

B.Pharm Course outcome and objectives of various subjects

Semester – I	
Human Anatomy and Physiology I	<p>CO1 – Introduction to the human body: structural organization and body system levels. Classification of tissues & intracellular signaling pathway</p> <p>CO2 – Integumentary system: Structure and functions of the skin, Divisions of the skeletal system, physiology of muscle contraction.</p> <p>CO3 – Body fluids and blood: composition and functions of blood, hemopoiesis. Functions of the lymphatic system</p> <p>CO4 – Peripheral nervous system: Classification, Structure, and functions of the sympathetic and parasympathetic nervous system. Special senses Structure and functions</p> <p>CO5 - Cardiovascular system: – anatomy, Structure and functions heart and blood vessels, disorders of the heart</p>
Pharmaceutical Analysis- I	<p>CO1 –1.Understand the concepts of primary standards and secondary standards, primary standards, Pharmacopoeia, limit tests, accuracy, and precision. 2. Understand the concepts of errors and how we can minimize them.</p> <p>CO2 –1.Understand the concepts of acid, base, indicators, neutralization curves, acidimetry, alkalimetry 2.Understand the principle, methodology, and applications of acid-base titrations and non-aqueous titrations</p> <p>CO3 – 1.Understand the concepts of precipitation, masking agents, demasking agents, precipitation, co-precipitation, post precipitation 2.Understand the principle, methodology, and applications of precipitation, complexometry, gravimetry, and diazotization</p> <p>CO4 – 1.Understand the concepts of oxidation, reduction, Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry 2.Understand the principle, methodology, and applications of redox titrations</p> <p>CO5-1.Understand the concepts of Conductivity cell, Electrochemical cell, Ilkovic equation 2.Understand the principle, methodology, and applications of conductometry, potentiometry and polarography</p>
Pharmaceutics I	<p>CO1 – Knowledge of pharmacy history, pharmacopeias, dosage forms, prescription handling, and posology.</p> <p>CO2 – Able to calculate doses, domestic conversions & other pharmaceutical calculations. Know what are powders and liquid dosage forms</p> <p>CO3 – Knowledge of monophasic & biphasic liquid dosage forms, their preparation, and stability.</p> <p>CO4 – Knowledge of suppositories preparation, displacement value calculations, and incompatibilities in preparations.</p> <p>CO5- Knowledge of preparation & Evaluation of semi-solid dosage forms.</p>
Pharmaceutical Inorganic Chemistry	<p>CO1 – 1. To know the sources of impurities and limit test 2. principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead, and Heavy metals,</p> <p>CO2 – 1. To know the Acids, Bases, and Buffers, electrolytes, Dental products. 2. understand the medicinal and pharmaceutical importance of Dental products, Major extra and intracellular electrolytes, Acids, Bases, and Buffers</p> <p>CO3 – 1. To know the Gastrointestinal agents 2. understand the medicinal and pharmaceutical importance of Acidifiers, Antacids, Cathartics, Antimicrobials</p> <p>CO4 –1. To know the Miscellaneous compounds in inorganic chemistry</p>

	<p>2. understand the medicinal and pharmaceutical importance of Expectorants, Emetics, Haematinics, Poison and Antidote, Astringents</p> <p>CO5-1. To know the Radio activity, Measurement of radioactivity, Properties of α, β, γ radiations, Half-life, radioisotopes</p> <p>2. understand the medicinal and pharmaceutical importance of Radiopharmaceuticals</p>
Communication skills	<p>CO1 – Learning the Communication Skills: Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context.</p> <p>CO2 – Basics of Elements of Communication: Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication</p> <p>CO3 – Writing Effectively: Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message.</p> <p>CO4 – learning Interview Skills: Purpose of an interview, Do's and Don'ts of an interview.</p> <p>CO5-learning Group Discussion: Introduction, Communication skills in group discussion, Do's and of group discussion</p>
Remedial Biology	<p>CO1 – Living world: Definition and characters, Diversity, Morphology, Anatomy of Root, stem, leaf</p> <p>CO2 – Body fluids and circulation: Structure of human heart and blood vessels, Composition and functions of blood & lymph</p> <p>CO3 – Life cycle and life history of parasites: Entamoeba histolytica, Taenia solium</p> <p>CO4 – Plants and mineral nutrition: Nitrogen metabolism, Nitrogen cycle. An essential mineral, macro, and micronutrients</p> <p>CO5- Plant respiration: Phases and rate of plant growth</p>
