions and symptoms.
CO5	Discuss the principles of evidence based therapy and pain management.

### PHARMACOTHERAPEUTICS- III (PRACTICALS)

CO	Description
CO1	Analyze and evaluate case studies and medication orders and prepare laboratory report in a standard format.
CO2	Identify medication related issues and rationalize the prescription.
CO3	Discuss the therapeutic approach to management of selected diseases
CO4	prepare individualized therapeutic plans based on diagnosis
CO5	Conduct patient counseling & exercise moral reasoning, ethical judgment and professionalism

### HOSPITAL PHARMACY (THEORY)

CO	Description
CO1	Know various drug distribution methods
CO2	Know the professional practice management skills in hospital pharmacies
CO3	Know the manufacturing practices of various formulations in hospital set up
CO4	Appreciate the practice based research methods
CO5	Appreciate the stores management and inventory control. Provide unbiased drug information to the physicians

### HOSPITAL PHARMACY (PRACTICALS)

CO	Description
CO1	Know various drug distribution methods
CO2	Know the professional practice management skills in hospital pharmacies
CO3	Know the manufacturing practices of various formulations in hospital set up
CO4	Appreciate the practice based research methods
CO5	Appreciate the stores management and inventory control. Learn to provide unbiased drug information to the physicians and other health care professionals

### CLINICAL PHARMACY (THEORY)

CO	Description
CO1	Interpretation of disease by laboratory investigation
CO2	Collection of patient details by interview and counsel the patients
CO3	Detect, assess and monitor adverse drug reaction and reporting.
CO4	Preparation of reports as clinical pharmacist.

## CLINICAL PHARMACY (PRACTICALS)

CO	Description
CO1	Monitor patient clinical review by laboratory data and medication chart review b monitoring safety and efficacy.
CO2	Collect medication history interview and provide counselling to the patients.
CO3	Identify and resolve drug related problems.
CO4	Retrieve, analyse, interpret and formulate drug information.

## BIOSTATISTICS & RESEARCH METHODOLOGY (THEORY)

CO	Description
CO1	Know the various Statistical methods and its application
CO2	Know about Research methodology & hypothesis testing
CO3	Operate various statistical software's
CO4	Appreciate the importance of Computer in Hospital and Community Pharmacy
CO5	Appreciate the statistical technique in solving the pharmaceutical problem.

## BIOPHARMACEUTICS & PHARMACOKINETICS (THEORY)

CO	Description
CO1	Define the basic concepts in biopharmaceutics and pharmacokinetics
CO2	Use raw data and derive the pharmacokinetic models and parameters the best describes the process of drug absorption, distribution, metabolism and elimination.
CO3	Critically evaluate biopharmaceutic studies involving drug product equivalency
CO4	Design and evaluate dosage regimens of the drugs using pharmacokinetic and biopharmaceutic parameters
CO5	Detect potential clinical pharmacokinetic problems and apply basic pharmacokinetic principles to solve them

## BIOPHARMACEUTICS & PHARMACOKINETICS (PRACTICAL)

CO	Description
CO1	Compare the in - vitro drug release profile of different marketed products
CO2	Perform the solubility enhancement techniques for improvement of drug release of poorly water soluble drugs
CO3	Estimate the bioavailability (absolute and relative) and bioequivalence from the given clinical data
CO4	Calculate the drug content in blood sample using Area Under Curve approach
CO5	Calculate and interpret various pharmacokinetic parameters from the given clinical data



### CLINICAL TOXICOLOGY (THEORY)

CO	Description
CO1.	Understand the General principles involved in the management of poisoning.
CO2.	Know the Antidotes and the clinical applications, Supportive care in clinical Toxicology.
CO3.	Know the Clinical symptoms and management of acute poisoning, Chronic Poisoning of Various chemical agents.
CO4.	Understand the role of Various Poison species causing Clinical Manifestations and its Relevance in the treatment of different toxic features.
CO5.	Know the Signs and symptoms of substance abuse and treatment of dependence

### V-PHARM D

### CLINICAL RESEARCH (THEORY)

CO	Description
CO1	Know the concept of new drug development process.
CO2	Know the concept of clinical development of drug
CO3	Understand the regulatory and ethical requirements.
CO4	Conduct the clinical trials in accordance to regulatory and ethical requirements.
CO5	Coordinate the clinical trials and promote quality drug trial research.

