



# MAHADEVA LAL SCHROFF COLLEGE OF PHARMACY

Approved by Pharmacy Council of India (PCI), New Delhi, Affiliated to BUHS and  
Recognized by Health Department, Govt. of Bihar  
NS 22, 23 Growth Centre, Jasoyia, BIADA, Aurangabad -824101 (Bihar)

## B.PHARM

### COURSE OUTCOME

#### FIRST YEAR B. PHARMACY (SEMESTER-I)

<b>BP 101T: Human Anatomy &amp; Physiology-I (Theory)</b>	
CO 1	Illustrate the gross morphology, structure, functions of various physiological systems like cardiovascular system, Haemopoietic, lymphatic, Musculoskeletal System, Peripheral nervous system
CO 2	Elaborate the Structure and function of cell and Tissue with organelles and types.
CO 3	Generate an idea about the additional signaling pathway activation by extracellular molecule
CO 4	Explain structure and function of all organs of systems
CO 5	Infer the type of organ on the basis of physiology
CO 6	Generate a plan to make this knowledge of internal structures and function of human body for Health promotion among society

<b>BP 102T: Pharmaceutical Analysis-I (Theory)</b>	
CO 1	Understand fundamentals of pharmaceutical analysis
CO 2	Prepare volumetric solution of specific strength
CO 3	Understand the concept of the sources of errors, types of errors, methods of minimizing errors
CO 4	Understand the principles of volumetric and electro chemical analysis
CO 5	Need, methodology and applications of various volumetric titrations
CO 6	Illustrate principle, types of electrodes, instrumentation, and applications in drug analysis.

<b>BP 103T: Pharmaceutics-I (Theory)</b>	
CO 1	Describe the basics of pharmacy profession with reference to history, current scope, pharmacopoeias, prescription, posology, proof spirit and pharmaceutical calculations.
CO 2	Differentiate and discuss types of dosage forms and excipients used for their development.
CO 3	Explain advantages, disadvantages, excipients, and techniques required for to formulate different monophasic and biphasic liquid dosage forms.
CO 4	Discuss advantages, disadvantages, and techniques in development of powder dosage form.
CO 5	Select the proper base and formulate semisolid dosage formulations of various types.
CO 6	Examine pharmaceutical incompatibilities and solve it.



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<b>BP 104T: Pharmaceutical Inorganic Chemistry-I (Theory)</b>	
CO 1	Know the sources of impurities & methods to determine impurities in pharmaceutical substances
CO 2	Understand the concepts of acids, bases, and buffers with tonicity measurements
CO 3	Understand functions of major extra and intra cellular ions, with associated diseases and their treatment also compositions, uses for inorganic compounds and their formulations as dental products
CO 4	Understand the use of inorganic compounds as gastrointestinal agents and antimicrobials
CO 5	Understand the use and mechanism for inorganic compounds used as expectorants, emetics, haematinics, antidotes, and astringents
CO 6	Acquire the knowledge of preparation, properties, storage condition and applications of radioisotopes, measurement of radioactivity and radiopharmaceuticals

<b>BP 105T: Communication Skills (Theory)</b>	
CO 1	Understand the behavioural needs for a pharmacist to function effectively in the areas of pharmaceutical operation, analyze the barriers of communication and communicate effectively
CO 2	Apply and display appropriate verbal, non-verbal, vocal & visual elements in professional environment
CO 3	Create and structure effective writing and active listening skill
CO 4	Students will be equipped with interview skills to express confidence at all levels with great clarity
CO 5	Apply Leadership quality and carry out regular interpersonal communication at the workspace
CO 6	Become proficient in communication skills pertaining to the production and presentation of messages in multiple formats & to comprehend the significance of body language

<b>BP 106RBT: Remedial Biology (Theory)</b>	
CO 1	know the classification and salient features of five kingdoms of life
CO 2	understand the basic components of anatomy & physiology of plant
CO 3	know understand the basic components of anatomy & physiology animal with special reference to human

<b>BP106RMT: Remedial Mathematics (Theory).</b>	
CO 1	Discuss the method of partial fraction, logarithm, function, and continuity in the mathematics and apply in pharmacy to solve problems
CO 2	Understand, analyze and apply the methods of system of linear equation in pharmacy to solve problems such as pharmacokinetic equations.
CO 3	Characterize, analyze and compute the role of calculus in pharmacy to solve problems
CO 4	Discuss, construct and explain methods of analytical geometry in pharmacy
CO 5	Elaborate, analyze and apply the role of integration (indefinite and definite) in pharmacy to solve problems.
CO 6	Describe, classify and apply the method of differential equations and Laplace transform and their application in pharmacy.



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## FIRST YEAR B. PHARMACY (SEMESTER-I)

### Practical

<b>BP 107P: Human Anatomy &amp; Physiology-I (Practical)</b>	
CO 1	To explain the use of different parts of the microscope for microscopic study of various tissues.
CO 2	To elaborate the various tissues and organs of different systems of human body.
CO 3	To identify axial and appendicular bones of human skeleton.
CO 4	To Estimate the haematological tests will be able to determine the abnormalities in the ranges of blood and physiological parameters through interpreting the normal values.
CO 5	Students will utilize their knowledge of normal physiology
CO 6	To understand the clinical manifestations in pathophysiology

<b>BP108P: Pharmaceutical Analysis-I (Practical)</b>	
CO 1	To practice proper handling of volumetric apparatus and their calibration
CO 2	To Prepare and standardise the solution of different concentrations
CO 3	To Understand concept of various volumetric analysis
CO 4	To Perform the assay of compounds using different titration methods
CO 5	To develop analytical skills in data interpretation and calculations
CO 6	To explain and apply different types of electrochemical methods of analysis.