Remedial Mathematics	<p>CO1 – learning partial fractions Polynomial, Rational fractions, Proper and Improper fractions</p> <p>CO2 – Knowledge of Matrices and Determinants: Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants</p> <p>CO3 – Calculus</p> <p>Differentiation: Introduction, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function, Derivative of the sum or difference of two functions</p> <p>CO4 – Knowledge of Analytical Geometry</p> <p>Introduction: Signs of the Coordinates, Distance formula</p> <p>CO5- Learning Differential Equations : Some basic definitions, Order and degree, Equations in separable form, Homogeneous equations</p>
SEMESTER – II	
Human Anatomy and Physiology	<p>CO1 – Nervous system Knowledge about organization of nervous system, neuron, neuroglia, classification and properties of nerve fibre, electrophysiology.</p> <p>CO2 – Studying about Digestive system Anatomy of GI Tract with special reference to anatomy and functions of stomach</p>

II	<p>CO3 – Knowledge about Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration</p> <p>CO4 – Knowledge about Endocrine system Classification of hormones, mechanism of hormone action, Structure and functions of the pituitary gland</p> <p>CO5- Studying the Anatomy of the male and female reproductive system, Functions of the male and female reproductive system, sex hormones</p>
Pharmaceutical Organic Chemistry I	<p>CO1 – 1. Understand the concepts of classification and nomenclature of simple organic compounds and structural isomerism. 2. Write the Structure, name, and the type of isomerism of the organic compound</p> <p>CO2 – 1. Understand the concepts of Alkanes, Alkenes and Conjugated dienes, E1 and E2 reactions, and the Stability of conjugated dienes. 2. Write the Halogenation of alkanes, E1 versus E2 reactions, Factors affecting E1 and E2 reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement</p> <p>CO3 – 1. Understand the concepts of SN1 and SN2 reactions 2. Write the order of Reactivity of alkyl halides, stereochemistry and rearrangement of carbocations, SN1 versus SN2 reactions, Factors affecting SN1 and SN2 reactions. Write the structures of Structure and uses of Ethyl alcohol, Methyl alcohol, chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol</p> <p>CO4 – 1. Understand the concepts of principles/mechanisms, applications Aldehydes, and ketones 2. Write the aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanillin, Cinnamaldehyde.</p> <p>CO5- 1. Understand the concepts of Acidity of carboxylic acids, Basicity, effect of substituent on Basicity. 2. Write the Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, and Succinic acid. Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, ethyl salicylate and Acetylsalicylic acid, Amphetamine, Ethanolamine, Ethylenediamine.</p>
Biochemistry	<p>CO1 – Upon completion of the course, student shall be able to understand the chemical nature and biological role of biomolecules, Concept of free energy, redox potential, and the significance of energy-rich compounds.</p> <p>CO2 – Gain knowledge about carbohydrate metabolism, related pathological conditions and their hormonal regulations, biological oxidation, mechanism of electron transport chain (ETC) and phosphorylation, and their inhibitors.</p> <p>CO3 – About the metabolism of lipids and the related disorders, the biological significance of cholesterol, general reactions of amino acids, metabolisms, and metabolic disorders.</p> <p>CO4 – Understand the biosynthesis of nucleotides, genetic organization of mammalian genome and DNA, RNA functions, the process of replication, transcription, and translation.</p> <p>CO5 – About the catalytic role of enzymes, the importance of enzyme inhibitors in the design of new drugs, and therapeutic and diagnostic applications of enzymes.</p>

Pathophysiology	<p>CO1 – Basic principles of Cell injury and Adaptation: Homeostasis, Pathogenesis, Morphology of cell injury, the Basic mechanism involved in the process of inflammation and repair</p> <p>CO2 – Cardiovascular System: Etiology, Pathophysiology of Cardiovascular disorders</p> <p>CO3 – Haematological Diseases: pathophysiology of various Haematological Diseases</p> <p>CO4 – Gastrointestinal system; pathophysiology of various Gastrointestinal Diseases</p> <p>CO5 - Infectious diseases: Pathophysiology of various communicable and Noncommunicable Infectious diseases</p>