### PHARMACOEPIDEMOLOGY AND PHARMACOECONOMICS (THEORY)

CO	Description
CO1	Better understanding and answering the demanding questions asked of pharmacotherap in pharmacoepidemiology and pharmaco-economics.
CO2	Assessing patterns and appropriateness of drug utilisation, provide explanations for poor compliance, quantify the frequency and severity of side effects
CO3	Pharmacoeconomics can help determine whether a replacement costlier product offers sufficient clinical advantage over its predecessors to justify the increased cost.
CO4	Capable to represent subsequent logical step within the evolution of medication assessment; their judicious deployment can help ensure both access to new medicines and innovation.
CO5	Evaluation of interventions to improve drug use and outcomes.

### CLINICAL PHARMACOKINETICS & PHARMACOTHERAPEUTIC DRUG MONITORING(THEORY)

CO	Description
CO1	Understand the basics of pharmacokinetic parameters and their application.
CO2	Designing of nomograms for elderly and paediatric patients.
CO3	Knowledge of dosage calculation and adjustment in hepatic and renal disease patients.
CO4	Individualization of dosage regimen and therapeutic drug monitoring of various drugs.
CO5	Genetic polymorphism influence on drug and understanding molecular effect on body.

### CLERKSHIP (PRACTICAL)

CO	Description
CO1	Know various drug distribution methods and know the professional practice management hospital pharmacies
CO2	Understand the prescribing and manufacturing practices of various formulations in hospital set up
CO3	Identify the patient-specific parameters in drug therapy. Provide patient counselling
CO4	Provide unbiased drug information to the doctors
CO5	Monitoring treatment by assessing alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects.

### I Pharm D-PB

#### PHARMACOTHERAPEUTICS-I & II (THEORY)

CO	Description
CO1	To impart knowledge and skills necessary for contribution to quality use of medicines
CO2	To study the etiopathogenesis of selected diseases and learn to study about the rationality of drug therapy
CO3	Understand the therapeutic approach in the management of diseases To study the controversies in drug therapy
CO4	Able to prepare the individualized therapeutic plan based on diagnosis To study the patient specific parameters in initiating drug therapy
CO5	Distinguish the management strategies of selected diseases in special populations. Study in detail the concepts of essential drug concept and rational drug therapy Assess drug safety monitoring, contraindications and treatment outcomes and modify treatment plan as needed

#### PHARMACOTHERAPEUTICS- I & II (PRACTICALS)

CO	Description
CO1	Gain practical knowledge and skills necessary for contribution to quality use of medicines
CO2	To study the pathophysiology of selected diseases and study about the rationality of drug therapy
CO3	Practically learn the therapeutic approach in the management of diseases To study the controversies in drug therapy
CO4	Learn to do individualized therapeutic plan based on diagnosis To study the patient specific parameters in initiating drug therapy
CO5	Monitoring and reporting of drug therapy such as alternatives, therapeutic responses produced and adverse effects and Study in detail the concepts of essential drug concept and rational drug therapy

## HOSPITAL AND COMMUNITY PHARMACY (THEORY)

CO	Description
CO1	Know various drug distribution methods.
CO2	Know the professional practice management skills in hospital pharmacies.
CO3	Know the manufacturing practices of various formulations in hospital set up.
CO4	Appreciate the practice based research methods and patient counselling in community pharmacy
CO5	Appreciate the stores management and inventory control. Provide unbiased drug information to the physicians.

## HOSPITAL AND COMMUNITY PHARMACY (PRACTICAL)

CO	Description
CO1	Practically Know various drug distribution methods
CO2	Practice and learn the professional practice management skills in hospital pharmacies
CO3	Expertise in the manufacturing practices of various formulations in hospital set up
CO4	Appreciate the practice based research methods
CO5	Appreciate the stores management and inventory control. Learn to provide unbiased drug information to the physicians and other health care professionals

## CLINICAL PHARMACY (THEORY)

CO	Description
CO1	Interpretation of disease by laboratory investigation
CO2	Collection of patient details by interview and counsel the patients
CO3	Detect, assess and monitor adverse drug reaction and reporting.
CO4	Preparation of reports as clinical pharmacist.

## CLINICAL PHARMACY (PRACTICALS)

CO	Description
CO1	Monitor patient clinical review by laboratory data and medication chart review by monitoring safety and efficacy.
CO2	Collect medication history interview and provide counselling to the patients.
CO3	Identify and resolve drug related problems.
CO4	Retrieve, analyse, interpret and formulate drug information.