<b>BP 109P: Pharmaceutics-I (Practical)</b>	
CO 1	Understand different excipients and their roles in formulations
CO 2	Differentiate between types of dosage forms.
CO 3	Calculate the quantities of ingredients for preparing formulations
CO 4	Prepare the various types of dosage forms
CO 5	Select the proper excipient for formulation of dosage form
CO 6	Combine the different techniques to develop preparation

<b>BP 110P: Pharmaceutical Inorganic Chemistry-I (Practical)</b>	
CO 1	Understand and perform the pharmacopeial procedures for the limit tests as tests for purity
CO 2	Determine the inorganic impurities present in pharmaceutical substances using pharmacopeial limit tests
CO 3	To perform the qualitative identification tests for inorganic compounds of pharmaceutical importance
CO 4	To perform the qualitative tests for pharmacopeial identification inorganic compounds of pharmaceutical importance.
CO 5	Perform tests for purity according to pharmacopeial procedures.
CO 6	Prepare and purify the inorganic compounds of pharmaceutical importance



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BP 111P: Communication Skills (Practical)	
CO 1	Understand, analyse and instil the confidence to speak English flawlessly with maximum zeal.
CO 2	Develop ability to do better pronunciation, word accent, and intonation.
CO 3	To apply the essential critical components of effective oral and written communication necessary for professional development.
CO 4	Experiment with different communication techniques to create high impact messages.
CO 5	Develop learning to construct and deliver messages that incorporate the appropriate use of organizing content, language, vocabulary, kinesics, eye contact, visual aids and time constraints.
CO 6	Develop the skills to prepare for job search artifacts & negotiate their use in Group Discussion's & interview.



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## SECOND YEAR B. PHARMACY (SEMESTER-II)

BP 201T: Anatomy & Physiology-II (Theory)	
CO 1	Analyze the gross morphology, structure and functions of various physiological systems such as the nervous system, respiratory system, and urinary system.
CO 2	Explain the mechanism of digestion and metabolism and discuss the role of various digestive secretions in digestive process.
CO 3	Categorize various hormones of endocrine gland, their functions and discuss the action the action and regulation of endocrine secretions.
CO 4	Explain structure of male and female reproductive system and discuss the spermatogenesis, menstrual cycle, Oogenesis, and role of various hormones in reproduction.
CO 5	Infer the type of organ on the basis of physiology
CO 6	Generate a plan to make this knowledge of internal structures and function of human body to educate medical and paramedical students

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<b>BP 202T: Pharmaceutical Organic Chemistry-I (Theory)</b>	
CO 1	Deduce the structure, name of the organic compound, and discuss applications of compounds belonging to different classes
CO 2	Knowledge about the type of isomerism
CO 3	Understand the concepts of hybridization of organic molecules
CO 4	Understand the named reactions and reaction orientation rules
CO 5	Acquire knowledge about preparation and reactivity of compounds with functional groups, such as alkanes, alkenes, aldehydes and ketones, alcohols, carboxylic acids, amino and azo compounds
CO 6	Explain the mechanism involved in the nucleophilic substitution, addition, and elimination reactions

<b>BP 203T: Biochemistry (Theory)</b>	
CO 1	Explain the classification & biological functions of carbohydrate, lipids, amino acid, nucleic acid & proteins as well concepts of energies in biochemical processes with energy rich compounds
CO 2	Understand the metabolism of carbohydrates with biological oxidation, phosphorylation and associated physiological and pathological conditions
CO 3	Able to analyse the metabolism of lipids as saturated fatty acid oxidation, de novo synthesis with example of palmitic acid. Understanding reactions for metabolism of amino acids and its disorders with synthesis of and catabolism of biological substances
CO 4	Understand the biosynthesis and catabolism nucleotides along with diseases as well as organization of mammalian genome, genetic code and Translation
CO 5	Understand the enzymes with properties, nomenclature, kinetics, inhibitors, regulation with coenzymes and their Therapeutic and diagnostic applications
CO 6	Understand the significance of Organ Function tests & introduction to nutrition with concepts of BMR

<b>BP 204T: Pathophysiology (Theory)</b>	
CO 1	Students will define the basic pathogenesis of human disease
CO 2	Students will define and explore the most common etiologies and predisposing factors associated with human disease
CO 3	Students understand the basis for some laboratory tests and other diagnostic procedures
CO 4	Students will utilize his knowledge in social awareness about diseases and make correlations between pathophysiology and clinical skills they are learning in their allied health science programs
CO 5	Students will understand how the various organ systems are interrelated, and use this understanding to promote a holistic approach towards the evaluation and treatment of patients.
CO 6	knowledge of sign and symptoms of the disease.



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<b>BP 205T: Computer Applications in Pharmacy (Theory)</b>	
CO 1	To illustrate the concept of number system in computers, understand different types of databases, applications of computers and databases in pharmacy.
CO 2	To make use of web technologies such as HTML, XML, CSS, programming languages, Web servers and pharmacy drug database.
CO 3	To appraise the applications of computers in pharmacy such as drug information services, pharmacokinetics, mathematical model in drug design, hospital, and clinical pharmacy etc.,
CO 4	To explain about bioinformatics and its impact in vaccine discovery
CO 5	To elaborate the applications of computers for data analysis in preclinical development.
CO 6	To Understand the recent healthcare technologies

<b>BP 206T: Environmental Sciences (Theory)</b>	
CO 1	Create awareness towards environmental issues and climate change
CO 2	Understand the concept of natural resources and various types
CO 3	Describe the different components of the environment and nature
CO 4	Acquire Knowledge of Environmental Pollution and its effects
CO 5	Understand the Concept of an ecosystem
CO 6	Create awareness about different types of pollution and their effects