Computer Applications in Pharmacy	<p>CO1 – Knowledge of Numbers system: Binary numbers system, Decimal numbers system, Octal number system, Hexadecimal number systems</p> <p>CO2 – Basic Knowledge of Web technologies: Introduction to HTML, XML, CSS, and Programming languages, introduction to web servers and Server Products</p> <p>CO3 – Basic knowledge of the Application of computers in Pharmacy – Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design</p> <p>CO4 – Understanding the basics of bioinformatics: Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery</p> <p>CO5- Basics of Computers as data analysis in Preclinical development: Chromatographic data analysis (CDS), Laboratory Information Management System (LIMS), and Text Information Management System (TIMS)</p>
Environmental sciences	<p>CO1 – The student will be able to raise awareness of environmental issues after completing the course.</p> <p>CO2 – imparting a fundamental understanding of environmental issues and their related issues</p> <p>CO3 – the student shall be able to Create an attitude of environmental care upon completing the course.</p> <p>CO4 – Motivate learners to participate in environment protection and environment improvement.</p> <p>CO5– Students acquire skills to help the concerned individuals in identifying and solving environmental problems.</p>
Semester III	
Pharmaceutical Organic Chemistry II	<p>CO1 – 1. Understand the concepts of the Reactivity of benzene, Orbital picture, resonance in benzene, aromatic characters, and Huckel's rule. 2. Write mechanism and orientation of nitration, sulphonation, halogenations Reactivity, Friedelcrafts alkylation, Friedelcrafts acylation, effect of substituents on Reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction and Structure and uses of DDT, Saccharin, BHC and Chloramine</p> <p>CO2 – 1. Understand the concepts of Acidity of phenols, Basicity of amines, 2. Write the effect of substituents on Acidity, qualitative tests, the effect of substituents on basicity, synthetic uses of aryl diazonium salts, the effect of substituents on Acidity, Structure, and uses of phenol, cresols, resorcinol, naphthols</p> <p>CO3 – 1. Understand the concepts of Hydrogenation, Saponification, and Rancidity of oils, and Drying oils.</p>

	<p>2. Write mechanism and significance of Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value.</p> <p>CO4 – 1. Understand the concepts of Synthesis and reactions of Polynuclear hydrocarbons.</p> <p>2. Write the Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, and Triphenylmethane and their derivatives.</p> <p>CO5-1. Understand the concepts of Reactivity of cyclopropane and cyclobutane.</p> <p>2. Write Baeyer's strain theory, the limitation of Baeyer's strain theory, Coulson and Moffitt's modification, and Sachse Mohr's theory.</p>
Physical Pharmaceutics I	<p>CO1 – To study the Solubility of drugs: Solubility expressions, mechanisms of solute-solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing Solubility of drugs.</p> <p>CO2 – Knowledge about States of Matter and properties of matter: State of matter, changes in the state of matter, latent heats,</p> <p>CO3 – To study Surface and interfacial phenomenon: Liquid interface, surface & interfacial tensions.</p> <p>CO4 – Knowledge about Complexation and protein binding: Introduction, Classification of Complexation, Applications, methods of analysis, protein binding</p> <p>CO5 – Knowledge about pH, buffers, and Isotonic solutions: Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers</p>
Pharmaceutical Microbiology	<p>CO1 – to understand methods of identification, cultivation, and preservation of various microorganisms</p> <p>CO2 – To understand the importance and implementation of sterilization in pharmaceutical processing and industry</p> <p>CO3 – To learn the importance of disinfectants, and bactericides in controlling MOs and their evaluation methods according to IP, BP, and USP</p> <p>CO4 – To understand the importance and implementation of aseptic conditions in pharmaceutical industries and to carry out microbiological standardization of pharmaceutical products</p> <p>CO5 – To gain knowledge in cell culture technology and its applications in pharmaceutical industries</p>
