PROGRAM OUTCOMES (B.Pharm)

1. **Pharmacy Knowledge:** Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and manufacturing practices.

2. **Planning Abilities:** Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.

3. **Problem analysis:** Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.

4. **Modern tool usage:** Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.

5. **Leadership skills:** Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and well-being.

6. **Professional Identity:** Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).

7. **Pharmaceutical Ethics:** Honor personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.

8. **Communication:** Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.

9. **The Pharmacist and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.

10. **Environment and sustainability:** Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

11. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

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Course outcome for B.Pharm(Semester)

Course of study for semester I

Course code	**Name of the subject and course outcome**
BP101T	**Human Anatomy and Physiology I– Theory**
CO1	Recall essential terms and concepts associated with the introduction to the human body, integumentary system, skeletal system, body fluids, peripheral nervous system, special senses, and the cardiovascular system.
CO2	Explain how the various organ interconnect in a system and intern in body to execute specific function
CO3	Apply their understanding of anatomy and physiology knowledge for diagnosis of various diseases and demonstrating the regulations of each physiological processes.
CO4	Analyze structural intricacies of different body systems with their functions and regulations
CO5	Assess importance of various concepts in anatomy and physiology in a clinical context
CO6	Synthesize information from various course modules such as presentations, animations and videos to create a comprehensive understanding of how the human body functions as a whole.
BP102T	**Pharmaceutical Analysis I – Theory**
CO1	Define pharmaceutical analysis, its historical progression, and the boundaries it encompasses. Define the principles of acid-base indicators, the concepts of oxidation and reduction, and outline different categories of redox titrations..
CO2	Explain how different methods are used to analyze substances in pharmaceuticals. Describe how limit tests identify impurities in medicines. Share the basics of titrating strong, weak, and very weak acids and bases, and how neutralization curves work.
CO3	Apply non-aqueous titration methods like acidimetry and alkalimetry to find out how much Sodium benzoate and Ephedrine HCl are in a sample. Conduct and describe precipitation titrations using techniques such as Mohr's, Volhard's, Modified Volhard's, and Fajans method, with a specific focus on determining the amount of sodium chloride.
CO4	Examine the origins of potential mistakes in pharmaceutical analysis, clarify the types of errors that can occur,
CO5	Evaluate the accuracy and precision of pharmaceutical analysis results by applying appropriate methods of chemical analysis.
CO6	Create charts, diagrams, and highlights to make complex pharmaceutical analysis data easy to understand and present.

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BP103T **Pharmaceutics I – Theory**

CO1	Outline the Dosage form, Prescription, Posology, scope of pharmacy and profession of Pharmacy.
CO2	Explain the Calculation of children and infant doses, Factors affecting posology, Development and Pharmacy profession and pharmaceutical industry.
CO3	Classify the dosage forms, liquid dosage forms, Powders and granules, suppository bases Surgical aids and Incompatibilities.
CO4	Apply the knowledge acquired about Liquid dosage forms, Incompatibilities for identification of adulteration of drugs,
CO5	Analyze the methods to overcome the incompatibilities,

BP104T **Pharmaceutical Inorganic Chemistry – Theory**

CO1	Explain the sources and types of impurities commonly found in pharmaceutical substances and the principles involved in limit tests for various impurities, including Chloride, Sulphate, Iron, Arsenic, Lead, and Heavy metals.
CO2	Demonstrate an understanding of the properties and medicinal uses of inorganic compounds belonging to different classes, including acids, bases, buffers, and various pharmaceutical agents, behind their use in pharmaceutical formulations.
CO3	Assess pharmaceutical formulations, including buffers, isotonic solutions, and dental products, while considering factors such as stability and tonicity.
CO4	Analyze the mechanisms of action, classifications, and pharmaceutical applications of gastrointestinal agents and miscellaneous compounds and their significance in pharmacotherapy.
CO5	Evaluate the role of radiopharmaceuticals in medicine, including their properties, safety precautions, storage conditions, and pharmaceutical applications.

BP105T **Communication skills – Theory**

CO1	Explain need of communication skills, barriers to communicate effectively
CO2	Demonstrate perspectives of communication required to function effectively in areas of pharmaceutical operation
CO3	Apply various elements, styles of communications, Basic listening skills, writing skills to communicate effectively and manage team as team player.
CO4	Apply Interview skills presentation skills and group discussion for development of leadership qualities and essentials
CO5	Demonstrate and apply basic communication skills and advance learning skills

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BP106RBT **Remedial Biology– Theory**

CO1	Recall and describe fundamental concepts, including the definition and characteristics of living organisms, diversity in the living world, binomial nomenclature, and the five kingdoms of life.
CO2	Understand morphology of different parts of flowering plants, including roots, stems, inflorescence, flowers, leaves, fruits, seeds, and the general anatomy of monocotyledons and dicotyledons.
CO3	Apply their knowledge of blood composition, blood groups, coagulation, lymph composition, and the human circulatory system, including the structure of the heart and blood vessels, cardiac cycle, cardiac output, and ECG.
CO4	Critically analyze human alimentary canal and digestive glands, digestive enzymes, digestion, absorption, assimilation of digested food, human respiratory system, breathing mechanism and regulation, gas exchange, and respiratory volumes.
CO5	Evaluate modes of excretion, the human excretory system, urine formation, the renin-angiotensin system, the nervous system, neuron structure, nerve impulse generation and conduction, brain structure and function, and the endocrine system.
CO6	Synthesize their knowledge of human reproductive system parts, spermatogenesis, oogenesis, menstrual cycle, essential minerals, photosynthesis, plant respiration, growth and development, cell structure, and cell organelles.

BP106RMT **Remedial Mathematics – Theory**

CO1	Identify and distinguish partial fractions, Express complex looking algebraic equations in terms of two manageable terms. Demonstrate understanding of application of logarithm to solve pharmaceutical problems. Describe characteristics of different function types and convert between different representations and algebraic forms to analyze and solve meaningful problems. Compute limits, derivatives, and definite & indefinite integrals of algebraic, logarithmic and exponential functions.
CO2	Solve applied problems using matrices in solving pharmacokinetic equations
CO3	Solve applied problems using differentiation functions.
CO4	Express equation of straight line and identify condition of perpendicular or parallel of two the lines.
CO5	Demonstrate understanding of use of differential equation and Laplace equation in solving chemical kinetic and pharmacokinetic equations

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BP107P **Human Anatomy and Physiology – Practical**

Course outcome number	Course Outcomes	Cognitive level
CO1	Demonstrate the ability to accurately study and use microscope for examining cells and tissues and skeletal system	P1
CO2	Perform hands-on techniques in Blood experiments and in studying cardiac parameters.	P2
CO3	Display precision in analyzing various parameters related to blood and cardiovascular system with normal values	P3
CO4	Distinguish data collected during experiments, interpret tissue samples under a microscope, and draw conclusions from their observations.	P4
CO5	Evaluate the importance of physiological measurements, including heart rate, pulse rate, and blood pressure, in assessing overall health and diagnosing potential medical conditions.	P5
CO6	Ability to design and conduct their own laboratory investigations, potentially exploring unique aspects of anatomy and physiology or developing novel experimental approaches.	P6