<b>BP 208P: Pharmaceutical Organic Chemistry (Practical)</b>	
CO 1	After conducting basic melting point, boiling point, and derivatization procedures for organic compounds, students will be able to identify reference organic compounds
CO 2	Through qualitative analysis, students will gain the ability to distinguish the characteristics of various organic classes
CO 3	By performing qualitative analysis, students can identify basic elements. This knowledge can be applied to synthetic research projects
CO 4	After completing solubility experiments, students will understand concepts related to saturation, unsaturation, and polarity. They will also be able to identify the main organic class
CO 5	Qualitative analysis helps students realize theoretical concepts in organic chemistry. They can then apply these concepts to develop synthesis methods
CO 6	Constructing molecular models using different models and software enhances students' understanding of stereochemistry



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<b>BP 209P: Biochemistry (Practical)</b>	
CO 1	Perform the qualitative identification tests for the carbohydrates and proteins
CO 2	Calculate the quantities for the preparation of buffer solutions, prepare buffer and measure the pH
CO 3	Quantify the reducing sugars and proteins and determine the sugar, total cholesterol, and creatinine in the blood/serum.
CO 4	Perform qualitative tests for abnormal constituents in urine
CO 5	Examine the enzyme activity and demonstrate the effect of pH, temp., acid hydrolysis and substrate concentration on the enzyme activity
CO 6	Estimate the quality of lipids (oils and fats) as saponification/ iodine/ acid value along with demonstrative use of polarimeter

<b>BP 210P: Computer Applications in Pharmacy (Practical)</b>	
CO 1	To design a questionnaire using a word processing package to gather information about a particular disease.
CO 2	To create HTML web page to show personal information
CO 3	To create mailing labels Using Label Wizard, generating label in MS WORD
CO 4	To demonstrate and make use of MS Office, MS Word, MS Excel, MS Access and MS Power point
CO 5	To understand the form design, report design, query design in MS Access
CO 6	To summarize the report and printing the report from patient database

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## SECOND YEAR B. PHARMACY (SEMESTER-III)

<b>BP 301T: Pharmaceutical Organic Chemistry II (Theory)</b>	
CO 1	Students will grasp the concept of aromaticity, recognize structural features, and predict the reactivity of various aromatic compounds, with a special focus on benzene. They will also explore electronic mechanisms related to these compounds
CO 2	Applying knowledge of acidity and basicity, students will learn about the preparation and distinct chemical properties of different aromatic and polynuclear aromatic organic classes.
CO 3	Students will investigate the chemistry of fats and oils, understanding analytical constants and distinguishing between good and bad lipid profiles
CO 4	Through the study of cycloalkanes, students will conceptualize the stability of cyclic compounds. They will explore the reactivity of 3-, 4-, 5-, and 6-membered cyclic compounds.
CO 5	By drawing the structures, students will become familiar with organic and heterocyclic classes. This foundational knowledge will prepare them for more advanced organic chemistry studies
CO 6	Exploring the medicinal applications of various classes, students will gain familiarity and bridge the gap to advanced medicinal chemistry

<b>BP 302T: Physical Pharmaceutics-I (Theory)</b>	
CO 1	Remember, understand, and compare the different properties of states of matter
CO 2	Understand, apply, and analyze the selection of a right material based on its physiochemical properties for the manufacture of effective pharmaceutical product
CO 3	Apply knowledge of solubility in pharmaceutical preparations and select suitable parameters for modification of solubility of a pharmaceutical substance
CO 4	Relate interfacial phenomena and adsorption to pharmaceutical sciences and connect the use of surfactants in designing various pharmaceutical products
CO 5	Explore the pH, buffers, and is tonicity in the field of pharmacy.
CO 6	Explore the pH, buffers, and is tonicity in the field of pharmacy

<b>BP 302T: Physical Pharmaceutics-I (Theory)</b>	
CO 1	Remember, understand, and compare the different properties of states of matter
CO 2	Understand, apply, and analyze the selection of a right material based on its physiochemical properties for the manufacture of effective pharmaceutical product
CO 3	Apply knowledge of solubility in pharmaceutical preparations and select suitable parameters for modification of solubility of a pharmaceutical substance
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<b>BP303T Pharmaceutical Microbiology (Theory)</b>	
CO 1	Understand the importance of the isolation, bacterial growth and culture techniques for microbial growth.
CO 2	Compare the different methods of sterilization with applications and sterility testing of official products
CO 3	Acquire knowledge sensitivity and resistance of pharmaceutical products using antimicrobial assays
CO 4	Correlate the concept of aseptic area design and pharmaceutical product operations
CO 5	Acquire the importance of Preservatives and spoilage of pharma products
CO 6	Understand the concept and characteristic feature of fungi and their importance

<b>BP304T Pharmaceutical Engineering (Theory)</b>	
CO 1	Summarize the concepts of flow of fluids, and know the role of size analysis and size reduction in pharmaceutical manufacturing
CO 2	Apply principles of heat transfer to various heat processes like evaporation and distillation. Measure humidity in air and know its significance in pharma manufacturing
CO 3	Understand the concepts of evaporation and distillation and apply them in laboratory
CO 4	Explore the principles of drying and mixing and relevant equipments
CO 5	Relate the theories and concepts of filtration, centrifugation, and crystallization to their applications in pharmaceutical industry
CO 6	Select material for plant construction, classify them and understand various types of corrosion, their prevention, and theories of corrosion

