VIVEKANAND EDUCATION SOCIETY'S
COLLEGE OF PHARMACY
Hashu Advani Memorial Complex, Behind Collector Colony, Chembur (E), Mumbai – 400 074

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B. Pharm Programme is accredited by NBA, New Delhi from 2016-17 to 2021-22

2.6.1

Teachers and students are aware of the stated Programme and Course outcomes of the Programme offered by the institution

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2.6.1 QIM

Teachers and students are aware of the stated Programme and course outcomes of the Programmes offered by the institution (15)
Describe Course Outcomes (COs) for all courses and mechanism of communication

B PHARM R 2019 SYLLABUS COURSE OUTCOMES

SEM	SUBJECT	Course Outcome	STATEMENTS	PO MAPPING
	Human Anatomy and Physiology I	CO1	Outline and categorize the various body structural levels (cells, tissues, organs, and systems) and recall the structure, composition and functions of plasma membrane and methods of movement of substances across plasma membrane	1, 3, 6, 8, 9
		CO2	Recall the anatomy of skeletal, cardiac and smooth muscle, explain the transmission at the neuromuscular junction and energy metabolism in the muscle as well as the mechanism of	1, 3, 6, 8, 9, 10
		CO3	Explain the anatomy and physiology of the Cardiovascular system, Lymphatic system, Peripheral Nervous system and sensory organs and appreciate coordinated working pattern of	1, 3, 6, 8, 9, 10
	Pharmaceutical Analysis I	CO1	Explain the role of pharmaceutical analysis in the field of pharmacy and industry and delineate	1,3,4,8,11
		CO2	Describe volumetric, gravimetric, electrochemical methods of analysis.	1,3,4,8,11
		CO3	Solve numerical problems related to volumetric, gravimetric methods of analysis and apply	1,3
	Pharmaceutics- I	CO1	Have knowledge of different Pharmacopoeias, various monophasic and biphasic, liquid and	1,6,7,8,9,11
		CO2	Explain evaluation of solutions, suspensions, and emulsions, semisolid dosage forms	1,2,3,4,6,7,8,9,10,1
		CO3	Perform related calculations and prepare liquid and semisolid dosage forms.	1,3,4,6,7,8,9,10,11
		CO4	Analyze the errors in the prescription and identify physical and chemical incompatibilities	1,3,6,7,8,9,11
		CO5	Devise the composition of monophasic and biphasic dosage forms, considering the	1,2,3,4,5,6,7,8,9,10,
	Pharmaceutical Inorganic Chemistry	CO1	Describe the principles and methods of limit tests to control common impurities	1,2,3,4,6
		CO2	Explain different pharmaceutical buffers, their preparations, uses in pharmaceutical system,	1,2,3,4,6,8
		CO3	Explain the medicinal importance of pharmaceutical inorganic compounds.	1,2,3,4,6,8
	Communication Skills	CO1	Understand the behavioral needs for a pharmacist to function effectively in the areas of	1, 6,8
		CO2	Effectively develop presentation skills with confidence to crack interviews	6,7,11
		CO3	Effectively manage the team as a team player. Apply skills learnt to confidently stand in a group	5,8
		CO4	Apply skills learnt to communicate effectively technically/businesswise	4,5,8,9,11
	Remedial Biology	CO1	Understand the cell biology (Basic Nature of Plant cell and Animal cell) and Classification	1,6,8,9,10,11
		CO2	Learn and comprehend various tissue system and organ system in plant and animals	1,6,8,9,10,11
		CO3	Understand and explain anatomy and Physiology of plants and animals.	1,6,8,9,10,11
	Remedial Mathematics	CO1	Know the theoretical concepts of various topics and their application in Pharmacy	1,3
		CO2	Solve the different types of pharmaceutical problems by applying theoretical concepts	1,3,4
		CO3	Appreciate the important application of mathematics and statistics in Pharmacy	1,3,4,7
	Human Anatomy and Physiology I LAB	CO1	Explain the parts of microscope, apply this knowledge to study histology of different tissues and	1,4,6,7,8,9,10,11
		CO2	Explain the components of the skeletal system and identify and describe each part in detail	1,4,6,7,8,9,10,11
		CO3	Perform the methods used in diagnosis of diseases using hematological tests like bleeding time,	1,4,6,7,8,9,10,11
		CO4	Explain the basic principles of cardiovascular system and able to assess heart rate, pulse rate and	1,4,6,7,8,9,10,11
		C05	Plan, execute and conclude the experiment using various methodologies	1,3,4,6,7,8,9,10,11
	Pharmaceutical Analysis Lab	CO1	Employ practice of calibration and proper handling of volumetric apparatus, electronic analytical balance and safety measures in the laboratory	1,2,4,11
		CO2	Demonstrate eye- hand coordination required for titrimetric analysis	1,2,4,11
		CO3	Perform and record, calculate and interpret data obtained for experiments related to limit tests,	1,2,4,11
		CO4	Conduct and evaluate various tests mentioned in a pharmacopoeial monograph	1,2,4,11
	Pharmaceutics I Lab	CO1	Prepare monophasic, biphasic, powders and semi solid systems, justify the components and	1,2,3,5,6,7,10,11
		CO2	Perform experiments as per GLP and record in the journals	1,2,3,5,6,7,10,11
		CO3	Plan, execute and conclude the experiment using various methodologies (defined protocol or	1,2,3,5,6,7,10,11
	Pharmaceutical Inorganic Chemistry Lab	CO1	Perform qualitative analysis of given inorganic mixtures.	1,2,4,6,8
		CO2	Cary out identification test of given inorganic compounds	1,2,3
		CO3	Perform limit test for chlorides, sulphates etc.	1,2,4,6,8
		CO4	Prepare inorganic compounds	1,2,4,6,8