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BP108P **Pharmaceutical Analysis I – Practical**

Course outcome number	Course Outcomes	Psychomotor Level
CO1	Execute the procedure for conducting limit tests on chloride, sulfate, iron, and arsenic with precision and accuracy, demonstrating the ability to imitate laboratory techniques for qualitative analysis.	P1
CO2	Demonstrate manipulation skills by effectively preparing and standardizing sodium hydroxide, sulfuric acid, sodium thiosulfate, potassium permanganate, and ceric ammonium sulfate solutions, showcasing adept manipulation of laboratory apparatus and materials.	P2
CO3	Complete the assay of ammonium chloride through acid-base titration and standardize the titrant with meticulous precision, displaying a high level of precision in analytical procedures.	P3
CO4	Apply articulation skills to carry out assays and standardization procedures for ferrous sulfate (Cerimetry), copper sulfate (Iodometry), calcium gluconate (complexometry), hydrogen peroxide (Permanganometry), sodium benzoate (non-aqueous titration), and sodium chloride (precipitation titration), ensuring accurate articulation of analytical techniques.	P4
CO5	Demonstrate naturalization skills in electro-analytical methods, including conductometric titration of strong acid against strong base, conductometric titration of strong acid and weak acid against strong base, and potentiometric titration of strong acid against strong base, ensuring a natural and competent understanding and application of these methods.	P5

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BP109P **Pharmaceutics I – Practical**

Course outcome number	Course Outcomes	Cognitive level
CO1	**Follow** the procedure for preparation of syrups, Elixir, Linctus and Solutions.	P1
CO2	**Carry out** the packing methods for powders and suppositories	P2
CO3	**Complete** the procedure for Suspension and Emulsion.	P3
CO4	**Apply** the skills for finding out incompatibilities present in the preparation.	P4
CO5	**Determine** the displacement value, child dose, isotonic, allegation method of calculation.	P5

BP110P **Pharmaceutical Inorganic Chemistry – Practical**

Course outcome number	Course Outcomes	Psychomotor Level
CO1	**Describe** the procedures for conducting limit tests for Chlorides, Sulphates, Iron, Heavy metals, Lead, and Arsenic, as well as the modified limit test for Chlorides and Sulphates.	P1
CO2	**Demonstrate** a comprehensive understanding of the principles and rationale behind the limit tests and identification tests conducted for various inorganic pharmaceutical substances, including the reactions involved and their significance in quality control.	P2
CO3	**Apply** their knowledge to conduct limit, identification, and purity tests accurately and efficiently, adhering to safety protocols and quality assurance standards.	P3
CO4	**Analyze** the results obtained from the limit tests, identification tests, and purity tests, interpreting their implications for the quality and purity of pharmaceutical substances, and potential areas of improvement in the testing procedures.	P4
CO5	**Evaluate** the reliability and validity of the test results obtained during the practical experiments, whether the inorganic pharmaceuticals meet the required quality standards and regulatory specifications.	P5

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BP111P **Communication skills – Practical**

Course outcome number	Course Outcomes	Psycomotor level
CO1	Imitation by effectively meeting new people and engaging in conversation, showcasing appropriate body language and social skills.	P1
CO2	Manipulate by asking relevant and meaningful questions during interactions, displaying effective communication and active listening skills.	P2
CO3	Precision in making friends by employing appropriate strategies and techniques to establish and maintain positive relationships, demonstrating empathy and understanding.	P3
CO4	Display articulation by effectively conveying their actions and experiences using appropriate language and vocabulary, showcasing clarity and coherence in their communication.	P4
CO5	Naturalization by following the do's and don'ts of communication, understanding and adhering to the social norms and etiquette associated with effective communication.	P5

BP112RBP **Remedial Biology – Practical**

Course outcome number	Course Outcomes	Cognitive level
CO1	Demonstrate fundamental laboratory techniques, including the proper use of a microscope, section-cutting techniques, mounting and staining procedures, and the preparation of permanent slides.	P1
CO2	Manipulate experimental conditions to study cells and their inclusions, including the use of staining techniques and microscopic observation.	P2
CO3	Achieve a high level of precision in performing detailed studies of plant parts (stem, root, leaf, seed, fruit, flower) and their modifications using computer models for enhanced visualization and understanding.	P3
CO4	Articulate mastery in microscopic studies and the identification of tissues pertinent to stem, root, leaf, seed, fruit, and flower and demonstrate proficiency in using microscopy to analyze and interpret cellular structures.	P4
CO5	Reach a level of naturalization where practical skills, including the identification of bones and the determination of blood group, blood pressure, and tidal volume, become automatic and integrated and also demonstrate the ability to apply these skills in a physiological context.	P5

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Course of study for semester II

BP201T **Human Anatomy and Physiology II – Theory**

Course outcome number	Course Outcomes	Cognitive level
CO1	Outline the structures and functions of the nervous system, digestive system, respiratory system, urinary system, endocrine system, reproductive system, and their associated organs and tissues.	C1
CO2	Explain the interrelationships and interactions between the different systems of the body, including how the nervous system coordinates bodily functions, how the endocrine system regulates hormones, and how the respiratory system facilitates gas exchange.	C2
CO3	Apply the knowledge of human anatomy and physiology to analyze and interpret clinical case studies or scenarios related to the nervous system, digestive system, respiratory system, urinary system, endocrine system, reproductive system, and genetics.	C3
CO4	Analyze the anatomical and physiological changes that occur in the body during different physiological processes, such as digestion, excretion, respiration, and reproduction. Evaluate the impacts of these processes on overall health and homeostasis.	C4
CO5	Evaluate the effectiveness and limitations of various diagnostic techniques and medical interventions used in the study and treatment of the nervous system, digestive system, respiratory system, urinary system, endocrine system, reproductive system, and genetic disorders.	C5
CO6	Create and design educational materials, such as presentations or Video shorts , that effectively communicate the complex concepts and functions of the nervous system, digestive system, respiratory system, urinary system, endocrine system, reproductive system, and genetics to a lay audience.	C6

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BP202T Pharmaceutical Organic Chemistry I – Theory

Course outcome number	Course Outcomes	Cognitive level
CO1	**List** the classifications of organic compounds, common and IUPAC nomenclature systems for organic compounds, and the various types of structural isomerism in organic compounds.	C1
CO2	**Demonstrate** a comprehensive understanding of organic compounds' structural features and nomenclature principles, including open-chain and carbocyclic compounds.	C2
CO3	**Explain** the properties, stabilities, and reactivity of alkanes, alkenes, and conjugated dienes and the outcomes of various reactions, including halogenation, ozonolysis, electrophilic and free radical addition reactions.	C3
CO4	**Analyze** reactions such as E1, E2, SN1, and SN2 reactions, including factors affecting their kinetics, stereochemistry, rearrangements, structure, and uses of alkyl halides and alcohols.	C4
CO5	**Evaluate** nucleophilic addition reactions of carbonyl compounds, including aldol condensation, Cannizzaro reaction, and benzoin condensation, qualitative tests, and practical applications of carbonyl compounds, such as aldehydes and ketones.	C5

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BP203T Biochemistry – Theory