Pharmaceutical Engineering	<p>CO1 – This course provides learners with a foundational understanding of the numerous unit operations utilized in the pharmaceutical industry.</p> <p>CO2 – Upon completion of the course, the student shall be able to perform evaporation and distillation processes involved in the pharmaceutical manufacturing process</p> <p>CO3 – Upon completion of the course, the student shall be able to perform drying and mixing processes involved in the pharmaceutical manufacturing process</p> <p>CO4 – After completing the course, students should be able to conduct the centrifugation and filtering steps necessary for manufacturing pharmaceuticals.</p> <p>CO5 – The student will be able to understand and appreciate the relevance of plant layout design for the best use of resources after completing the course. Understanding the many preventative techniques used in the pharmaceutical sector to control corrosion</p>
Semester IV	
Pharmaceutical Organic Chemistry III	<p>CO1 – 1. Understand the concepts of Optical activity, enantiomerism, diastereoisomerism, meso compounds</p> <p>Elements of symmetry, chiral and achiral molecules</p> <p>2. Write DL system of nomenclature of optical isomers, sequence rules, the RS system of nomenclature of optical isomers</p> <p>Reactions of chiral molecules, Racemic modification, and resolution of the racemic mixture. Asymmetric Synthesis.</p> <p>CO2 –</p>

	<p>CO2 – 1. Understand the concepts of Conformational isomerism, Geometrical isomerism. 2. Write Stereo isomerism in biphenyl compounds and conditions for optical activity. Stereospecific and stereoselective reactions. Methods of determination of the configuration of geometrical isomers.</p> <p>CO3 – 1. Understand the concepts of Relativity of Pyrrole, Furan, and Thiophene. 2. Write Synthesis, reactions and medicinal uses of Pyrrole, Furan and Thiophene.</p> <p>CO4 – 1. Understand the concepts of Basicity of pyridine. 2. Write the mechanism and Reactivity of Pyrazole, Imidazole, Oxazole and Thiazole, Pyrimidine, Purine, and azepines.</p> <p>CO5 – 1. Understand the concepts of reduction. 2. Write the mechanism and applications of Metal hydride reduction (NaBH₄ and LiAlH₄), Clemmensen reduction, Birch reduction, Wolff Kishner reduction, Oppenauer-oxidation, Dakin reaction, Beckmanns rearrangement, and Schmidt rearrangement. Claisen-Schmidt condensation</p>
Medicinal Chemistry I	<p>CO1 – Upon completion of the course, student shall be able to understand the classification, mechanism of action, SAR Studies, and Synthesis of drugs belonging to antihistaminic agents and anticancer agents.</p> <p>CO2 – Gain knowledge about the classification, mechanism of action SAR Studies, and Synthesis of antianginal agents, Diuretics, and antihypertensive agents.</p> <p>CO3 – Able to understand the classification, mechanism of action, SAR Studies, and Synthesis of drugs belongs to antiarrhythmic agents, antihyperlipidemic agents, coagulants, and anticoagulants and drugs acting on CHF.</p> <p>CO4 – Gain knowledge about the drugs acting on the endocrine system and thyroid and antithyroid agents.</p> <p>CO5 – About the classification, mechanism of action SAR Studies and Synthesis of antidiabetic agents and Local anesthetics.</p>
Physical Pharmaceutics II	<p>CO1 – To study Colloidal dispersions: Classification of dispersed systems & their general characteristics, size & shapes of colloidal particles</p> <p>CO2 – Knowledge of Rheology: Newtonian systems, law of flow, kinematic viscosity, the effect of temperature, non-Newtonian systems</p> <p>CO3 – To study Coarse dispersion: Suspension, interfacial properties of suspended particles, settling in suspensions</p> <p>CO4 – To gain knowledge of Micromeritics: Particle size and distribution, mean particle size, number and weight distribution, particle number</p> <p>CO5 – To study Drug stability: Reaction kinetics: zero, pseudo-zero, first & second order, units of basic rate constants, determination of reaction order</p>
Pharmacology I	<p>CO1 – To understand the Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors.</p> <p>CO2 – To understand the Pharmacology of drugs acting on the peripheral nervous system.</p> <p>CO3 – To understand C.N.S. special emphasis on the importance of various neurotransmitters like GABA, Glutamate, Glycine, serotonin, and dopamine.</p> <p>CO4 – To understand the Pharmacology of drugs acting on the central nervous system.</p> <p>CO5 – To understand Drug addiction, drug abuse, tolerance, and dependence.</p>