	Communication Skills Lab	CO1	Practice the Basic Communication attributes required during meeting people, making friends, asking questions using Wordsworth® English language lab software	4,6,8,11
		CO2	Learn the Advanced techniques involved in effective communication , writing skills, interview handling skills, presentation skills, E-mail writing using Wordsworth® English language lab	1,4,6,7,8,11
		CO3	Plan, execute and conclude the tasks using various methodologies (defined protocol or	1,2,3,4,6,8,9,11
SEM I	Remedial Biology lab	CO1	Demonstrate Handling of microscope independently & able to demonstrate understanding of section cutting techniques, mounting and staining, permanent slide preparation. Able to apply	1,2,3,4,6,7,8,9,10,1 1
		CO2	Understand and explain morphology of plant with respect to stem, root, leaf and its modification	1,6,8,10,11
		CO3	Identify the bones and understand and explain about determination of blood group, blood pressure, tidal volume which basal characteristics are commonly assessed during physical	1,2,3,4,6,7,8,9,10,1 1
		CO4	Explain about study of frog by using computerized simulated software.	1,3,4,6,7,8,,9,10,11
		CO5	Plan, execute and conclude the experiment using various methodologies	1,2,3,4,6,7,8,9,10,1
	Anatomy and Physiology II	CO1	Explain the anatomy and physiology of Nervous System and Endocrine system and their role in	1, 3, 6, 8, 9, 10
		CO2	Describe and illustrate the anatomical features of the Respiratory system, Digestive system and	1, 3, 6, 8, 9, 10
		CO3	Identify, illustrate and describe the anatomical and physiological features of Reproductive	1, 3, 6, 8, 9, 10
		CO1	Classify and give IUPAC nomenclature of various organic compounds along with the type of	1,8
		CO2	Describe and explain the hybridization & stability in alkanes, alkenes & conjugated dienes along	1,3,8
		CO3	Describe and explain the different nucleophilic substitution & addition reactions in Alkyl halides	1,3,8

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	Pharmaceutical Organic Chemistry I	CO4	Describe and explain the method of preparation, reactions, chemical properties, uses, structures & the qualitative identification tests for compounds of different functional groups like alcohols,	1,3,8,11
	Biochemistry	CO1	Understand classification, structure, functions, digestion and metabolism of basic biomolecules	1
		CO2	Learn thermodynamic and bioenergetic aspects of biochemical reactions	1
		CO3	Reproduce names, structures, products and enzymes involved in all metabolic processes	1, 11
		CO4	Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new	1, 11
		CO5	Explain three cornered central paradigms of biochemistry i.e. replication, transcription and	1,11
	Pathophysiology	CO1	Explain of Principles related to cell injury, adaptation, repair, growth, inflammation and	1,6,7,8,9,11
		CO2	Describe the etiology and pathophysiology of diseases related to cardiovascular, Skeletal,	1, 6,7,8,9,11
		CO3	Describe the etiology and pathophysiology of diseases related to infectious diseases.	1, 6,7,8,9,11
		CO4	Apply the knowledge of related to diseases and symptoms to identify the disease.	1, 6,7,8,9,11
		CO1	Understand the basics of computers	3,4,10
		CO2	Differentiate among different web technologies and databased	1,4,7,10
		CO3	Delate various application of computers in Pharmacy	1,4,6,10
	Environmental Science	CO1	Describe the basics of Environmental sciences like need and purpose of study the subject,	1,3,4,10,11
		CO2	Classify and compare different sources of energies	1,3,4,10,11
		CO3	, Relate technology to control pollution and economic benefits thereof, infer, the concept of green building, carbon credit and disaster management Realize the environment related moral	1,3,4,10,11
	Human Anatomy and Physiology II Lab	CO1	Determine body temperature, Basal mass index , vital capacity and tidal volume and explain how total blood count is determined using cell counter and which basal characteristics are commonly	1,2,3,4,7,9,10,11
		CO2	Understand and explain the anatomy and physiology of the different systems in the body and	1,2,4,6,7, 8,9,10,11
		CO3	Identify and explain the histology, structure of different organs and tissues in the human body	1,6,7,9,10,11
		CO4	Explain the response of the human body to difference reflexes, visual acuity, different types of	1,2,4,6,7,8,9,10,11
		C05	Plan, execute and conclude the experiment using various methodologies	1,3,4,6,7,8,9,10,11
	Pharmaceutical Organic Chemistry - I Lab	CO1	Practice and follow safety rules & precautionary measures in a laboratory.	8,9
		CO2	Explain theoretical aspects of physical constant determination, detection of functional groups.	1,2,3,8
		CO3	Characterize/ Identify monofunctional or bifunctional organic compounds by physical constant,	1,2,3,8
		CO4	Prepare solid derivatives from organic compounds & molecular model construction of basic	1,2,3,8
		CO5	Plan, execute and conclude the experiment using various methodologies (defined protocol or	2
	Biochemistry Lab	CO1	Able to perform Qualitative and quantitative analysis of various samples of carbohydrate,	1,2
		CO2	Estimate enzyme activity with respect to various factors Temp, substrate concentration and	1,2
		CO3	understand clinical applications of biochemical methods through experiments	1
		CO4	Correlate findings with theoretical concepts and conclude the results based on confirmatory tests	1,3