Course outcome number	Course Outcomes	Cognitive level
CO1	Describe the introduction, classification, chemical nature, and biological roles of carbohydrates, lipids, nucleic acids, amino acids, and proteins, demonstrating knowledge and comprehension of biomolecules	C1
CO2	Explain the concept of free energy, endergonic and exergonic reactions, and the relationship between free energy, enthalpy, and entropy. Discuss the biological significance of ATP and cyclic AMP and classify energy-rich compounds	C2
CO3	Analyze the pathways, energetics, and significance of glycolysis, the citric acid cycle, the HMP shunt, glycogen metabolism, and gluconeogenesis. Discuss hormonal regulation of blood glucose levels and its relation to diabetes mellitus	C3
CO4	Explain the mechanisms of electron transport chain, oxidative phosphorylation, and substrate phosphorylation, and identify inhibitors of ETC and oxidative phosphorylation/Uncouplers	C4
CO5	Evaluate the processes involved in lipid metabolism, including beta-oxidation, ketone body formation, de novo synthesis of fatty acids, and discuss the biological significance of cholesterol and associated disorders	C5
CO6	Analyze the general reactions of amino acid metabolism, such as transamination, deamination, decarboxylation, and urea cycle. Examine catabolism of specific amino acids and the synthesis of biologically significant substances	C6

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BP204T Pathophysiology – Theory

Course Outcome Number	Course Outcomes	Cognitive Level
CO 1	Recall and explain the basic principles of cell injury and adaptation, including components and types of feedback systems, causes of cellular injury, and morphological changes in cells, such as atrophy, hypertrophy, and dysplasia.	C1
CO 2	Apply knowledge of cell injury and adaptation to analyze specific pathological conditions, such as cell swelling, intracellular accumulation, and enzyme leakage, and comprehend the underlying pathophysiological mechanisms.	C2
CO 3	Understand the mechanisms involved in inflammation and repair, including alterations in vascular permeability and blood flow, migration of white blood cells, and mediators of inflammation. Evaluate the pathophysiology of atherosclerosis and its clinical implications.	C3
CO 4	Analzying the applied knowledge of pathophysiology to analyze and explain diseases of the cardiovascular, respiratory, and renal systems, such as hypertension, congestive heart failure, asthma, and acute/chronic renal failure, with a focus on the underlying mechanisms.	C4
CO 5	Evaluating various hematological diseases, endocrine disorders, nervous system disorders, and gastrointestinal conditions. Develop comprehensive explanations of the pathophysiology of these diseases, including classifications, etiology, and pathogenesis.	C5
CO 6	Creating of pictograms for the topics in the syllabus for better understanding the pathophysiology of various diseases, such as inflammatory bowel diseases, liver diseases (including hepatitis), bone and joint diseases, hypertension, artherosclerosis, asthama, COPD and cancer.	C6

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BP205T **Computer Applications in Pharmacy – Theory**

Course outcome number	Course Outcomes	Cognitive level
CO1	Define HTML and its role in web development. list the basic structure of an HTML document (doctype, html, head, title, and body tags). Recall common HTML tags (e.g., p, h1-h6, a, img, div).	C1
CO2	Understand the basic concepts of computer science and information technology as applied to pharmacy. Gain proficiency in using specific software tools for pharmaceutical applications. Learn to manage and analyze pharmaceutical data. Explore the role of computer applications in drug discovery, development, and patient care.	C2
CO3	Data Analysis Advanced computing tools are used for the analysis of clinical trial data, pharmacokinetics, and pharmacodynamics studies. Simulation software can predict how drugs interact with the body, which is useful in the development of new medications.	C3
CO4	Principles of CADD and its role in drug discovery Molecular Modeling and Simulation Bioinformatics in drug development	C4
CO5	Medication Records Management: How well does the database handle medication records, including details like dosage, contraindications, and manufacturer? Patient Information Management: Assess the efficiency in managing patient profiles, including personal information, medical history, and prescription history.	C5

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BP206T **Environmental sciences – Theory**

Course outcome number	Course Outcomes	Cognitive level
CO1	**Recall** key environmental concepts and terminologies.	C1
CO2	**Describe** a deep understanding of the fundamental principles governing environmental science, including ecosystems, biodiversity, and environmental laws.	C2
CO3	**Apply** their knowledge of environmental sciences to analyze and propose sustainable solutions to real-world environmental problems..	C3
CO4	**Analyze** environmental data and evaluate the impact of human activities on the environment.	C4
CO5	**Evaluate** the effectiveness of various environmental conservation strategies and policies, considering their social, economic, and ecological implications.	C5
CO6	**Develop** innovative and sustainable solutions to address complex environmental challenges, demonstrating creativity and originality in their approaches.	C6

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BP207P **Human Anatomy and Physiology II –Practical**

Course outcome number	Course Outcomes	Cognitive level
CO1	Demonstrate the ability to accurately study and examine the integumentary and special senses using specimens, models, and other relevant resources.	P1
CO2	Perform hands-on techniques to study the nervous system, endocrine system, and other body systems using specimens, models, charts, and other practical tools.	P2
CO3	Display precision in demonstrating and performing the general neurological examination, including assessing reflexes, sensory functions, and motor skills with accuracy and attention to detail.	P3
CO4	Articulate and communicate the function of the olfactory nerve, different types of taste, visual acuity, reflex activity, and other physiological processes accurately, both verbally and in written reports.	P4
CO5	Apply the knowledge gained from practicals to real-life scenarios, such as understanding positive and negative feedback mechanisms, determining tidal volume and vital capacity, and interpreting body temperature recordings.	P5
CO6	Modify and adapt experimental protocols and techniques when studying the digestive, respiratory, cardiovascular, urinary, and reproductive systems, using models, charts, specimens, and other relevant resources.	P6

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BP208P **Pharmaceutical Organic Chemistry I– Practical**

Course outcome number	Course Outcomes	Psychomotor Level
CO1	**Recall** the preliminary tests used for the qualitative analysis of unknown organic compounds, including color, odor, and detection of elements (Nitrogen, Sulphur, and Halogen) by Lassaigne's test and functional group tests.	P1
CO2	**Demonstrate** the principles and procedures involved in systematic qualitative analysis of organic compounds, including solubility tests, functional group tests, and the significance of melting point/boiling point determination.	P2
CO3	**Identify** the unknown organic compounds, including detecting functional groups, solubility characteristics, and determining melting point/boiling point.	P3
CO4	**Analyze** the results obtained from qualitative tests, functional group identification, and melting point/boiling point determination to confirm the unknown organic compounds accurately.	P4
CO5	**Evaluate** the reliability and validity of their qualitative analysis of results, purity of the unknown compounds, and make informed decisions based on their observations and data.	P5

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BP209P **Biochemistry – Practical**