Pharmacognosy and Phytochemistry I	<p>CO1 – Learn the definitions, scope, history, classification, and Evaluation of crude drugs</p> <p>CO2 – Understand the cultivation techniques and post-harvesting techniques.</p> <p>CO3 – Learn the types of culture and applications.</p> <p>CO4 – Learn the basic principles and concepts of various systems of AYUSH. Earn the</p>

	<p>definition and chemical test for secondary metabolites.</p> <p>CO5– Learn the sources, chemical nature, and uses of plant fibers, primary metabolites and marine products</p>
Semester V	
Medicinal Chemistry II	<p>CO1 –Understand the drug metabolic pathways and ionization, Solubility, Partition Coefficient, Hydrogen bonding, Protein binding, Chelation, Bioisosterism, Optical and Geometrical isomerism.</p> <p>CO2 – 1.Understand the chemistry of drugs with respect to their pharmacological activity inthe autonomic Nervous System.</p> <p>CO3 – 1.Understand the chemistry of drugs with respect to their pharmacological activity of Parasympathomimetic agents and Cholinergic Blocking agents.</p> <p>CO4 – 1.Understand the chemistry of drugs with respect to their pharmacological activity of Sedatives and Hypnotics, Antipsychotics and Anticonvulsants</p> <p>CO5– 1.Understand the chemistry of drugs with respect to their pharmacological activity of General anesthetics and Narcotic and non-narcotic analgesics</p>
Industrial PharmacyI	<p>CO1 – To study the methods of PreformulationStudies:Introductiontopreformulation,goalsandobjectives,the studyofphysicochemicalcharacteristics ofdrugsubstances.</p> <p>CO2 –To study theIntroduction, ideal characteristics of tablets, and classification of tablets. Excipients,Formulation of tablets, granulation methods</p> <p>CO3 – To study <i>Hardgelatincapsules</i>:Introduction,Productionofhardgelatincapsuleshells.Sizeof capsules, Filling, finishing, and special techniques of Formulationofhardgelatincapsules</p> <p>CO4 – To study Definitions,types,advantages,andlimitations.Preformulationfactorsandessenti alrequirements,</p> <p>CO5– To study Cosmetics:Formulationandpreparationofthefollowingcosmeticpreparations:lipsticks,shampoos</p>
Pharmacology II	<p>CO1 – Knowledge of Pharmacologyofdrugsactingonthe cardiovascularsystem</p> <p>CO2 – Understanding the Pharmacologyofdrugsactingoncardiovascularsystem like drugsusedinthetherapyofshock. Hematinics,coagulants,andanticoagulants</p> <p>CO3 –Knowledge about Autocoidsandrelated drugs like anti-histaminics and NSAIDS</p> <p>CO4 – Knowledge of Pharmacologyofdrugsactingonthe endocrinesystem Basicconceptsinenocrinepharmacology</p> <p>CO5–Knowledge of Bioassay of insulin, oxytocin, vasopressin, ACTH,d-tubocurarine,digitalis, histamine,and5-HT.</p>
Pharmacognosy and Phytochemistry II	<p>CO1 – able to understand basic metabolic pathways and formation of different secondary metabolites through these pathways and gain knowledge on utilization of radioactive isotopes in the investigation of Biogenetic studies</p> <p>CO2 – Gain knowledge of chemistry, biosources, therapeutic uses, and commercial applications of secondary metabolites</p> <p>CO3 – knowledge of Isolation, Identification, and Analysis of some terpenoids, glycosides,alkaloids, and resins</p> <p>CO4 – able to understand Industrial production, estimation, and utilization of some of the phytoconstituents.</p> <p>CO5– gain knowledge of Modern methods of extraction and application of the latest techniques like Spectroscopy, chromatography, and electrophoresis in the isolation, purification, and identification of crude drugs.</p>

Pharmaceutical Jurisprudence	<p>CO1 – Designed to impart basic knowledge on important legislations related to the profession of pharmacy in India. The Pharmaceutical legislations and their implications in the development and marketing (Import, Export) of pharmaceuticals</p> <p>CO2 – Designed to know the basic knowledge of the Drugs and Cosmetics Act 1940 and rules 1945.</p> <p>CO3 – Intended to provide a fundamental understanding of The Pharmacy Act of 1948.</p> <p>CO4 – Study of Salient Features of Drugs and Magic Remedies Act and its rules: Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences, and Penalties.</p> <p>CO5 – To study Pharmaceutical Legislations – A brief review, Introduction, Study of drugs inquiry committee, Health survey and development committee, Hathi committee, and Mudaliar committee</p>