<b>BP 305P: Pharmaceutical Organic Chemistry-II (Practical)</b>	
CO 1	Students will gain practical knowledge by applying recrystallization and steam distillation techniques to purify aromatic compound mixtures. This experience emphasizes the significance of purification and separation
CO 2	Students will learn about standard values for lipid profiles and develop the ability to differentiate between edible and non-edible fats and oils commonly used in daily life
CO 3	Through hands-on work with reaction assemblies, students will troubleshoot reactions and construct plausible mechanistic pathways. This knowledge will serve as a foundation for advanced medicinal chemistry studies
CO 4	Students will acquire fundamental skills such as calculations, reagent preparation, and energy estimation through practical experimentation with various reactions
CO 5	By exploring named reactions, students will justify theoretical assumptions and distinguish practical findings. These named reactions are well-established in the field
CO 6	After conducting a variety of reactions, students will be well-prepared for applied research projects, particularly in the synthesis of medicinal compounds



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<b>BP 306P: Physical Pharmaceutics-I (Practical)</b>	
CO 1	Develop skill of determining solubility of drugs and mastered ability to estimate distribution co-efficient of substances
CO 2	Examine multi-component systems and partial miscibility of substances
CO 3	Understand the surface tension and develop skill to determine the surface tension
CO 4	Investigate and understand the concepts of complexation and use them in formulation development
CO 5	Understand and apply the knowledge for determination of HLB of surfactants
CO 6	Explore the adsorption isotherm and estimate the adsorption

<b>BP 307P: Pharmaceutical Microbiology (Practical)</b>	
CO 1	Understand the methods of isolation and identification of microorganisms.
CO 2	Acquire the importance of sterilization in pharmaceutical products in small scale and large scale
CO 3	Understand the sterility testing of pharmaceutical products
CO 4	Gain the knowledge about different staining techniques
CO 5	Demonstrate the bacteria by different biochemical test
CO 6	Create the knowledge about different laboratory apparatus with applications

<b>BP 308P: Pharmaceutical Engineering (Practical)</b>	
CO 1	Study various heat processes applicable to pharma industry such as Steam distillation, drying, crystallization.
CO 2	Estimate the moisture content, loss on drying, air humidity and elaborate their role in pharma manufacturing
CO 3	Investigate the working and applications of rotary tablet machine and de-humidifier, fluidized bed coater, fluid energy mill, colloid mill, planetary mixer, fluidized bed dryer and freeze dryer
CO 4	Examine the role of size analysis and size reduction in pharmaceutical manufacturing.
CO 5	Study the factors affecting Filtration, Evaporation and Crystallization
CO 6	Integrate the concept of efficiency of mixing and role of centrifugation in stability evaluation of emulsion



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## SECOND YEAR B. PHARMACY (SEMESTER-IV)

<b>BP 401T: Pharmaceutical Organic Chemistry-III (Theory)</b>	
CO 1	Explain the concepts of stereochemistry of organic compounds
CO 2	Explain the meaning of racemic mixture & different methods use for resolution
CO 3	Determine the configuration of stereoisomers
CO 4	Understand different synthesis & reactions of stereoisomers
CO 5	Explain the synthesis and medicinal uses of heterocyclic compounds
CO 6	Explain the important named reactions for synthesis of organic compounds

<b>BP 402T: Medicinal Chemistry-I (Theory)</b>	
CO 1	Explain the influence of physicochemical properties and biotransformation on drug action.
CO 2	Outline the synthetic route for the selective medicinal compounds of each category and acquire knowledge on the mechanism of action of pharmacodynamics agents
CO 3	Classify the therapeutic agents based on the chemical nature and discuss structure activity relationship
CO 4	Acquire knowledge about the relationship between the biological activity and structure of therapeutic agents
CO 5	Assimilate the therapeutic uses of adrenergic agents and cholinergic agents
CO 6	Understanding classification, physiochemical, SAR, metabolism mechanism of action of CNS acting drugs

<b>BP 403T: Physical Pharmaceutics-II (Theory)</b>	
CO 1	Remember and understand the basic concepts of colloids, and their properties
CO 2	Understand, analyze, and apply the knowledge of rheology and viscosity to the various Newtonian and non-Newtonian systems
CO 3	Understand the basic concepts and stability aspects of dispersed systems like suspensions and emulsions
CO 4	Remember and understand the use of physicochemical properties in the formulation development and evaluation of various dosage forms
CO 5	Create, remember, understand, analyze, and evaluate the concepts of micromeritics in the estimation of particle size, surface area, and flow properties of powders
CO 6	Design, understand, and apply the principles of chemical kinetics to determine the stability and expiry of formulations



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<b>BP 404T: Pharmacology-I (Theory)</b>	
CO 1	Explain general concepts of Pharmacology and factors affecting pharmacokinetic and pharmacodynamic behaviour of drug and apply these factors in Pharmacology of drugs and drug discovery.
CO 2	Summarize the mechanisms of drug action, including pharmacokinetics, and pharmacodynamics of different categories of drugs
CO 3	Demonstrate and interpret mechanisms of drug action of drugs at the receptor, subcellular and macromolecular levels
CO 4	Relate the receptor mediated actions of drugs, Adverse drug reactions, Drug interaction and Drug discovery process
CO 5	Understand and recall the importance of receptor mediated actions of drugs and neurohumoral transmission through Autonomic nervous system. Use these principles to suggest suitable drugs, in management of disorders, related to Autonomic nervous system
CO 6	Compare and contrast drugs used in the management of various CNS disorders to suggest suitable drugs in the management of anesthesia, muscular disorders, insomnia, epilepsy, neurodegenerative diseases, and alcoholism. Additionally, justify their usage and associated complications like dependence, addiction, and tolerance