Course outcome number	Course Outcomes	Psychomotor Level
CO1	Demonstrate the ability to identify and differentiate carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose, and starch) qualitatively, showcasing skills in practical analysis	P1
CO2	Perform identification tests for Proteins (albumin and Casein), displaying adept manipulation skills and effective use of laboratory apparatus and materials	P2
CO3	Quantitatively analyze reducing sugars (DNSA method) and Proteins (Biuret method) with meticulous precision, showcasing a high level of precision in analytical procedures	P3
CO4	Qualitatively analyze urine for abnormal constituents, demonstrating accurate articulation of analytical techniques and procedures. Determine blood creatinine, blood sugar, and serum total cholesterol, effectively applying articulation skills in the laboratory	P4
CO5	Prepare buffer solutions and measure pH with precision, showcasing adept manipulation skills and knowledge of laboratory techniques. Study the enzymatic hydrolysis of starch, investigate the effect of Temperature on Salivary amylase activity, and explore the effect of substrate concentration on salivary amylase activity, demonstrating naturalization skills in practical biochemistry	P5

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BP210P **Computer Applications in Pharmacy – Practical**

Course outcome number	Course Outcomes	Psycomotor level
CO1	Recognize symbols indicating drug interactions or allergy alerts in pharmacy management software. Recall how to search for drug information using online databases like Micromedex or Epocrates Remember where to find dosage guidelines or drug interactions within pharmacy software systems.	P1
CO2	Understand the Role of Computer Systems in Pharmacy Students will learn about various computer systems and software applications used in pharmacy settings, including their role in managing patient information, medication inventory, Database and prescriptions.	P2
CO3	Apply Computer Applications in Simulated Pharmacy Practices Students will demonstrate the ability to use pharmacy management software for tasks such as prescription processing, inventory control, and generating patient medication records.	P3
CO4	Analyze Pharmacy Data for Improved Patient Care Students will use data analysis tools to interpret pharmacy data, identifying trends that can improve medication safety, adherence, and patient outcomes.	P4
CO5	Evaluate the Implement Electronic Health Records (HER) and e-Prescribing Students will gain hands-on experience with HER systems and e-prescribing, understanding their impact on patient care continuity and pharmacy workflow efficiency.	P5
CO6	Creating Innovative approaches to Students will learn about the legal and ethical considerations in using computer applications in pharmacy, including data privacy and security protocols.	P6

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Course of study for semester III

BP301T **Pharmaceutical Organic Chemistry II – Theory**

Course outcome number	Course Outcomes	Cognitive level
CO1	Recall the analytical, synthetic, and other evidence used in deriving the structure of benzene.Explain the orbital picture, resonance in benzene, aromatic characters, and Huckel's rule.	C1
CO2	Apply knowledge of reactions of benzene, including nitration, sulphonation, halogenation, Friedel-Crafts alkylation, and Friedel-Crafts acylation.	C2
CO3	Analyse the impact of substituents on reactivity and orientation of mono-substituted benzene compounds towards electrophilic substitution reactions.	C3
CO4	Evaluate the acidity of phenols, effects of substituents on acidity, and understand the basicity of aromatic amines and the synthetic uses of aryl diazonium salts.	C4
CO5	Synthesise knowledge on fatty acids, their reactions (hydrolysis, hydrogenation, saponification, and rancidity), and analytical constants (acid value, saponification value, ester value, iodine value, acetyl value, Reichert Meissl value).	C5
CO6	Apply understanding of the synthesis, reactions, structure, and medicinal uses of polynuclear hydrocarbons (naphthalene, phenanthrene, anthracene, diphenylmethane, triphenylmethane) and cycloalkanes (Baeyer's strain theory, Coulson and Moffitt's modification, Sachse Mohr's theory).	C6

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BP302T Physical Pharmaceutics I – Theory

Course outcome number	Course Outcomes	Cognitive level
CO1	Recall and describe the fundamental principles of solubility and distribution of drugs in different systems, including gases, liquids, and solids.	C1
CO2	Explain the mechanisms of solute-solvent interactions, the concept of ideal solubility parameters, and the principles behind Raoult's law and real solutions.	C2
CO3	Apply quantitative approaches to assess and predict factors influencing drug solubility, as well as analyze the critical solution temperature and its applications in pharmaceutical formulations.	C3
CO4	Analyse the states of matter, latent heats, vapor pressure, and properties of matter concerning pharmaceuticals, and assess the impact of different states on drug formulation and delivery.	C4
CO5	Evaluate the physicochemical properties of drug molecules, such as refractive index, optical rotation, dielectric constant, and dipole moment, and assess their significance in pharmaceutical applications.	C5
CO6	Develop an understanding of complexation, protein binding, and their implications in drug action, and propose innovative solutions or formulations based on crystalline structures and stability constants. These course outcomes are designed to cover all aspects of the Physical Pharmaceutics Theory course content and align with different cognitive levels of Bloom's Taxonomy, ensuring a comprehensive and in-depth understanding of the subject matter for students.	C6

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BP303T Pharmaceutical Microbiology – Theory

Course outcome number	Course Outcomes	Cognitive level
CO1	Understanding about the importance of microbiology in pharmaceutical sciences and know the isolation and preservation methods for animal cell and transformed cell cultures, pure cultures including quantitative measurement of bacterial growth and cell cultures application in pharmaceutical industry	C1
CO2	Explain about different microscope and microscopical techniques and Apply for the identification of bacteria using different staining method.	C2
CO3	Classify the different sterilization methods, sterility indicators, and different disinfectant techniques, sterility testing and their factors affect on the fungi and virus depends on their proper study	C3
CO4	Apply the knowledge acquired about the design of aseptic area and the different source of contamination present in aseptic area with the help of different microbial assay techniques.	C4
CO5	Analyze the different aseptic techniques like laminar air flow for take the preventive measurement from contamination and make an aseptic or clean area.	C5
CO6	Developing the Preservation of pharmaceutical products using antimicrobial agents and evaluation of microbial stability of formulations.	C6

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BP304T Pharmaceutical Engineering – Theory

Course outcome number	Course Outcomes	Cognitive level
CO1	Able to recall and describe the fundamental principles of fluid flow, including types of manometers, Bernoulli's theorem, and energy losses. Remember the mechanisms and laws governing size reduction, as well as the principles of size separation and heat transfer mechanisms.	C1
CO2	Demonstrate an understanding of the principles of heat transfer, evaporation, distillation, drying processes, and mixing. They will explain the differences between various heat processes and comprehend the mechanisms of drying, mixing, and distillation.	C2
CO3	Apply their knowledge to practical situations by explaining the construction, working, and uses of various equipment such as Hammer mill, ball mill, evaporators, distillation units, dryers, and mixers. Apply the principles of filtration and centrifugation to different scenarios.	C3
CO4	Analyze the factors affecting size reduction, size separation, and heat transfer. Also analyze the principles and mechanisms of drying, mixing, filtration, and centrifugation, identifying their applications and importance in pharmaceutical engineering.	C4
CO5	Evaluate the merits and demerits of various pharmaceutical engineering equipment and processes, such as evaporators, distillation methods, dryers, mixers, filters, and centrifuges. They will assess the efficiency and suitability of different equipment for specific pharmaceutical applications.	C5
CO6	Apply their knowledge to create solutions for materials selection in pharmaceutical plant construction and the prevention of corrosion. develop an understanding of the types of materials used, their properties, and corrosion prevention methods, contributing to the design and maintenance of pharmaceutical plants.	C6

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BP305P Pharmaceutical Organic Chemistry II – Practical