Semester VI	
Medicinal Chemistry III	<p>CO1 – Upon completion of the course, the student shall be able to understand the historical background, nomenclature, stereochemistry, structure-activity relationship, chemical degradation classification and important products of the β-Lactam antibiotics, Aminoglycosides and Tetracycline.</p> <p>CO2 – Able to understand historical background, nomenclature, stereochemistry, structure-activity relationship, chemical degradation classification, and important products of the Macrolide, Miscellaneous, Prodrugs, and Antimalarials.</p> <p>CO3 – Understand the synthetic classification, mechanism of action, SAR of antitubercular agents, urinary tract anti-infective agents, and antiviral agents; Synthesis of some specified drugs of the above classes.</p> <p>CO4 – Students should be able to understand synthetic classification, mechanism of action, SAR, and Synthesis of some specified drugs.</p> <p>CO5 – Gain knowledge on various approaches used in drug design, various physicochemical parameters used in quantitative structure activity relationship (QSAR), concepts of pharmacophore modeling, docking techniques and Concept and applications of combinatorial chemistry.</p>
Pharmacology III	<p>CO1 – To understand the Pharmacology of drugs acting on Respiratory system.</p> <p>CO2 – To understand the Pharmacology of drugs acting on the Gastrointestinal Tract.</p> <p>CO3 – To understand General principles of chemotherapy and anti-biotics.</p> <p>CO4 – To comprehend the general principles of chemotherapy Antitubercular agents and anti-leprotic drugs.</p> <p>CO5 – To gain knowledge of acute, subacute, and chronic toxicity.</p>
Herbal Drug Technology	<p>CO1 – Students will understand agricultural practices. Learn the principles and concepts of traditional systems of medicine like Ayurveda, Unani and Sidha etc.,</p> <p>CO2 – Learn the advantages of Nutraceuticals in the management of chronic diseases and applications of nutraceuticals. Understand the Interaction of Herbs on drugs and foods.</p> <p>CO3 – Understand the process of manufacturing formulations and cosmetics and the role of excipients, and their applications in the manufacturing process of drugs.</p> <p>CO4 – Learn the regulatory aspects of AYUSH drugs manufacturing. Understand the importance and precepts of the patent system and standardization of natural drugs.</p> <p>CO5 – Understand the scope and prospects of the Herbal Industry. Regulatory aspects of the Herbal Industry and GMP of the Herbal Industry</p>
Biopharmaceutics and factors	<p>CO1 – Knowledge of Absorption; Mechanisms of drug absorption through GIT, influencing drug absorption through GIT, absorption of the</p>

Pharmacokinetics	<p>drug from Nonperoral extra-vascular routes</p> <p>CO2 – To study the Elimination: Drug metabolism and basic understanding of metabolic pathways renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, Nonrenal routes of drug excretion of drugs</p> <p>CO3 – Pharmacokinetics: Definition and introduction to Pharmacokinetics, Compartment models</p> <p>CO4 – To understand the Two compartments open model IV Bolus, Kinetics of Multiple Dosing, steady-state drug concentration, calculation of loading and maintenance doses, and their significance.</p> <p>CO5 – To understand the Concept of Non-Linear Pharmacokinetics, causes of non-linearity, Michaelis Menton Equation and estimation of Km and Vmax parameters</p>
Pharmaceutical Biotechnology	<p>CO1 – After finishing the course, students should be able to understand The biological sciences and technology have a long-term promise to be revolutionized by biotechnology. The significance of immobilized enzymes in the pharmaceutical industry.</p> <p>CO2 – Designed to understand the leading of new biological revolutions in diagnosis, prevention, and cure of diseases, new and cheaper pharmaceutical drugs. Genetic engineering applications in relation to the production of pharmaceuticals</p> <p>CO3 – Imparts the knowledge of Immunity, Production importance of Monoclonal antibodies in Industries.</p> <p>CO4 – Designed to know ELISA, RIA, and immunoblotting techniques regarding production of transgenic crops and animals and the future promises a lot more.</p> <p>CO5 – Importance of the use of microorganisms in fermentation technology and Blood Products, Plasma substitutes</p>