## SECOND YEAR B. PHARMACY (SEMESTER-IV)

<b>BP 405T: Pharmacognosy &amp; Phytochemistry-I (Theory)</b>	
CO 1	Discuss the concepts of pharmacognosy, classification, evaluation and identification of the crude drugs. Apply quality control techniques to evaluate the quality of crude drugs.
CO 2	Propose the strategies involved in Cultivation, Collection, Processing and Storage of drugs of natural origin.
CO 3	Distinguish the difference between primary and secondary metabolites. Analyse the role of role of pharmacognosy in identifying and classifying plants metabolites
CO 4	Interpret the designation plants products such as fibers, hallucinogens, teratogens, and natural allergens
CO 5	Understand the fundamental aspects of plant tissue culture
CO 6	Critically evaluate the role of pharmacognosy in both allopathy and traditional systems of medicine. Asses the important of pharmacognosy in drug discovery and development

<b>BP 406P: Medicinal Chemistry-I (Practical)</b>	
CO 1	Identify reactants required based on reaction scheme and accordingly set up assembly for synthesis of organic compounds of therapeutic use and several reaction intermediates
CO 2	Evaluate the progress of the reaction using visual observation as well as quantifying color, pH, and physical state of compounds
CO 3	Perform isolation and re-crystallization of product from the reaction mixture using specific solvents and recrystallization procedures at the end of reaction to obtain pure compounds
CO 4	Determine percentage purity of APIs/dosage forms using assay methods as depicted in the official pharmacopoeia
CO 5	Determinate of partition coefficients of drugs and synthesized compounds
CO 6	Synthesize medicinal compounds using bulky scale feasible methodologies





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<b>BP 407P: Physical Pharmaceutics-II (Practical)</b>	
CO 1	Assess the particle size and flow properties of powders
CO 2	Predict the sedimentation of suspensions and evaluate effect of suspending agents on stability of suspension
CO 3	Analyze the order of reaction and apply it to drug stability determination
CO 4	Compute the viscosity of various formulations (Newtonian and Non-Newtonian). Also learn to prepare colloids and evaluate them
CO 5	Understand the concept of colloids
CO 6	Analyze and develop the different types of emulsions

<b>BP 408P: Pharmacology-I (Practical)</b>	
CO 1	Understand the technical aspects of instruments and animals used in experimental pharmacology.
CO 2	Explain various techniques of animal handling, drug administration, and blood withdrawals
CO 3	Summarize and apply various ethical guidelines for conducting experimental pharmacological studies
CO 4	Understand and recall the use of simulated software for drug testing studies
CO 5	Demonstrate the preclinical pharmacologic experiments for determination of activities of drugs on microsomal enzymes, ciliary motility, skeletal muscles, pupils and locomotor activity
CO 6	Design and evaluate the preclinical pharmacological experiments on CNS and local anesthetic activity

<b>BP 408P: Pharmacology-I (Practical)</b>	
CO 1	Evaluate primary metabolites by using organoleptic, physical & chemical tests
CO 2	Perform qualitative microscopy for leaf constants
CO 3	Determine particle size of starch grain, calcium oxalate crystals and phloem fibres by quantitative microscopy
CO 4	Determine different extractive and ash values as per pharmacopeial requirements
CO 5	Determine swelling index and foaming index
CO 6	Identified different type of stomata and trichomes in various leaves



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## THIRD YEAR B. PHARMACY (SEMESTER-V)

<b>BP501T: Medicinal Chemistry-II (Theory)</b>	
CO 1	Classify the different categories of medicinal drugs and correlate their structure-activity relationship
CO 2	Understand and remember the chemistry of drugs and apply the concept to evaluate their pharmacological activity
CO 3	Understand and remember the effect of physicochemical properties on drug ADME
CO 4	Remember and evaluate the adverse effects and therapeutic value of medicinal drugs
CO 5	Correlate stereochemistry of drugs with their pharmacological effects
CO 6	Understand and create the synthetic route for medicinal drugs

<b>BP502T: Industrial Pharmacy-I (Theory)</b>	
CO 1	Understand pre-formulation studies to design pharmaceutical dosage forms
CO 2	To correlate drug properties according to BCS classification
CO 3	Design and evaluate tablets, capsules, pellets, with their packages
CO 4	Design and evaluate parenteral, ophthalmic and aerosol dosage forms and their packages
CO 5	Design and evaluate pharmaceutical aerosols, syrups, elixirs, suspensions and emulsions and their packages
CO 6	Formulate cosmetic preparations such as lipsticks, shampoos, cream, toothpastes, hair dyes and sunscreens

<b>BP503T: Pharmacology-II (Theory)</b>	
CO 1	Justify the mechanism of action, therapeutic uses, adverse effects, and contradictions of drugs used in cardiovascular complications
CO 2	Adapt & justify the principles of pharmacotherapy in the management of disease and disorders of urinary system, including their pharmacokinetics and pharmacodynamics
CO 3	Explain the pharmacology of drugs affecting blood coagulation, hemoglobin synthesis, plasma volume and nociception (NSAIDs and antiarthritic drugs)
CO 4	Explain autacoids and drugs used for inflammation and gout.
CO 5	Explain the pharmacology of drugs used for the disorders associated with the endocrine system
CO 6	Compare various methods of bioassay, adapt & inculcate the principles of bioassay of different drugs



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## BP504T: Pharmacognosy & Phytochemistry-II (Theory)

CO 1	Analyze and categorize the basic metabolic pathways involved in synthesizing various types of secondary metabolite groups
CO 2	Apply modern extraction techniques, characterization methods, and identification protocols to herbal drugs and phytoconstituents
CO 3	Evaluate the chemistry, biosources, therapeutic properties, and commercial applications of secondary metabolites present in crude drugs
CO 4	Demonstrate proficiency in isolating, identifying, and analyzing different phytoconstituents
CO 5	Evaluate the industrial production, estimation techniques, and practical applications of various phytoconstituents
CO 6	Utilize principles, procedures, and techniques of chromatography, spectroscopy, and electrophoresis to identify and analyze natural drugs in pharmacognosy