		CO5	Demonstrate oral and written communication and ability to plan experiment with proper time	2,3,8
	Computer Applications in Pharmacy Lab	CO1	Designing and creating, questioners, HTML forms and MS access databases	2,4,5,11
		CO2	Apply learning to the problems of pharmaceutical origin	1,2,3,4,5,11
II				
	Pharmaceutical Organic Chemistry II	CO1	Explain different reactions of benzene and predict aromatic character, resonance, orientation, effect of substituents in benzene and its derivatives	1,3,8
		CO2	Describe and explain the method of preparation, reactions, chemical properties, uses, structures & the qualitative identification tests for compounds of different functional groups like phenols, aromatic amines, aromatic acids and hydrocarbons.	1,3,8,11
		CO3	Explain reactions shown by fats & oils along with determining their analytical constants like Acid value, Saponification value, RM value.	1,3,8
		CO4	Describe different conformational stabilities of cycloalkanes & reactions of cyclopropane & cyclobutane.	1,3,8
	Physical Pharmaceutics I	CO1	Understand various physicochemical properties of drug molecules in the designing the dosage forms	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
		CO2	Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
		CO3	Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
	Pharmaceutical Microbiology	CO1	Understand classification and methods of identification, isolation, cultivation and preservation of various classes of microorganisms	1,6,8,10,11
		CO2	Understand the use of various microscopic techniques, staining techniques and biochemical tests for identification of microorganisms	1,4,6,8,10,11
		CO3	Describe various methods for control of microorganisms, their evaluation and factors affecting their efficiency	1,3,6,8,9,10,11
		CO4	Demonstrate various methods used for sterilization of pharmaceutical products and evaluation of efficiency of methods of sterilization	1,3,4,6,8,9,10,11
		CO5	Describe the cell culture technology and its application in pharmaceutical industry and research	1,4,6,8,9,10,11
	Pharmaceutical Engineering	CO1	Understand mechanics of fluid, fluid flow, and its measurements	1,2,3,8
		CO2	Classify and describe heat measuring devices, mixers and dryers with respect to their applications in pharmacy	1,2,3,8
		CO3	distillation, size reduction, filtration, centrifugation and refrigeration and will able to describe the equipment and accessories involved therein.	1,2,3,8,10
		CO4	Summarize construction material, discuss corrosion of equipment from pharmaceutical industry point	1,3,8,10
	Pharmaceutical Organic Chemistry - II Lab	CO1	Perform experiments involving laboratory techniques like recrystallization, distillation.	1,2,4
		CO2	Determine analytical constants like Acid value, Iodine value in Fats & Oils.	1,2,3,8
		CO3	Describe the theoretical aspects of organic synthesis & perform various unit operations of organic synthetic reactions.	1,2,4,5,6
		CO4	Plan, execute and conclude the experiment using various methodologies (defined protocol or qualitative or quantitative techniques).	2
		CO1	Understand the principles and methods for the determination of various physical parameters of drugs and formulations.	1,2,3,4,5,6,8,10,11

	Physical Pharmaceutics – I Lab	CO2	Carry out various physical tests involved in the characterization of drugs.	1,2,3,4,5,6,8,10,11
		CO3	Demonstrate testing of various physical parameters involved in pre-formulation and formulation evaluation.	1,2,3,4,5,6,8,10,11
		CO4	Plan, execute the experiment using various methodologies (defined protocol or qualitative or quantitative techniques) and summarize the findings in systematic way verbally and in written communication.	1,2,3,4,5,6,8,10,11
	Pharmaceutical Microbiology Lab	CO1	Demonstrate methods of subculturing, characterization and identification of bacteria using various techniques (morphological, serological and biochemical)	1,2,3,5,6,7,8,10,11
		CO2	Practice methods of sterilization for various products, perform test for sterility on pharmaceuticals and bioassay of antibiotics	1,2,3,5,6,7,8,9,10,11
		CO3	Demonstrate the use of different equipments used in experimental microbiology	1,2,3,4,5,6,7,8,10,11
		CO4	Plan, execute and conclude the experiment using various methodologies	1,2,3,4,5,6,7,8,10,11
sem III	Pharmaceutical Engineering Lab	CO1	Impart knowledge of different unit operations	1,2,3,4,11
		CO2	Understand process controls with respect to unit operations that are employed in the pharmaceutical industry	1,2,3,4,8
		CO3	Perform experiments as per GLP and record in the journals	1,2,3,8
	Pharmaceutical Organic Chemistry –III	CO1	Understand basic concepts and various terminologies involved in stereochemistry.	1,11
		CO2	Understand the methods of preparation and properties of heterocyclic organic compounds.	1,11
		CO3	Predict and explain the reaction products considering the mechanisms and their stereochemical aspects.	1,3,11
	Medicinal Chemistry I	CO1	Identify and study the suitable drug targets for treatment of disorders	1,3
		CO2	Identify the relationship between the physicochemical properties of the chemical entity and biological response	1,3,6
		CO3	Draw a schematic metabolic pathway for any given drug	1,3,6
		CO4	Identify the SAR of all the classes of Drugs acting on Autonomic Nervous System, Cholinergic neurotranimitters, Drugs acting on Central Nervous System.	1,3,6