Quality Assurance	<p>CO1 – To study the Quality Assurance and Quality Management concepts: Definition and Concept of Quality control, Quality assurance, and GMP.</p> <p>CO2 – To study Organization and personnel: Personnel responsibilities, training, hygiene, and personal records. Premises: Design, construction, and plant layout</p> <p>CO3 – To study Good Laboratory Practices: General Provisions, Organization, Personnel, Facilities, Equipment, Testing Facilities Operation.</p> <p>CO4 – To study the Document maintenance in the pharmaceutical industry: Batch Formula Record, Master Formula Record, SOP, Quality audit</p> <p>CO5 – To study the Calibration and Validation: Introduction, definition, and general principles of calibration, qualification and validation</p>
Semester VII	
Instrumental Methods of Analysis	<p>CO1 – Gain knowledge on instrumentation, principles, and procedures of UV-Visible and Fluorimetry spectroscopic techniques and their pharmaceutical applications.</p> <p>CO2 – Students are able to understand the principles, instrumentation, procedures, IR spectroscopic techniques, flame photometry, nepheloturbidometry, and atomic absorption spectroscopy and their applications in pharmaceuticals.</p> <p>CO3 – Gain knowledge of chromatographic techniques for qualitative and quantitative analysis of various compounds and their pharmaceutical applications.</p> <p>CO4 – Understand the principles, instrumentation, and procedures of Gas chromatography and HPLC chromatographic techniques for qualitative and</p>

	<p>quantitative analysis of pharmaceutical compounds also learns their applications in pharmaceutical industry.</p> <p>CO5 – About the principles, instrumentation, procedures of ion exchange chromatography, gel chromatography and affinity chromatography techniques for qualitative and quantitative analysis of various pharmaceutical compounds.</p>
Industrial Pharmacy II	<p>CO1 – Pilot plant scale-up techniques, General and significance of personnel requirements, Pilot plant and scaleup for solids, Liquid orals and Parenterals, SUPAC guidelines</p> <p>CO2 – Technology Development and Transfer (TT) as per WHO Guidelines, Approved regulatory bodies and agencies, TT Agencies</p> <p>CO3 – Roles and responsibilities of Regulatory affairs department and Professionals; Regulatory requirements for drug approval (IND, NDA and ANDA)</p> <p>CO4 – Quality management systems, Quality by Design (QbD), Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP</p> <p>CO5– Indian Regulatory Requirements (CDSCO) and State Licensing Authority Regulatory requirements and approval procedures for New Drugs</p>
Pharmacy Practice	<p>CO1 – Knowledge of Hospital and its organization Definition, Classification of hospital- Primary, Secondary and Tertiary hospitals,</p> <p>CO2 – To study the process of dispensing of drugs to inpatients, types of drug distribution systems, charging policy and labelling</p> <p>CO3 – To study about Organization, functions, Policies of the pharmacy and therapeutic committee including drug list in the formulary.</p> <p>CO4 – Knowledge of Clinical Pharmacy Introduction to Clinical Pharmacy, Concept of clinical pharmacy, functions and responsibilities of clinical pharmacist</p> <p>CO5– To study about Organisation of the drug store, types of materials stocked and storage conditions, Purchase and inventory control</p>
Novel Drug Delivery System	<p>CO1 – Upon completion of the course student shall be able to impart basic knowledge on the area of novel drug delivery systems along with development of various approaches of NDDS</p> <p>CO2 – impart basic knowledge on the area of novel drug delivery systems along with development of Microencapsulation, Implants drug delivery systems</p> <p>CO3 – Intended to provide basic information on Transdermal, Mucosal and Pulmonary drug delivery systems as alternate to conventional drug delivery.</p> <p>CO4 – Upon completion of this course students gain knowledge on concepts of targeted drug delivery systems and carrier mediated drug delivery and Monoclonal antibodies.</p> <p>CO5– Intended to provide basics concepts of ocular drug delivery and intrauterine drug delivery systems upon completion of the course.</p>
Semester VIII	
Biostatistics and Research Methodology	<p>CO1 – know the basic concepts of statistics like frequency distribution, measures of dispersion and central tendency, correlation and their application statistical analysis of data</p> <p>CO2 – Understand the application of probability, regression and use of parametric tests in statistical interpretation of data</p> <p>CO3 – Understand the application of non-parametric tests in statistical interpretation of data. Know graphical representation of data. Also learn need and designs used in research.</p>