## BIostatistics & RESEARCH METHODOLOGY (THEORY)

CO	Description
CO1	Know the various Statistical methods and its application
CO2	Know about Research methodology & hypothesis testing
CO3	Operate various statistical software's
CO4	Appreciate the importance of Computer in Hospital and Community Pharmacy
CO5	Appreciate the statistical technique in solving the pharmaceutical problem.

## CLINICAL TOXICOLOGY

CO	Description
CO1.	Understand the General principles involved in the management of poisoning.
CO2.	Know the Antidotes and the clinical applications, Supportive care in clinical Toxicology.
CO3.	Know the Clinical symptoms and management of acute poisoning, Chronic Poisoning of Various chemical agents.
CO4.	Understand the role of Various Poison species causing Clinical Manifestations and its Relevance in the treatment of different toxic features.
CO5.	Know the Signs and symptoms of substance abuse and treatment of dependence

### PHARMACOTHERAPEUTICS-III (THEORY)

CO	Description
CO1	Understand the Etio-pathology & clinical parameters of selected gastrointestinal, hematological, neurological and psychiatric diseases
CO2	Initiate drug therapy, evaluate the therapeutic goals by therapeutic intervention
CO3	Know the controversies in drug therapy
CO4	Know the effective use of non pharmacological therapeutic interventions in the treatment of specific diseases, conditions and symptoms.
CO5	Discuss the principles of evidence based therapy and pain management

### PHARMACOTHERAPEUTICS-III (PRACTICALS)

CO	Description
CO1	Analyze and evaluate case studies and medication orders and prepare laboratory report in a standard format.
CO2	Identify medication related issues and rationalize the prescription.
CO3	Discuss the therapeutic approach to management of selected diseases
CO4	prepare individualized therapeutic plans based on diagnosis
CO5	Conduct patient counseling & exercise moral reasoning, ethical judgment and professionalism

### BIOPHARMACEUTICS & PHARMACOKINETICS (THEORY)

CO	Description
CO1	Define the basic concepts in biopharmaceutics and pharmacokinetics
CO2	Use raw data and derive the pharmacokinetic models and parameters the best describes the process of drug absorption, distribution, metabolism and elimination.
CO3	Critically evaluate biopharmaceutic studies involving drug product equivalency
CO4	Design and evaluate dosage regimens of the drugs using pharmacokinetic and biopharmaceutic parameters
CO5	Detect potential clinical pharmacokinetic problems and apply basic pharmacokinetic principles to solve them

**II Pharm D-PB**  
**CLINICAL RESEARCH-THEORY**

CO	Description
CO1	Know the concept of new drug development process.
CO2	Know the concept of clinical development of drug
CO3	Understand the regulatory and ethical requirements.
CO4	Conduct the clinical trials in accordance to regulatory and ethical requirements.
CO5	Coordinate the clinical trials and promote quality drug trial research.

**PHARMACOEPIDEMIOLOGY AND PHARMACOECONOMICS (THEORY)**

CO	Description
CO1	Better understanding and answering the demanding questions asked of pharmacotherapy pharmacoepidemiology and pharmaco-economics.
CO2	Assessing patterns and appropriateness of drug utilisation, provide explanations for poor compliance, quantify the frequency and severity of side effects
CO3	Pharmacoeconomics can help determine whether a replacement costlier product offers sufficient clinical advantage over its predecessors to justify the increased cost.
CO4	Capable to represent subsequent logical step within the evolution of medication assessment; their judicious deployment can help ensure both access to new medicines and innovation.
CO5	Evaluation of interventions to improve drug use and outcomes.

**CLINICAL PHARMACOKINETICS & PHARMACOTHERAPEUTIC DRUG MONITORING (THEORY)**

CO	Description
CO1	Understand the basics of pharmacokinetic parameters and their application.
CO2	Designing of nomograms for elderly and paediatric patients.
CO3	Knowledge of dosage calculation and adjustment in hepatic and renal disease patients.
CO4	Individualization of dosage regimen and therapeutic drug monitoring of various drugs.
CO5	Genetic polymorphism influence on drug and understanding molecular effect on body.

## CLERKSHIP (PRACTICAL)

CO	Description
CO1	Know various drug distribution methods AND Know the professional practice management hospita pharmacies
CO2	Understand the prescribing and manufacturing practices of various formulations in hospital set up
CO3	Identify the patient-specific parameters in drug therapy. Provide patient counselling
CO4	Provide unbiased drug information to the doctors
CO5	Monitoring treatment by assessing alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects.

P. Padma

**PRINCIPAL**

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