	Physical Pharmaceutics II	CO1	Understand the concept of coarse and colloidal dispersions, rheology, powder technology and drug stability	1,6,9,10,11
		CO2	Identify the different types of dispersion, rheological properties of the different dosage form	1,6,9,10,11
		CO3	Identify different order of reactions and pathways of drug degradation	1,6,9,10,11
		CO4	Apply basic principles of drug characterization to achieve stable and reproducible drug delivery	1,4,6,9,10,11
	Pharmacology I	CO1	Understand and explain the basic pharmacological principles related to drugs like concepts of	1, 6, 8, 9,10,11
		CO2	Understand and explain the basic principles of Pharmacokinetics, Pharmacodynamics and adverse reaction of drugs	1,6, 8, 9,10,11
		CO3	Understand and explain the pharmacology and drugs used for peripheral nervous system	1,6, 8, 9,10,11
		CO4	Understand and explain the Pharmacology and drugs used for central nervous system	1,6, 8, 9,10,11
		CO5	Analyze and apply the knowledge of basic principles of pharmacology in predicting adverse drug reactions, drug interactions and drug development process	1,2,3,5,6,7,8,9,10,11
	Pharmacognosy and Phytochemistry I	CO1	Outline the Alternative and complementary systems of medicine, classify drugs of natural origin	1,3,6,7,9,10,11
		CO2	Describe primary and secondary plant metabolites their biosynthesis, evaluation and therapeutic application	1,3,6,7,9,10,11
		CO3	Describe the applications of plant tissue culture techniques with respect to production of secondary metabolites and edible vaccines	1,3,6,7,9,10,11
		CO4	Elaborate commercial production, collection, preparation, storage and factors affecting cultivation of medicinal plants and its conservation	1,3,6,7,9,10,11
		CO5	Evaluate and analyse crude drugs by morphological and microscopic and other evaluation techniques of Drugs of Natural Origin	1,3,6,7,9,10,11
		CO6	Describe the source, composition, preparation and applications of crude drugs containing carbohydrates, lipids, fibers, important protein and enzymes of natural origin and marine drugs	1,3,6,7,9,10,11
	Medicinal Chemistry I Lab	CO1	Demonstrate skills of handling synthetic procedures and quantitative evaluation techniques.	1,11
		CO2	Understand and apply various isolation techniques, purification techniques in synthetic chemistry and different types of assay methods for quantitative evaluation.	1,3,11
		CO3	Design or predict experimental requirements for determining partition coefficient of organic molecule and interpret results obtained.	1,3,11
		CO4	Recognize the reaction from experimental conditions, deduce the mechanism and transform one functional group to other.	1,3,11
		CO5	Demonstrate skills of written communication skills & ability to plan the experimentation with proper time management	1,8
	Physical Pharmaceutics- II Lab	CO1	Demonstrate the properties of the powder and liquid dosage forms and comment on the quality.	1,2,3,4,5,6,8,10,11
		CO2	Determine reaction rate constant, order of a reaction for different reactions	1,2,3,4,5,6,8,10,11
		CO3	Predict shelf life by carrying out accelerated stability studies	1,2,3,4,5,6,8,10,11
		CO4	Demonstrate testing of various physical parameters involved in pre-formulation and formulation evaluation.	1,2,3,4,5,6,8,10,11
		CO5	Plan, execute the experiment using various methodologies (defined protocol or qualitative or quantitative techniques) and summarize the findings in systematic way verbally and in written communication.	1,2,3,4,5,6,8,10,11
		CO1	Understand, explain, evaluate and apply basic techniques related to the instruments and animal handling for experimental purpose including routes of the administration.	1,2,3,4,6,7,9,10,11
		CO2	Explain the guidelines recommended for ethical handling of animals and perform the animal experiments in ethical manner	1,2,3,4,6,7,9,10,11
		CO3	Learn, analyze and perform common laboratory techniques and observe the effect of hepatic microsomal enzymes on drug induced sleeping time in mice	1,2,3,4,6,7,9,10,11
		CO4	Perform, explain and apply the principle for experiments that Study the effect of drugs acting on the central nervous system	1,2,3,4,6,7,9,10,11

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	Pharmacology I Lab	CO5	Plan, execute and conclude the experiment using various methodologies	1,3,4,6,7,8,9,10,11
	: Pharmacognosy and Phytochemistry I Lab	CO1	Carry out quantitative microscopy for leaf constants	1,3,6,7,9,10,11
		CO2	Determine different extractive values, ash values, moisture content, swelling index and foaming index as per Official Compendia	1,3,6,7,9,10,11
		CO3	Determine the histological features of plants of diagnostic significance such as calcium oxalate	1,3,6,7,9,10,11
		CO4	Demonstrate oral and written communication skills and ability to plan the experimentation with proper time management	1,3,7,8
		CO5	Identify crude drugs containing carbohydrates, lipids and protein by chemical tests	1,3,6,7,9,10,11
iv				
	Medicinal Chemistry II	CO1	1. Understand the chemistry of drugs with respect to their pharmacological activity	1,6
		CO2	2. Explain the drug metabolic pathways, adverse effect and therapeutic value of drugs	1,2,6
		CO3	3. Distinguish Structural Activity Relationship of different class of drugs	1,6
		CO4	4. Illustrate the chemical synthesis of selected drugs	1,6