Course outcome number	Course Outcomes	Psychomotor Level
CO1	Imitate and execute laboratory techniques including recrystallization and steam distillation. Manipulate laboratory apparatus proficiently during experiments.	P1
CO2	Demonstrate precision in determining oil values (acid value, saponification value, iodine value) including the standardisation of reagents.Manipulate reagents and instruments with accuracy during the determination process.	P2
CO3	Articulate the procedures involved in the synthesis of compounds like benzanilide, 2,4,6-tribromo aniline, 5-nitro salicylic acid, benzoic acid, 1-phenyl azo-2-naphthol, benzil, dibenzal acetone, cinnamic acid, and p-iodo benzoic acid. Apply learned principles to predict outcomes and mechanisms in compound synthesis.	P3
CO4	Articulate the synthesis of complex compounds involving multistep reactions.Apply integrated knowledge to successfully perform multistep synthesis, exemplified by the synthesis of compounds like dibenzal acetone and p-iodo benzoic acid.	P4
CO5	Apply knowledge to troubleshoot and adapt experimental procedures in response to unexpected results. Imitate good laboratory practices and safety measures during experimental work.	P5

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BP306P Physical Pharmaceutics I – Practical

Course outcome number	Course Outcomes	Psychomotor Level
CO1	Demonstrate the ability to perform solubility determination experiments at room temperature accurately and safely, following established laboratory protocols.	P1
CO2	Show proficiency in performing experiments to determine the pKa value of a drug using the Half Neutralization/Henderson Hasselbalch equation, highlighting precision and attention to detail.	P2
CO3	.Successfully conduct experiments to determine the partition coefficient of benzoic acid in benzene and water, showcasing skill in handling and manipulating chemical systems.	P2
CO4	Competently carry out experiments to determine the partition coefficient of iodine in CCl4 and water, emphasizing the ability to manipulate substances and apparatus safely and effectively.	P2
CO5	Display a high level of precision in determining the % composition of NaCl in a solution using the phenol-water system by the CST method, ensuring accurate and repeatable results.	P3
CO6	Demonstrate the ability to measure and articulate surface tension values of various liquids using the drop count and drop weight methods, showcasing expertise in experimental techniques and data interpretation.	P4

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BP307P **Pharmaceutical Microbiology – Practical**

Course outcome number	Course Outcomes	Cognitive level
CO1	**Follow** the procedure for the apparatus used in experimental microbiology, sterilizing glassware and preparing media, motility characters and methods of isolation of pure culture.	P1
CO2	**Carry out** the staining techniques to identify the different types bacteria.	P2
CO3	**Complete** the procedure Sub culturing of bacteria Nutrient stabs and slants preparations.	P3
CO4	**Apply** the skills acquired about Biochemical testing for the identification of micro-organisms.	P4
CO5	**Determine** the microbiological assay of antibiotics by cup plate method	P5

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BP 308P **Pharmaceutical Engineering –Practical**

Course outcome number	Course Outcomes	Psychomotor Level
CO1	Able to replicate and demonstrate the procedures for the determination of radiation constants of different materials, steam distillation efficiency calculation, and the operation of various pharmaceutical machinery, such as rotary tablet machines, fluidized bed coaters, and fluid energy mills, by accurately following step-by-step instructions.	P1
CO2	Develop the skills required for hands-on manipulation of equipment and materials during practical's. Practice techniques related to steam distillation, construction of drying curves, determination of moisture content, and size analysis by sieving with precision.	P2
CO3	Demonstrate precision in conducting experiments related to pharmaceutical engineering. including determining the overall heat transfer coefficient, calculating the efficiency of steam distillation, and constructing size frequency curves with arithmetic and logarithmic probability plots.	P3
CO4	Articulate their understanding of the principles, construction, working, and applications of pharmaceutical machinery such as fluidized bed dryers, freeze dryers, and colloid mills. Able to explain the factors affecting the rate of filtration and evaporation.	P4
CO5	Apply their knowledge and skills to natural situations, including studying the effect of time on the rate of crystallization and calculating the uniformity index using a Double Cone Blender. Develop a comprehensive understanding of the practical aspects of pharmaceutical engineering.	P5
CO6	Demonstrate precision in conducting experiments related to size reduction using a ball mill, including verifying the laws of size reduction, determining coefficients, power requirements, and critical speeds. Develop expertise in handling and operating equipment accurately.	P5

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Course of study for semester IV

BP401T **Pharmaceutical Organic Chemistry III– Theory**

Course outcome number	Course Outcomes	Cognitive level
CO1	**Recall** the fundamental concepts of stereochemistry, including optical isomerism, geometrical isomerism, conformational isomerism, and atropisomerism, along with their respective nomenclature systems.	C1
CO2	**Demonstrate** a comprehensive understanding of stereochemistry principles, including the concepts of chirality, achirality, and symmetry, and their significance in organic molecule behavior and reactivity.	C2
CO3	**Explain** the outcome of stereospecific and stereoselective reactions and methods for determining the configuration of geometrical isomers.	C3
CO4	**Analyze** the structural features, synthesis methods, reactions, and medicinal uses of various heterocyclic compounds, including pyrrole, furan, thiophene, pyrazole, imidazole, oxazole, thiazole, pyridine, quinoline, isoquinoline, acridine, and indole.	C4
CO5	**Evaluate** heterocyclic compounds' relative aromaticity, reactivity, their importance in medicinal chemistry and drug design.	C5

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BP402T Medicinal Chemistry I – Theory

Course outcome number	Course Outcomes	Cognitive level
CO1	Remembering: Students will be able to recall the fundamental physicochemical properties crucial for understanding drug action, including ionisation, solubility, partition coefficient, and protein binding.	C1
CO2	Understanding: Students will demonstrate an understanding of the principles of drug metabolism, distinguishing between Phase I and Phase II reactions, and recognizing the factors influencing drug metabolism, such as stereochemical aspects.	C2
CO3	Analysing: By analysing the biosynthesis, distribution, and pharmacological actions of cholinergic neurotransmitters and receptors, students will be able to differentiate between direct and indirect acting cholinomimetic agents and cholinergic blocking agents.	C3
CO4	Evaluating: Students will evaluate the mechanisms of action and pharmacological profiles of different classes of drugs acting on the central nervous system, including sedatives, hypnotics, antipsychotics, and anticonvulsants, to assess their efficacy and potential side effects.	C4
CO5	Evaluating: Students will evaluate the mechanisms of action and pharmacological profiles of different classes of drugs acting on the central nervous system, including sedatives, hypnotics, antipsychotics, and anticonvulsants, to assess their efficacy and potential side effects.	C5
CO6	Creating: Through synthesising information on various classes of general anaesthetics, narcotic and non-narcotic analgesics, and anti-inflammatory agents, students will design rational drug regimens for pain management and anaesthesia, considering factors such as potency, duration of action, and adverse effects.	C6

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BP403T Physical Pharmaceutics II – Theory