## BP505T: Pharmaceutical Jurisprudence (Theory)

CO 1	To understand different pharmaceutical legislation and their implications in the development and marketing of pharmaceuticals
CO 2	Describe the pharmaceutical education in India and its regulation by the regulatory bodies.
CO 3	Know various Indian Pharmaceutical Acts, Laws and schedule of Drug and cosmetic.
CO 4	Understand the various concepts of the pharmaceutical legislation in India.
CO 5	Enumerate the various rules and the offences-penalties for contravention of the pharmaceutical legislation in during pharmaceutical practice.
CO 6	Learn the knowledge on schedules and functioning of various committees in the Drug and Cosmetic Act and rules

## BP506P: Industrial Pharmacy-I (Practical)

CO 1	Determine pre-formulation parameters of a given drug
CO 2	Formulate and evaluate tablet and capsule dosage form
CO 3	Formulate and evaluate small volume parenteral and ophthalmic dosage forms and their packages
CO 4	Formulate and evaluate large volume parenterals
CO 5	Evaluation of marketed Tablets, Capsules, and Parenteral preparations
CO 6	Prepare and evaluate of cosmetic formulations such as lipsticks and creams

## BP507P: Pharmacology-II (Practical)

CO 1	Apply and adapt the principles of in vitro experiments in cardiovascular pharmacology
CO 2	Evaluate the effects of drugs effecting cholinergic system using isolated tissues
CO 3	Evaluate the effect of agonist and antagonist DRC of acetylcholine using frog rectus abdominis muscle and rat ileum respectively
CO 4	Estimate concentrations of drugs using various types of bioassays
CO 5	Adapt & justify the various procedures with their principles of experiments meant for spasmogenic, spasmolytic, analgesic, and anti-inflammatory activities on different animal models
CO 6	Compare and adapt the principles of experiments through dose response curve (DRC), different bioassay, PA2 value, PD2 value estimation, etc. using software



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BP508P: Pharmacognosy & Phytochemistry-II (Practical)	
CO 1	Demonstrate proficiency in conducting morphological and microscopical evaluations to accurately identify crude drugs, focusing on differentiating cell types, tissues, and cell inclusions
CO 2	Apply modern tools and techniques to extract, isolate, and evaluate active principles from crude drugs. Additionally, analyze the natural excipients utilized in the formulation of pharmaceutical products within the industry
CO 3	Utilize chromatographic and spectroscopic techniques for the identification and estimation of active principles extracted from crude drugs, thereby enhancing analytical skills
CO 4	Identify, examine, and compare various crude drugs based on their organoleptic, physical, and chemical characteristics using appropriate physical and chemical tests, fostering a comprehensive understanding of crude drug properties
CO 5	Perform isolation and analysis of volatile oils from crude drugs and their analysis using Thin-Layer Chromatography (TLC) technique, gaining practical experience in analytical separation methods
CO 6	Conduct the separation of sugars through Paper Chromatography



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## THIRD YEAR B. PHARMACY (SEMESTER-VI)

### **BP601T: Medicinal Chemistry-III (Theory)**

CO 1	Define and classify anti-infective agents along with their structures.
CO 2	Describe the structure activity relation of some important class of drugs used in various infectious diseases and understand their mode of action
CO 3	Understand and create synthetic route of medicinally important drugs
CO 4	Explain therapeutic uses and side effects of anti-infective agents
CO 5	Apply the basic concept of drug design approaches (QSAR, Pharmacophore modelling) and techniques towards the drug development
CO 6	Corelate stereochemistry of drugs with their pharmacological effects

### **BP602T: Pharmacology-III (Theory)**

CO 1	Understand the mechanism of action of a drug and its relevance in the therapeutics
CO 2	Summarise the principles of toxicology and treatment of poisoning
CO 3	Understand the applications of chronopharmacology
CO 4	Classify the chemotherapeutic agents and distinguish their applications in different infectious diseases
CO 5	Understand the mechanisms of immunotherapy, including therapeutics of respiratory and GIT disorders
CO 6	Understand the classification of cancers and mechanisms of drugs used in treating cancers

### **BP603T: Herbal Drug Technology (Theory)**

CO 1	Explain various processes related to herbal materials, various aspects of biodynamic agriculture & Indian systems of medicine.
CO 2	Acquire the knowledge of & Indian systems of medicine encompassing their basic principles and formulations
CO 3	Get the knowledge of nutraceuticals and their regulatory aspects with its application and drug interactions in the management of various metabolic diseases
CO 4	Utilize the knowledge of natural excipients in development of formulations and cosmetics, to explain various regulations related to ASU drugs and herbals
CO 5	Students will apply analytical skills to evaluate and adhere to standardization techniques and quality control parameters for herbal drugs and formulations in accordance with diverse regulatory agencies
CO 6	Explain drug discovery process using ethnopharmacology, role of herbal drug industry and relevant regulations

### **BP604T: Biopharmaceutics and Pharmacokinetics (Theory)**





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CO 1	Explain absorption, distribution, drug disposition mechanism for the drug & predict its pharmacokinetics
CO 2	Understand physicochemical, pharmaceutical, and patient related factors which can affect ADME of drug
CO 3	Differentiate the processes of linear and nonlinear type
CO 4	Explain protein binding mechanism for the drug & predict its pharmacokinetics
CO 5	Explain compartment models and compute pharmacokinetic parameters from given data
CO 6	Design BABE study for given formulation based on given data