	Industrial Pharmacy I	CO1	To understand dosage forms and their manufacturing techniques	1,3,4,6,7,11
		CO2	To understand all the related and practical aspect of solid, liquid and semisolid dosage form development and evaluation	1,2,3,4,7,8,10,11
		CO3	To correlate the theoretical knowledge with professional and practical need of pharmaceutical industry.	1,2,3,4,5,6,7,8,9,10, 11
	Pharmacology II	CO1	Classify the drugs used for cardiovascular system, urinary system and endocrine system and explain their Pharmacology.	1,8,9,10,11
		CO2	Classify and explain autacoids and related drugs and their role in inflammatory disorders like rheumatic and gout.	1,8,9,10,11
		CO3	Explain the concept of bioassay, their types, methods and application with different examples of drugs.	1,8,9,10,11
	Pharmacognosy and Phytochemistry II	CO1	Describe the modern extraction process by using different methods and principles, in the isolation, purification, identification and analysis of various phyto-constituents	1,3,6,7,9,10,11
		CO2	To develop the skills of general methods of extraction, evaluation, chemical tests of crude drugs containing various secondary metabolites.	1,3,6,7,9,10,11
		CO3	Describe basic metabolic pathways and biosynthesis of various secondary metabolites through these pathways	1,3,6,7,9,10,11
		CO4	To understand utilization of radioactive isotopes in the investigation of biogenetic studies.	1,3,6,7,9,10,11
		CO5	To understand the industrial production, estimation and utilization of different classes of phytoconstituents	1,3,6,7,9,10,11
	Pharmaceutical Jurisprudence	CO1	The Pharmaceutical legislations and their implications in the development and marketing of	
		CO2	Various Indian pharmaceutical Acts and Laws.	
		CO3	The regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals.	
		CO4	The code of ethics during the pharmaceutical practice	1,2,5,6,7,8,9,10,11
	Industrial Pharmacy I Lab	CO1	To understand all the theoretical and practical aspect of dosage form development.	1,3,4,6,7,11
		CO2	To formulate and evaluate solid, liquid and semisolid dosage forms.	1,2,3,4,7,8,10,11
		CO3	To correlate the theoretical knowledge with professional and practical need of pharmaceutical industry.	1,2,3,4,5,6,7,8,9,10, 11
		CO4	Plan, execute the experiment using various methodologies (defined protocol of qualitative or quantitative techniques) and summarize the findings in systematic way verbally and in written communication.	2,3,4,5,6,8,11
	Pharmacology II Lab	CO1	Demonstrate the understanding of guidelines for animal experimentations, various routes of drug administration, and methods for blood collection from experimental animals.	1,3,4,6,7,9,10,11
		CO2	Describe the composition of physiological salt solutions and basic instruments used in experimental pharmacology.	1,3,4,6,7,9,10,11
		CO3	Perform experiments using various isolated preparation and describe the effect of different drugs on the concentration response curves, interpret the action of various drugs using preclinical models/computer simulations.	1,3,4,6,7,9,10,11
		CO4	Plan, execute and conclude the experiment using various methodologies.	1,3,4,6,7,8,9,10,11
sem v	Pharmacognosy and Phytochemistry II Lab	CO1	Identify crude drugs based on morphological characters, microscopic characters and give biological source with the chemical constituents and therapeutic uses	1,3,6,7,9,10,11
		CO2	Apply the knowledge of microscopic characters in ascertaining the genuinely of powdered formulations.	1,3,6,7,9,10,11
		CO3	Understand the principle involved for carrying out extraction, isolation and detection of active constituents by chromatography	1,3,6,7,9,10,11
		CO4	Demonstrate oral and written communication skills and ability to plan the experimentation with proper time management	1,3,7,8
		CO5	Identify unorganized drugs by qualitative chemical tests	1,3,6,7,9,10,11
		CO6	Understand principle involved in distillation of volatile oils and detection of phytoconstituents by	1,3,6,7,9,10,11
	Medicinal Chemistry III	CO1	Understand structure, chemistry, therapeutic value, metabolism, and adverse reactions of medicinally important drugs.	1,11
		CO2	Understand the importance of drug design and different modern techniques of drug design.	1,3,4,11
		CO3	Express Development for particular class of the drug and interpret effect of substitution on	1,3,8,11
	Pharmacology III	CO1	Classify the drugs acting on respiratory and gastrointestinal system into correct therapeutic categories; correlate the pathophysiology of few common disorders of respiratory and gastrointestinal system to their pharmacotherapy; explain the principal pharmacological actions, including the mode of action, side effects and uses of related drugs	1, 3, 6, 8, 9, 10
		CO2	Classify chemotherapeutic agents; explain the principal pharmacological actions, including the mode of action, side effects and uses of related drugs; and justify the need for rational use of antimicrobials.	1, 3, 6, 8, 9, 10
		CO3	Explain the principles of immunology and chronopharmacology and discuss their pharmacotherapeutic applications.	1, 3, 6, 8, 9, 10
		CO4	Comprehend the principles of toxicology and treatment of various poisonings.	1, 3, 6, 8, 9, 10
		CO1	To understand herbs as raw materials and its processing to produce herbal drug product.	1,3,6,7,9,10,11
		CO2	Outline the fundamental principles involved in different traditional systems of medicine including ayurveda and standardization of various ayurvedic formulations	1,3,6,7,9,10,11