Course outcome number	Course Outcomes	Cognitive level
CO1	Recall and list the classifications and general characteristics of colloidal dispersions, including size and shape of colloidal particles, as well as the properties associated with colloids.	C1
CO2	Explain the optical, kinetic, and electrical properties of colloidal dispersions, and demonstrate an understanding of the effects of electrolytes, coacervation, peptization, and protective action in colloidal systems.	C2
CO3	Apply knowledge of rheology to identify and characterize Newtonian and non-Newtonian systems, such as pseudoplastic, dilatant, and plastic fluids. Demonstrate the ability to determine viscosity using various viscometers.	C3
CO4	Analyze the interfacial properties of suspended particles in coarse dispersions, including the settling behavior in suspensions, formulation of flocculated and deflocculated suspensions, and theories of emulsification. Evaluate the stability and rheological properties of emulsions.	C4
CO5	Evaluate the principles of micromeretics, including particle size and distribution, methods for determining particle size and surface area, as well as the derived properties of powders. Assess factors influencing drug stability, such as reaction kinetics, temperature, solvent, and catalysis.	C5
CO6	Develop strategies for stabilizing medicinal agents against common reactions like hydrolysis and oxidation, and propose methods for accelerated stability testing in expiration dating of pharmaceutical dosage forms. Formulate approaches to prevent photolytic degradation. These course outcomes are designed to cover all aspects of the Physical Pharmaceutics II Theory course content and align with different cognitive levels of Bloom's Taxonomy, ensuring a comprehensive and in-depth understanding of the subject matter for students.	C6

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BP404T Pharmacology I – Theory

Course outcome number	Course Outcomes	Cognitive level
CO1	Memorize and comprehend the fundamental concepts and principles of pharmacology, including the definition, historical landmarks, and scope of pharmacology, as well as the nature and source of drugs.	C1
CO2	Explain enzyme induction, enzyme inhibition, kinetics of elimination, and how these factors affect drug actions and interactions	C2
CO3	Apply their knowledge of pharmacokinetics to understand and analyze the processes of drug absorption, distribution, metabolism, and excretion.	C3
CO4	Analyze the classification of neurotransmitters and their importance in ANS function and understanding of drugs acting on the peripheral nervous system, including parasympathomimetics, parasympatholytics, sympathomimetics, sympatholytics, neuromuscular blocking agents, skeletal muscle relaxants, and local anesthetic agents	C4
CO5	Evaluate the pharmacology of drugs acting on the CNS, including general anesthetics, pre-anesthetics, sedatives, hypnotics, centrally acting muscle relaxants, anti-epileptics, alcohols, and disulfiram. The pharmacology of drugs used in Parkinson's disease, Alzheimer's disease, and drug addiction, including drug abuse, tolerance, and dependence.	C5
CO6	Creativity by applying their knowledge to propose strategies for the management and treatment of various CNS disorders, such as Parkinson's disease, Alzheimer's disease, and drug addiction.	C6

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BP405T Pharmacognosy and Phytochemistry I– Theory

Course outcome number	Course outcome	Cognitive level
CO1	Describe and define in detail about the history, present status, future, scope, development of pharmacognosy and various systems of medicines.	C1, C2, C4, C5
CO2	Explain the methods of cultivation, collection, processing, storage and crude drugs classification, marine drugs and plant fibres.	C1, C2, C3, C4, C5, C6
CO3	Apply the suitable methods to detect different types of adulteration.	C1, C2, C3, C4, C5
CO4	Compare and contrast different types of plant tissue culture, primary & secondary metabolites.	C1, C2, C3, C4
CO5	Assess the quality control of crude drugs by various methods of evaluation.	C1, C2, C3, C4, C5

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BP406P Medicinal Chemistry I – Practical

Course outcome number	Course Outcomes	Psychomotor Level
CO1	By the end of this course, students will be able to demonstrate their understanding of the synthesis of various heterocyclic compounds such as 1,3-pyrazole, 1,3-oxazole, benzimidazole, benzotriazole, and 2,3-diphenyl quinoxaline through imitation (P1), manipulation (P2), and precision (P3) in the laboratory setting	P1
CO2	Students will be proficient in articulating (P4) the synthesis and properties of local anaesthetics like benzocaine, anti-epileptic drugs like phenytoin, and antipsychotic agents like phenothiazine, by correlating theoretical knowledge with practical observations, thereby demonstrating their understanding at the precision (P3) and articulation (P4) levels	P2
CO3	Upon completion of this course, students will be able to assay (P2) drugs such as chlorpromazine, phenobarbitone, atropine, ibuprofen, aspirin, and furosemide using various analytical techniques, thereby demonstrating their proficiency in manipulation (P2) and precision (P3) in pharmaceutical analysis.	P3
CO4	Students will be capable of determining the partition coefficient of drugs (P3) and correlating it with their physicochemical properties, thereby exhibiting a deeper understanding of drug distribution in different phases. This outcome involves manipulation (P2), precision (P3), and articulation (P4) skills	P4
CO5	By the end of the course, students will be able to apply their knowledge and skills to solve complex problems related to drug synthesis, analysis, and distribution, demonstrating naturalisation (P5) of learned concepts. This outcome integrates imitation (P1), manipulation (P2), precision (P3), articulation (P4), and naturalisation (P5) levels of Bloom's taxonomy.	P5

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BP407P Physical Pharmaceutics II – Practical

Course outcome number	Course Outcomes	Psychomotor Level
CO1	Demonstrate the ability to accurately perform particle size determination and particle size distribution using the sieving method, following established laboratory procedures.	P1
CO2	Proficiently use microscopic methods to determine particle size and particle size distribution, showcasing precision in handling and manipulating microscopic equipment.	P2
CO3	.Measure and calculate bulk density, true density, and porosity with precision, highlighting attention to detail and accurate data recording.	P3
CO4	Conduct experiments to determine the angle of repose and assess the influence of lubricants on the angle of repose, demonstrating the ability to manipulate materials and analyze outcomes.	P4
CO5	Measure and determine the viscosity of liquids using Ostwald's viscometer with precision and accuracy, showcasing expertise in handling laboratory equipment.	P5
CO6	Perform accelerated stability studies, demonstrating the ability to plan, execute, and interpret the results of stability tests, and make informed decisions based on the data obtained.	P6

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BP408P Pharmacology I – Practical

Course outcome number	Course Outcomes	Psycomotor level
CO1	Adhere the proper techniques and procedures involved in experimental pharmacology.	P1
CO2	Manipulate and observe the effect of drugs on ciliary motility of the frog esophagus.	P2
CO3	Manipulate and analyze the effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice.	P2
CO4	Calibrate in their measurements and observations, analyzing the data to draw conclusions about the effects of the drugs on the rabbit eye. .	P3
CO5	Articulate the steps involved in these techniques and explain their purposes and importance in experimental pharmacology	P4
CO6	Naturalized understanding of the effects and considerations associated with each route of administration.	P5

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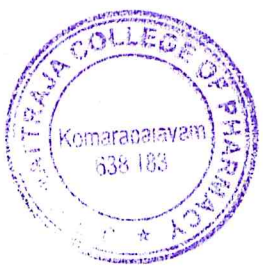
BP409P Pharmacognosy and Phytochemistry I – Practical