## BP605T: Pharmaceutical Biotechnology (Theory)

CO 1	Understand the importance and use of microbial products via fermentation technology in Pharmaceutical Industry
CO 2	Acquire the knowledge of rDNA technology and Genetic engineering applications in production of pharmaceuticals
CO 3	Understand the concept of immunity in production of Vaccine, Monoclonal antibodies and Immunoassay kits
CO 4	Discuss the biotransformation and microbial genetics
CO 5	Understand the Microbial genetics and their related techniques like ELISA, Southern blot and western blotting
CO 6	Acquire the knowledge of gene amplification and mutation and effects

## BP606T: Pharmaceutical Quality Assurance (Theory)

CO 1	Discuss QC and QA concepts and relate it to quality certifications and regulations applicable to pharmaceutical industries
CO 2	Understand importance of TQM, QbD, NABL and ISO
CO 3	Understand the cGMP and GLP aspects
CO 4	Discuss Quality control of packaging materials in a pharmaceutical industry
CO 5	Illustrate the importance of documentation in Pharmaceutical Industry
CO 6	Explain calibration and validation in Pharmaceutical Industry

## BP607P: Medicinal Chemistry-III (Practical)

CO 1	Understand and perform procedures used to synthesize medicinal drugs by employing conventional and microwave irradiation techniques
CO 2	Understand and evaluate the synthetic mechanism of drug synthesis
CO 3	Recrystallize and purify the synthetic compounds
CO 4	Calculate and determine the theoretical, practical, percentage yields and melting point of synthesized compound
CO 5	Learn applications of various software's for drawing structures, reactions and to evaluate physicochemical parameters of drugs used in QSAR
CO 6	Perform and evaluate the assay methods of active pharmaceutical ingredients



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<b>BP608P: Pharmacology-III (Practical)</b>	
CO 1	Determine the dose of administration and select the proper route of administration for different classes of drugs
CO 2	Understand human dose from animal dose data and animal dose from human dose data in pharmacological experiments
CO 3	Design the preclinical pharmacologic experiments for determination of activities of drugs like antiallergic, anti-ulcer & gastrointestinal motility, saline purgative, insulin hypoglycaemic effects & test for pyrogens
CO 4	Identify, illustrate & demonstrate experimentally, the effects of agonist and antagonists on isolated tissues like guinea pig ileum
CO 5	Test a drug for acute skin and eye toxicity, treating biochemical and experimental data for determination of its statistical significance
CO 6	Demonstrate the pharmacological experiment using simulations

<b>BP609P: Herbal Drug Technology (Practical)</b>	
CO 1	Prepare and design herbal cosmetic formulations.
CO 2	Evaluate herbal drug excipients in accordance with pharmacopeial monographs
CO 3	Estimate the content of secondary metabolites in herbal drugs
CO 4	Prepare, standardize, and evaluate herbal and Ayurvedic formulations using pharmacopeial standards
CO 5	Recognize the evaluation of herb monographs as per Pharmacopoeia
CO 6	Evaluate the preliminary phytochemical screening of herbal extracts



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## FOURTH YEAR B. PHARMACY (SEMESTER-VII)

BP701T Instrumental Methods of Analysis (Theory)	
CO 1	Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis.
CO 2	Understand the chromatographic separation and analysis of drugs.
CO 3	Perform quantitative & qualitative analysis of drugs using various analytical instruments.

BP702T Industrial Pharmacy-II (Theory)	
CO 1	Understand the significance of personnel and space requirements in pilot plant scale-up, along with the considerations for scaling up solids, liquid orals, and semi-solids. Recognize the importance of relevant documentation and compliance with SUPAC guidelines and platform technology principles.
CO 2	Master the WHO guidelines for Technology Transfer (TT) including terminology, quality risk management, and documentation required for transfer from R&D to production. Explore practical aspects and challenges of commercialization through case studies and understand the role of TT agencies in India and associated documentation and legal issues.
CO 3	Explore the granular aspects of Technology Transfer (TT) from R&D to production, focusing on process, packaging, and cleaning transfer protocols. Delve into documentation requirements, premises, and equipment qualification, as well as analytical method transfer. Understand the role of quality control and validation in ensuring successful technology transfer.
CO 4	Gain insights into the historical overview of Regulatory Affairs, the role of Regulatory authorities, and the responsibilities of Regulatory Affairs Professionals. Learn about the Drug Development Teams, Non-Clinical Drug Development, and Clinical research protocols required for regulatory approval.
CO 5	Develop proficiency in the concept of Quality Management Systems, encompassing Total Quality Management, Quality by Design (QbD), and Six Sigma principles. Understand the implementation of ISO standards such as ISO 9000 series and ISO 14000, and their relevance in pharmaceutical quality assurance.
CO 6	Acquire knowledge of regulatory requirements and approval procedures for New Drugs in India, including the organizational structure and responsibilities of the Central Drug Standard Control Organization (CDSCO) and State Licensing Authority. Understand the importance of Certificate of Pharmaceutical Product (COPP) and compliance with Indian regulatory standard.



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<b>BP703T Pharmacy Practice (Theory)</b>	
CO 1	Understand, analyze, and evaluate the importance of hospital, hospital organization, community pharmacy, hospital formulary, and pharmacy & therapeutic committee
CO 2	Explain, design, and develop strategies for the hospital and pharmacy administration, drug distribution, budget preparation, and drug store management
CO 3	Remember, apply, analyze, and evaluate the role & responsibilities of pharmacists in various activities like hospital & community pharmacy management and clinical pharmacy services
CO 4	Recall, outline, and make use of the pharmacists' skills for patient care including ADR monitoring, patient counselling, rational use of OTC drugs, etc
CO 5	Relate and perceive investigational use of drugs
CO 6	List, contrast and apply pharmacist knowledge for the interpretation of clinical laboratory tests

<b>BP704T Novel Drug Delivery System (Theory)</b>	
CO 1	Study different novel drug delivery systems.
CO 2	Prepare and evaluate nanoparticle, ocusert and transdermal patches.
CO 3	Develop skill in manufacturing of the mucosal drug delivery system and evaluate its various parameters
CO 4	Study floating tablet and effect of polymer concentration on drug release
CO 5	Study the effect of polymer concentration on swelling and floating of GRDDS
CO 6	Study the concept and approaches of targeted drug delivery systems.