		CO3	Understand and apply the significance of excipients of natural origin, used in pharmaceutical formulations and describe various classes of excipients .	1,3,6,7,9,10,11
		CO4	Apply the knowledge of pharmacology to understand pharmacodynamic and pharmacokinetic herb-drug and herb-food interactions	1,3,6,7,9,10,11

	Herbal Drug Technology	CO5	Attain the knowledge of health benefits of nutraceuticals, herbal cosmetics, conventional and novel herbal formulations.	1,3,6,7,9,10,11
		CO6	To understand and demonstrate patenting, regulatory requirements and evaluation of natural products.	1,3,6,7,9,10,11
	Biopharmaceutics and Pharmacokinetics	CO1	Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance.	1,2,3,4,5,6,7,8,9,10
		CO2	Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.	1,2,3,4,5,6,7,8,9,10
		CO3	To understand the concepts of bioavailability and bioequivalence of drug products and their	11
		CO4	Understand various pharmacokinetic parameters, their significance & applications	1,2,3,4,5,6,7,8,9,10
	Pharmaceutical Biotechnology	CO1	Understand the tools, techniques, ethics and environmental safety involved in gene cloning, and	1,2,3,4,5,6,7,8,9,10
		CO2	Discuss basics of immunology and explain the antigen-antibody interactions and defense mechanism and explain technique of monoclonal antibodies production for treating the human diseases	1,4,7,9,10,11
		CO3	Study fermentation technology and understanding the basic concepts for production of safer vaccines and antibiotics	1,4,7,10,11
		CO4	Demonstrate different techniques and applications of enzyme immobilization and cell culture	1,9,10,11
	Pharmaceutical Quality Assurance	CO1	Understand the concepts of quality assurance, total quality management, ICH guidelines and quality by design	1,4,9,10,11
		CO2	Understand the organization, planning of premises and resources for pharmaceutical industry.	1,2,3,4,9
		CO3	Apply the principles of quality control and good laboratory practices during practical training.	2,3,5,6,9,10
		CO4	Evaluate and apply document maintenance and complaint handling to practical situations.	2,3,4,11
		CO5	Evaluate and support the calibration and validation principles as applicable to academic laboratories.	1,3,5,7,8
	Medicinal chemistry III Lab	CO1	Perform Synthesis of Some drugs and intermediates	1,2,3,4,11
		CO2	Perform Assay of drugs	1,2,3,5,11
		CO3	Apply principles of Green Chemistry to synthesis	1,2,3,5,11
		CO4	Experimenting on computers for studies in pharmaceutical chemistry	1,2,3,5,10,
	Pharmacology III Lab	CO1	Solve the problems based on dose calculation in pharmacological experiments, calculation of pharmacokinetic parameters, student's t test, ANOVA test, Chi square test, Wilicoxin Signed Rank test.	1,2,3,5, 11
		CO2	Explain the principal and methodology of some in vitro and in vivo models and discuss the data analysis of the same.	1,2,3,5, 6,8,9
		CO3	Explain the principle and methodology of acute oral toxicity, skin irritation and eye irritation	1,2,3,5, 6,7,8,9
		CO4	Plan, execute and conclude the experiment using various methodologies (defined protocol or qualitative or quantitative techniques).	1,2,3,6,7,8,9
SEM VI	Herbal Drug Technology Lab	CO1	Extract and perform qualitative chemical rests on the crude drugs containing various phytoconstituents.	1,3,4,6,7,8,9,10,11
		CO2	Apply analytical procedures and principles for quantitative determination of total aldehyde content, phenol content and total alkaloids from crude drugs	1,3,6,7,9,10,11
		CO3	Carry out evaluation of ayurvedic dosage form, herbal drugs, herbal formulations, herbal	1,3,6,7,9,10,11
		CO4	Demonstrate oral and written communication skills and ability to plan the experimentation with proper time management	1,3,6,7,9,10,11
	Instrumental Methods of Analysis	CO1	Recall with examples the terminologies associated with spectroscopy and chromatography	1,3,7,8
		CO2	Explain and illustrate the theory and applications of UV visible spectroscopy, fluorimetry, IR spectroscopy, HPLC, GC, paper chromatography, TLC, ion chromatography, gel chromatography and affinity chromatography	1, 2, 3, 8, 11
		CO 3	Apply the knowledge gained and perform mathematical calculations to obtain quantitative results from UV spectroscopy and chromatographic parameters	1, 2, 3, 4, 6, 8, 11
		CO 4	Predict the spectroscopic behavior of molecules	2, 3, 4, 8, 11
	Industrial Pharmacy II	CO1	Know the process of pilot plant and scale up of pharmaceutical dosage forms	2, 3, 4, 8, 11
		CO2	Understand the process of technology transfer from lab scale to commercial batch	1,2,3,4,6,7,10,11
		CO 3	Know different Laws and Acts that regulate pharmaceutical industry	1,2,3,4,6,7,10,11
		CO 4	Understand the approval process and regulatory requirements for drug products	1,2,3,4,5,6,7,8,9,10, 11
	Pharmacy Practice	CO1	Understand the management of hospital pharmacy, community pharmacy, clinical pharmacy and the functions of pharmacy and therapeutics committee.	1,2,3,4,6,7,8,9,10, 11
		CO2	Comprehend adverse drug reaction classification, therapeutic drug monitoring, drug store management and inventory control.	1,2,5,6,9,10
		CO 3	Summarize the over the counter medications, investigational use of drugs, and interpretation of clinical laboratory tests.	1,3,5,7,9