Course outcome number	Course outcome	Psychomotor level
CO1	Carryout the identification test for unorganised crude drugs	**P1, P3, P5**
CO2	Demonstrate the various quantitative microscopically study of cure drugs.	**P1, P2, P3, P5**
CO3	Perform the linear measurements of starch grains, fibres and calcium oxalate crystals.	**P1, P2, P3, P5**
CO4	Integrate the physical evaluation of crude drugs for their quality assessment.	**P1, P2, P3, P5**
CO5	Follow the procedure of swelling and foaming index of crude drugs.	**P1, P2, P3, P5**



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Course of study for semester V

BP501T **Medicinal Chemistry II – Theory**

Course outcome number	Course Outcomes	Cognitive level
CO1	**Recall** and explain the key concepts related to medicinal chemistry, including the classification of anti-histaminic agents, anti-neoplastic agents, anti-anginal drugs, anti-hypertensive agents, anti-arrhythmic drugs, anti-hyperlipidemic agents, coagulants, and anticoagulants.	C1
CO2	**Demonstrate** an understanding of the mechanisms of action and pharmacological properties of various drug classes discussed in the course, such as anti-neoplastic agents, diuretics, and drugs acting on the endocrine system.	C2
CO3	**Apply** knowledge of drug structure-activity relationships to predict the potential therapeutic effects and adverse reactions of specific drugs, including local anesthetics and anti-diabetic agents.	C3
CO4	**Analyze** and compare the mechanisms of action and pharmacological profiles of different anti-histaminic agents, anti-arrhythmic drugs, and anti-hypertensive agents, evaluating their suitability for specific clinical conditions.	C4
CO5	**Evaluate** the therapeutic efficacy and safety of selected drug classes, such as anti-neoplastic agents and anti-hyperlipidemic agents, considering patient-specific factors and potential drug interactions.	C5
CO6	**Integrate** knowledge of drug design principles and medicinal chemistry concepts to propose novel drug candidates or modifications to existing drugs, addressing unmet clinical needs or improving drug performance in specific disease states.	C6

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BP502T Industrial PharmacyI– Theory

Course outcome number	Course Outcomes	Cognitive level
CO1	Carry out assessment of physicochemical properties of drugs as a tool in the optimization of solid and liquid dosage forms.	C1
CO2	Formulate and prepare tablets, capsules and liquid orals using established procedures and technology.	C2
CO3	Identify containers, closures, valves and propellants for different types of aerosol systems Describe the facilities and standards necessary for the industrial production of sterile dosage forms.	C3
CO4	Formulate and prepare different types of parenteral and ophthalmic dosage forms	C4
CO5	Evaluate the pharmaceutical dosage forms for quality and stability and compare with standards prescribed in the pharmacopoeia, evaluate appropriate packaging materials for various pharmaceutical dosage forms.	C5
CO6	Select ingredients and formulate cosmetics such as lipsticks, shampoos, cold cream and vanishing cream, toothpastes, hair dyes and sunscreens	C6

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BP503T Pharmacology II – Theory

Course outcome number	Course Outcomes	Cognitive level
CO1	Memorizing and comprehend the fundamental concepts and principles of pharmacology related to drugs acting on the cardiovascular system.	C1
CO2	Understanding the hemodynamics and electrophysiology of the heart, as well as the classification and mechanisms of action of drugs used in congestive heart failure, anti-hypertensive drugs, anti-anginal drugs, anti-arrhythmic drugs, and anti-hyperlipidemic drugs.	C2
CO3	Apply their knowledge of pharmacology to analyze the pharmacological management of shock. They will evaluate the use of hematinics, coagulants, anticoagulants, fibrinolytics, anti-platelet drugs, and plasma volume expanders in various clinical scenarios.	C3
CO4	Analyze the mechanisms of action, therapeutic uses, and potential side effects of histamine, 5-HT, prostaglandins, thromboxanes, leukotrienes, angiotensin, bradykinin, substance P, non-steroidal anti-inflammatory agents, anti-gout drugs, and antirheumatic drugs.	C4
CO5	Evaluate the mechanisms of action and therapeutic uses of drugs acting on the anterior pituitary hormones, thyroid hormones, hormones regulating plasma calcium levels, insulin, oral hypoglycemic agents, glucagon, ACTH, corticosteroids, and androgens/anabolic steroids.	C5
CO6	Testing the bioassay methods used for insulin, oxytocin, vasopressin, ACTH, d-tubocurarine, digitalis, histamine, and 5-HT, recognizing their importance in drug development and research.	C5

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BP504T Pharmacognosy and Phytochemistry II– Theory

Course outcome number	Course outcome	Cognitive level
CO1	Memorizing primary and secondary metabolic pathways	C1, C2, C3, C4
CO2	Illustrate composition, chemistry & chemical classes, biosources, therapeutic uses and commercial application of secondary metabolites.	C1, C2, C3, C4, C5, C6
CO3	Apply the right method of production, estimation of some important phytoconstituents.	C3, C4, C5,
CO4	Analyze the isolated various constituents viz. Terpenoids, Glycosides, Alkaloids and Resins from the crude drugs.	C3, C4, C5,
CO5	Validating the isolated compounds by Spectroscopy, chromatography and electrophoresis techniques.	C3, C4, C5, C6

BP505T Pharmaceutical Jurisprudence – Theory

CO Number	Coursera Outcomes	Cognitive level
CO 1	Knowledge of the act's objectives, definitions, and legal provisions. Understanding the legalities surrounding the import and manufacture of drugs.	C2, C3
CO 2	In-depth knowledge of the specified schedules and requirements for selling drugs. Understanding offenses, penalties, labelling , and packing.	C2, C3, C4
CO 3	Comprehension of the objectives, definitions, and legal provisions under various acts. Understanding of registration, licensing, and legal frameworks surrounding narcotics and medicinal preparations.	C2, C2,C4
CO 4	Knowledge of objectives and provisions under different acts. Understanding animal ethics and pharmaceutical pricing.	C2,C3,C5
CO 5	Awareness of different committees and their recommendations. Understanding pharmaceutical ethics and compliance with the pharmacist's oath.	C2,C5,C6

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BP506P Industrial PharmacyI – Practical

Course outcome number	Course Outcomes	Cognitive level
CO1	Preformulation studies on paracetamol/asparin/or any other	P1
CO2	Preparation of Paracetamol tablets, Aspirin tablets, Tetracycline capsules, Calcium Gluconate injection, Ascorbic Acid injection	P2
CO3	Quality control test of (as per IP) marketed tablets and capsules	P3
CO4	Evaluation of Paracetamol tablets, Aspirin tablets, Tetracycline capsules, Calcium Gluconate injection, Ascorbic Acid injection	P4
CO5	Preparation of Eye drops/ and Eye ointments Preparation of Creams (cold / vanishing cream) Evaluation of Glass containers (as per IP)	P5

BP507P Pharmacology II – Practical

Course outcome number	Course Outcomes	Psycomotor level
CO1	Imitate the ability to prepare physiological salt solutions accurately for in-vitro pharmacology experiments.	P1
CO2	Meticulously measure and record changes in blood pressure and heart rate in dogs following drug administration, demonstrating precision in data collection.	P2
CO3	Perform experiments to assess the effect of drugs on isolated frog hearts and demonstrate the correct manipulation of equipment and procedures.	P3
CO4	Articulating the mechanisms of action of the drugs used and their impact on renal function.	P4
CO5	Articulate the effects of physostigmine and atropine on the DRC of acetylcholine using frog rectus abdominis muscles and rat ileum and differences in cholinergic responses and drug mechanisms.	P4