	<p>CO4 – Understand the regression modelling. Learn various statistical tools and software's</p> <p>CO5– Learn about design and analysis of experiments</p>
Social and Preventive Pharmacy	<p>CO1 – learning the Concept of health and disease: concepts and Evaluation of public health.</p> <p>CO2 – Studying about Preventive medicine: General principles of prevention and control of diseases such as cholera, SARS, Ebola virus, influenza, acute respiratory infections</p> <p>CO3 – Learning about National health programs, its objectives, functioning and outcome of the following: HIV AND AIDS control programme, TB</p> <p>CO4 – Knowledge regarding National health intervention programme for mother and child, National family welfare programme</p> <p>CO5– Knowledge regarding Community services in rural, urban and school health: Functions of PHC, Improvement in rural sanitation</p>
Cosmetic Science	<p>CO1 – students gain knowledge on concepts of cosmetic and evolution of cosmetic products and important excipients used along with Structure of skin and oral cavity and their importance.</p> <p>CO2 – Intended to provide basic information to students on the Principles of formulation and building blocks of skin and hair care products</p> <p>CO3 – It imparts basic knowledge on the area of Sunscreen Formulations and role of herbs in skin, hair and oral care.</p> <p>CO4 – Designed to know the important principles of equipments used in skin and hair care.</p> <p>CO5– Upon completion of this course students can understand common problems associated to hair and skin along with formulations aspects of deodorants and antiperspirants.</p>
Quality Control and Standardization of Herbals	<p>CO1 – know the WHO guidelines for quality control of herbal drugs, Evaluation of commercial crude drugs, basic tests for drugs – Pharmaceutical substances, Medicinal plants materials and dosage forms</p> <p>CO2 – able to understand quality assurance in herbal drug industry of cGMP, GAP, GMP and GLP in traditional system of medicine, WHO Guidelines on current good manufacturing Practices (cGMP) for Herbal Medicines and WHO Guidelines on GACP for Medicinal Plants.</p> <p>CO3 – Know the EU and ICH guidelines for quality control of herbal drugs.</p> <p>CO4 – Able to understand Stability testing of herbal medicines, application of various chromatographic techniques in standardization of herbal products, Preparation of documents for new drug application and export registration GMP requirements and Drugs & Cosmetics Act provisions.</p> <p>CO5– able to understand the Regulatory requirements for herbal medicines. WHO guidelines on safety monitoring of herbal medicines in pharmacovigilance systems Comparison of various Herbal Pharmacopoeias. Role of chemical and biological markers in standardization of herbal products</p>
Computer Aided Drug Design	<p>CO1 – To know Design and discovery of lead molecules, Stages of drug discovery and development and The role of drug design in drug discovery process, Analog Based Drug Design</p> <p>CO2 – To know the Concept of QSAR and docking, 2. Types of physicochemical parameters, experimental and theoretical approaches for the determination of physicochemical parameters such as Partition coefficient, Hammett's substituent constant and Taft's steric constant. Hansch analysis, Free Wilson analysis, 3D-QSAR approaches like COMFA and COMSIA.</p> <p>CO3 – To know the Concept of Molecular Modeling, virtual screening techniques Virtual Screening techniques and Molecular docking: 2. To write Drug likeness screening, Concept of pharmacophore mapping and pharmacophore based Screening, Rigid docking, flexible docking, manual</p>

	<p>docking, Docking based screening. <i>De novo</i> drug design.</p> <p>CO4 – 1. To know the Concept of Informatics & Methods in drug design. 2. To write Bioinformatics, cheminformatics. ADME databases, chemical, biochemical and pharmaceutical databases</p> <p>CO5– 1. To know the Concept of Molecular Modeling. 2. To write molecular mechanics and quantum mechanics. Energy Minimization methods and Conformational Analysis, global conformational minima determination.</p>
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