<b>BP704T Novel Drug Delivery System (Theory)</b>	
CO 1	Study different novel drug delivery systems.
CO 2	Prepare and evaluate nanoparticle, ocusert and transdermal patches.
CO 3	Develop skill in manufacturing of the mucosal drug delivery system and evaluate its various parameters
CO 4	Study floating tablet and effect of polymer concentration on drug release
CO 5	Study the effect of polymer concentration on swelling and floating of GRDDS
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## FOURTH YEAR B. PHARMACY (SEMESTER-VIII)

<b>BP801T Biostatistics and Research Methodology (Theory)</b>	
CO 1	Describe the introduction of Statistics, Biostatistics and Frequency distribution; Apply, analyze and evaluate the concept of descriptive statistics and their application to solve pharmaceutical problems.
CO 2	Discuss, analyze, and evaluate the concept of regression analysis, probability theory, sampling theory, inferential statistics with related parametric tests, non-parametric tests and their application to solve pharmaceutical problems.
CO 3	Discuss, analyze, and evaluate the concept of inferential statistics with related non-parametric tests and their application to solve pharmaceutical problems.
CO 4	Study the research need, research design and apply the statistics in research design
CO 5	Discuss statistical software- Excel, SPSS, MINITAB, DOE, R, Online Statistical Software's and evaluate the clinical data by applying the statistical technique and software's.
CO 6	Discuss, analyze, and evaluate the concept of Design of Experiments (DOE) and their application in research design.

<b>BP802T Social and Preventive Pharmacy (Theory)</b>	
CO 1	Understand, analyze, and evaluate the concept of health and diseases, importance of nutrition and hygiene in health, impact of cultural practices, poverty, and urbanization on health
CO 2	Relate, explain, design, and develop strategies for the promotion of various national disease control programmes and prevention of various prevalent diseases in country
CO 3	Remember, understand, apply, analyze, and evaluate role of pharmacist in the context of societal benefits with respect to promotion of health, prevention of diseases and implementation of various national programmes
CO 4	Recall, outline and make use of the principles of prevention and control of communicable and non-communicable diseases
CO 5	Relate and perceive community services in rural, urban, and school health
CO 6	List, contrast and apply general rules and approaches in social and preventive pharmacy

<b>BP804ET Pharmaceutical Regulatory Science (Theory)</b>	
CO 1	Analyze the regulatory approval processes for pharmaceutical products, including the timelines and requirements for Investigational New Drug (IND), New Drug Application (NDA), and Abbreviated New Drug Application (ANDA), across various regulatory authorities globally
CO 2	To know registration of Indian drug substances and drug products in overseas markets, including the procedures for export, preparation of technical documentation such as Drug Master Files (DMF) and Common Technical Documents (CTD), and adherence to international standards like ASEAN Common Technical Document (ACTD).
CO 3	Develop a comprehensive understanding of clinical trial protocols, ethical considerations, and regulatory obligations involved, including the formation and functioning of





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	Institutional Review Boards (IRBs) or Independent Ethics Committees (IECs), informed consent procedures, and pharmacovigilance measures.
CO 4	Evaluate key regulatory concepts and frameworks governing the pharmaceutical industry, including terminology, guidelines, regulations, and relevant laws such as those outlined in the Orange Book, Federal Register, and Code of Federal Regulations, to ensure compliance and adherence to regulatory standards.
CO 5	Synthesize knowledge from all units to critically analyze and address challenges in pharmaceutical regulatory affairs, integrating understanding of drug development processes, regulatory approval mechanisms, international market registration requirements, clinical trial management, and adherence to regulatory frameworks for safe and effective pharmaceutical products.
CO 6	To Regulatory requirements process in obtaining and maintaining government approval for drugs, medical devices, nutritional products, and related materials. They are often employed by pharmaceutical, biotechnology, and medical device companies. They may also work in government or law.

<b>BP805 ET: Pharmacovigilance (Theory)</b>	
CO 1	Design the drug safety monitoring program and aware about national and international scenario of pharmacovigilance
CO 2	Identify and carry out the detection of new adverse drug reactions and their reporting, communications system, and assessments
CO 3	Elaborate the use of Dictionaries, coding and terminologies used in pharmacovigilance and international standards for the classification of diseases and drugs
CO 4	Prioritize the knowledge of Methods to generate safety data during pre-clinical, clinical and post-approval phases of drugs' life cycle
CO 5	Summarize the Pharmacovigilance Program of India (PvPI) requirement for ADR reporting in India and ICH guidelines for ICSR, PSUR, expedited reporting, and pharmacovigilance planning
CO 6	Develop and design the adverse drug reaction reporting systems and communication in Pharmacovigilance with the conceptualization of Pharmacoepidemiology, Pharmacoconomics, safety pharmacology

## FOURTH YEAR B. PHARMACY (SEMESTER-VIII)

<b>BP811ET Advanced Instrumentation Techniques (Theory)</b>	
CO 1	Understand the concepts Adverse drug reaction and reporting of ADR and Pharmacovigilance
CO 2	Understanding of Rational and Irrational uses of drug
CO 3	Understanding of Essential drug concept and use of essential drugs
CO 4	Understand the concepts of Therapeutic drug monitoring and procedure of that are used for drug testing
CO 5	Understanding of Pharmacoconomics and Pharmacodynamic