		CO 4	Apply drug distribution systems, prescribed medication order and communication skills during practical situations.	1,2,4,11
		CO 5	Evaluate medication adherence, patient counselling and education programs in hospitals.	2,3,4,5,8
	Novel Drug Delivery Systems	CO1	To understand various approaches for development of novel drug delivery systems.	2,3,5,7,8,11
		CO2	To understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems, their formulation and evaluation	1,2,3,4,5,6,7,8,9,10, 11
	Instrumental Methods of Analysis Lab	CO1	Apply the principles of uv-vis spectroscopy, fluorescence spectroscopy, flame photometry, colorimetry and turbidometry to perform, analyze, determine and report the content of drugs in formulation/sample solution	1,2,3,4,5,6,7,8,9,10, 11
		CO2	Relate the principles of separation with chromatographic techniques to identify and separate two components in a mixture	2, 3, 4, 6, 8, 10
		CO3	Recall the working principle, instrumentation and pharmaceutical applications of HPLC, GC and HPTLC	2, 3, 4, 6, 8, 10
		CO4	Plan, execute and conclude the experiment using qualitative or quantitative techniques	1, 2, 3, 4, 10, 11
		CO1	Apply theoretical knowledge learned in classroom in practical setting	1, 2, 3, 4

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	Practice School	CO2	Understanding the importance and applications of various subjects and their correlation with practice of Pharmacy	1,4,11
		CO3	Development of skills in the handling of modern tools	1,4,11
		CO4	Acquire skills of documentation and record keeping	1,4,11
		CO5	Plan academic, career and personal interests via research experience	1,4,11
SEM VII				
	Research Methodology and Biostatistics	CO1	Understand descriptive statistics, Graphics, Correlation, Regression, logistic regression Probability theory, Sampling technique, Parametric tests, Non-Parametric tests, ANOVA, Introduction to Design of Experiments, Phases of Clinical trials and Observational and Experimental studies,	1,7,3,9,10,11
		CO2	Perform analysis using SPSS, R and MINITAB statistical software's, analysing the statistical data using Excel.	1,2,3,4,7,9,10,11
		CO3	Explain the basics of biostatistics and its role in Pharmacy	1,5,7,8,9,10,11
		CO4	Evaluate and apply the principles of biostatistics during conduct of basic research	1,2,3,4,5,6,7,8,9,10, 11
	Social and Preventive Pharmacy	CO1	Explain the basic concepts related to health, diseases and health education and apply the knowledge for promoting health and hygiene at the social level.	1,3,6,7,8,9,10,11
		CO2	Explain the various measures to control and prevent spread of diseases and apply these principles to avoid spread of the disease	1,4,5,6,7,8,9,10,11
		CO3	Understand the different types of national health programs and their objectives and apply this knowledge to create awareness among those socially connected with the learner.	1,3,4,5,6,7,8,9,10,1 1
		CO4	Understand the importance of community services and render them for societal benefit through analysis of social health problems and contribute to public health objectives	1, 3,4,5,6,7,8,9,10,11
	Pharmaceutical Marketing Management	CO1	State the importance of marketing in the pharma industry. Develop an understanding of Indian	1, 6, 8, 7
		CO2	Formulate marketing strategies with respect to Pharmaceutical products. Able to formulate a pricing strategy.	1, 6, 8, 7
		CO3	Take crucial product related decisions in the business world and create promotion and advertising strategies for Pharmaceutical products.	1, 6, 8, 7, 9
		CO4	Gain a deeper understanding about pharmaceutical supply chain and logistics through different channels. Understand the role and responsibilities of Medical Representatives and Product Management team.	1, 6, 8, 7, 9
	Pharmaceutical Regulatory Science	CO1	Know about the process of drug discovery and development	1,6,7,10
		CO2	Know the important regulatory concepts, documentation requirements, regulatory registration procedures, regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals globally.	1,4,6,7,9,11
		CO3	Describe the clinical trials requirements for approvals for conducting clinical trials and discuss the role of pharmacovigilance and the process of monitoring in clinical trials.	1,2,3,4,5,6,7,8,9,10, 11
		CO4	To correlate the theoretical knowledge with professional and practical need of pharmaceutical industry.	1,2,3,4,5,6,7,8,10,1 1
	Pharmacovigilance - Elective	CO1	Remember the history and development of pharmacovigilance and discuss the importance of drug safety monitoring.	1,3,4,6,7,8,11
		CO2	Discuss the various facets of ADRs in normal as well as special populations with their relation to pharmacovigilance methods.	1,3,4,6,7,8,11
		CO3	Integrate knowledge of drug-disease classification, coding and information resources and outline the pharmacovigilance process.	1,3,4,6,7,8,11
		CO4	Outline the regulatory processes in pharmacovigilance and summarize the components of pharmacovigilance program.	1,3,4,6,7,8,11
	Quality Control and Standardization of Herbals – Elective	CO1	Describe WHO guidelines for quality control of herbal drugs.	1,3,6,7,9,10,11
		CO2	Understand the significance of Quality Assurance in herbal drug industry by implementing eGMP, GAP, GMP and GLP	1,3,6,7,9,10,11
		CO3	Describe EU and ICH guidelines for quality control of herbal drugs.	1,3,6,7,9,10,11
		CO4	Understand the stability testing of herbal medicines and application of different chromatographic	1,3,6,7,9,10,11
		CO5	Understand regulatory requirements for herbal medicines.	1,3,6,7,9,10,11
	Computer Aided Drug Design	CO1	Recognize various stages and approaches of drug discovery and development	1,2,3,4,9,11
		CO2	Interpret the QSAR equation and 3D contour plots	1,3,4,9,10,11
		CO3	Experimenting with facts learned, for designing new molecules using molecular docking, de novo drug design, pharmacophore, virtual screening techniques	1,3,4,9,11
		CO4	Debate on use of informatics and databases in drug design	1,2,3,4,10,11
		CO5	Explain Molecular and Quantum Mechanics methods in drug design	1,3,4,11
	Cell and Molecular Biology-Elective	CO1	Understand the basic mechanisms related to cell function, composition and molecular biology	1,9,10,11
		CO2	Learn and comprehend the basics of molecular genetics, structure and function of nucleic acids and protein synthesis	1,9,10,11
		CO3	Understand about cell cycle and cell signaling pathways	1,9,10,11
		CO4	Develop the ability to apply and analyze the knowledge of cell and molecular biology in identifying molecular targets for drugs	1,3,5,7,8,10,11
	Cosmetic Science- Elective	CO1	Discuss the various raw materials for cosmetics and structure and function of human skin	1,3,8,11
		CO2	Understand the toxicological aspects and toxicity testing for cosmetics and cosmeceuticals	1,3,4, 7,8,11
		CO3	Discuss the various cosmetics products w.r.t. raw materials, large scale manufacturing and functional and physicochemical evaluation including Herbal cosmetics.	1,2,3,8,11
		CO4	Know the regulatory guidelines and sensorial assessment for cosmetics	1,3,4,5,7,8,9,10,
		CO1	Understand the regulations and ethical requirement for the usage of experimental animals, the maintenance of laboratory animals as per the guidelines, basic knowledge of various in-vitro and in-vivo preclinical evaluation processes.	1,6,7,9,10,11
		CO2	Explain the knowledge gained on preclinical evaluation of drugs and recent experimental techniques in the drug discovery and development.	1,6,7,10,11
		CO3	Learn about the various screening methods involved in the drug discovery process.	1,6,7,10,11

	Experimental Pharmacology- Elective	CO4	Understand and explain the rational used for selection of sex, gender, number, group of various animals used in the drug discovery process and good laboratory practices in maintenance and handling of experimental animals.	1,6,7,9,10,11
		CO5	They would appreciate to correlate the preclinical data to humans.	1,4,6,7,9,11
	Advanced Instrumentation Techniques	CO1	Recall with examples the terminologies associated with spectroscopy, X-ray diffraction, extraction, immunoassays, calibration and validation	1, 2, 3, 8, 11
		CO2	Explain and illustrate the theory, instrumentation and applications of Nuclear Magnetic Resonance spectroscopy, mass spectrometry, thermal methods of analysis, X ray diffraction methods, radioimmunoassay, extraction and hyphenated techniques and the methodology of calibration and validation of analytical instruments	1, 2, 3, 4, 6, 8, 11
		CO3	Apply the knowledge gained and perform mathematical calculations to obtain: chemical shift values and relative intensities of peaks in 1H NMR; mass to charge ratio of fragments in MS	2, 3, 4, 8, 11
		CO4	Predict the spectroscopic behavior of molecules	2, 3, 4, 8, 11
	Dietary Supplements and Nutraceuticals - Elective	CO1	Explain concept of nutraceuticals, dietary supplements, functional foods, classify these based on chemical nature, health benefits and mechanism of action	1,3,7,9,10
		CO2	Acquire the knowledge of chemistry of phytochemicals as nutraceuticals, their health benefits, recommended doses along with the marketed formulations	1,3,7,9,10
		CO3	To understand the effect of processing, storage and interactions of different environmental factors on the potential of nutraceuticals.	1,3,7,9,10
		CO4	To understand the role of antioxidants as nutraceuticals for prevention of various chronic diseases	1,3,7,9,10
		CO5	Describe the regulatory aspects for manufacture and sale of nutraceutical products and dietary supplements	1,3,7,9,10
	Pharmaceutical Product Development- Elective	CO1	Understand the process product development, with respect to preformulation, formulation development and manufacturing aspects and stability studies.	1,2,3,4,6,7,10,11
		CO2	Understand the about Pharmaceutical excipients with respect to product development.	1,2,3,4,6,7,10,11
		CO3	Understand the concepts of Optimization and QbD and its application to pharmaceutical product development.	1,2,3,4,5,6,7,8,9,10, 11
		CO4	Understand the regulatory requirements and quality control testing of different types of dosage	1,2,3,4,6,5,7,8,9,10,
SEM VIII	Project Work	CO1	Apply theoretical knowledge learned in classroom to a solve research problem	1, 3, 11
		CO2	Understanding the importance and applications of various subjects and their correlation in hypothesizing and solving research problem	1, 11
		CO3	Development of critical thinking, and analytical skills through hands-on learning	1, 3, 11
		CO4	Acquire various skills like Problem solving, data handling, presentation, documentation etc.	1, 2, 3, 8, 11
		CO5	Plan academic, career and personal interests via research experience	1, 2, 9
		CO6	Work collaboratively with other researchers/ fellow colleagues.	4,5,6

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