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BP508P Pharmacognosy and Phytochemistry II – Practical

Course outcome number	Course outcome	Psychomotor level
CO1	Adhere the procedure for morphological, microscopical study of crude drugs.	**P1, P2, P3**
CO2	Carryout the isolation and detection of Caffeine, Diosgenin, Atropine, Sennosides.	**P1, P3, P5**
CO3	Perfome the identification test for unorganised crude drugs.	**P1, P2, P3**
CO4	Execute the extraction and chemical identification of some important crude drugs.	**P1, P3, P5**
CO5	Demonstrate the paper chromatography, TLC and distillation.	**P1, P3, P5**

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Course of study for semester VI

BP601T **Medicinal Chemistry III – Theory**

Course outcome number	Course Outcomes	Cognitive level
CO1	**Recall** the historical background, nomenclature, stereochemistry, structure-activity relationships, and chemical degradation of antibiotics, including β-lactam antibiotics, aminoglycosides, and tetracyclines.	C1
CO2	**Explain** the classification and important products of antibiotics like β-lactam antibiotics, aminoglycosides, and tetracyclines.	C2
CO3	**Apply** the principles of structure-activity relationships to predict the activity of antibiotics.	C3
CO4	**Analyze** the historical background, nomenclature, stereochemistry, structure-activity relationships, and classification of antibiotics such as macrolides and miscellaneous antibiotics.	C4
CO5	**Evaluate** the concept and application of prodrug design in the context of antibiotic therapy and prodrugs in general.	C5
CO6	**Create** an understanding of drug design approaches, including quantitative structure-activity relationships (QSAR), pharmacophore modeling, docking techniques, and combinatorial chemistry, and their applications in drug discovery.	C6

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BP602T Pharmacology III – Theory

Course outcome number	Course Outcomes	Cognitive level
CO1	Remembering the classifications and pharmacological characteristics of drugs acting on the respiratory system and gastrointestinal tract as well as their therapeutic applications.	C1
CO2	Understanding the mechanisms of action of anti-asthmatic drugs, antiulcer agents, antibiotics, and other drug categories discussed in the course, demonstrating a deep understanding of their effects on the body.	C2
CO3	Applying pharmacological knowledge to analyse and propose treatment strategies for specific respiratory conditions like COPD, gastrointestinal disorders, and infectious diseases using the appropriate drugs covered in the course.	C3
CO4	Analyse the potential side effects, drug interactions, and contraindications associated with the drugs mentioned in the course content to make informed decisions about drug therapy.	C4
CO5	Evaluate the effectiveness and safety of various drug therapies, including immunostimulants, immunosuppressants, and chemotherapeutic agents, considering patient-specific factors and the latest research findings.	C5
CO6	Creating innovative approaches to address emerging challenges in pharmacology, such as drug resistance in infectious diseases or novel strategies for cancer chemotherapy, incorporating advanced concepts like protein drug and biosimilars.	C6

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BP603T Herbal Drug Technology – Theory

Course outcome number	Course outcome	Cognitive level
CO1	Define the different terms prescribed by the WHO guidelines for herbal drugs. Outline the GAP, GMP and herbal drug industry.	C1,C2, C3, C4, C5
CO2	Categorizing the various ingredients used for the preparation of herbal cosmetics.	C1,C2, C3, C4, C5, C6
	Summarizing the Patenting, Regulatory requirements and issues of natural products	C2, C3, C4, C5,C6
CO3	Choose the right nutraceuticals for treatment of various diseases along with study of herbal-drug and herb-food interactions.	C2, C3, C4, C5,C6
CO4	Apply the suitable concept of Indian system of medicine for the formulation of different dosage forms	C2, C3, C4, C5,C6
CO5	Validate the herbal drugs based on the WHO & ICH guidelines	C1, C2, C3, C4, C5,C6

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BP604T **Biopharmaceutics and Pharmacokinetics – Theory**

Course outcome number	Course Outcomes	Cognitive level
CO1	Remembering: Recall and define the basic concepts in biopharmaceutics and pharmacokinetics. This involves remembering key terms, definitions, and fundamental concepts related to these fields.	C1
CO2	Explain the selection of the correct pharmacokinetic model based on plasma level or urinary excretion data that best describes the process of drug absorption, distribution, metabolism, and elimination (ADME). This involves grasping the underlying principles and concepts behind different pharmacokinetic models.	C2
CO3	Determine the effect of pharmacokinetic (ADME) parameters on the biological effects of the drug by applying a one-compartment open model. This involves using knowledge and concepts to solve practical problems related to drug pharmacokinetics.	C2
CO4	Calculate various pharmacokinetic parameters from plasma and urinary excretion data by applying a multi-compartment model. This requires breaking down complex data and applying mathematical and analytical skills to derive pharmacokinetic parameters.	C3
CO5	Design dosage regimens for patients based on calculated pharmacokinetic parameters. This involves synthesizing information and creating customized drug dosage plans tailored to specific patient needs.	C4
CO6	Use plasma drug concentration-time data to calculate the pharmacokinetic parameters of a drug product by nonlinear pharmacokinetics. Additionally, calculate various pharmacokinetic parameters from plasma and urinary excretion data by applying non-compartmental pharmacokinetics. Finally, demonstrate the ability to design a basic protocol for the conduct of a bioavailability/bioequivalence (BA/BE) study and interpret the BA/BE data. This level involves critical thinking, assessment, and decision-making based on complex pharmacokinetic data and regulatory requirements.	C5

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BP605T Pharmaceutical Biotechnology – Theory

Course out come	OUT COME	LEVEL OF BLOOMS TAXANOMY
CO 1	**After a successful completion of the course, the students will:** • Interpret and report enzyme immobilization • Memorise and transfer the knlowdge on biosensors • Understand Protein Engineering & genetic engineering • Transfer the knowledge on enzyme production	C3
CO 2	• Understand Recombinant DNA technology & PCR. • To manufacture drugs by genetic engineering (i) Interferon ii) Vaccines- hepatitis- B iii) Hormones-Insulin)	C3
CO 3	• Understand and remember on immunology, immune & blood products • Develop production manual of vaccines oxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products.	C6
CO 4	• Understand various Immuno blotting techniques, Genetic organization of cells. • Memorise genetic process • Apply Microbial biotransformation and its applications.	C3
CO 5	• Use microorganisms in fermentation technology • Understand the concepts and construction of fermentor • Manufacture antibiotics and vitamins using genetic engineering and fermentation techniques	C6

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BP606T **Quality Assurance –Theory**

Course outcome number	Course Outcomes	Cognitive level
CO1	**Recall** and define key concepts related to quality assurance and quality management in the pharmaceutical industry. They will remember the definitions and principles of Quality Control, Good Laboratory Practices (GLP), ISO standards, and NABL accreditation.	C1
CO2	**Understanding** of the underlying concepts and principles of pharmaceutical quality management. They will comprehend the elements of Total Quality Management (TQM), ICH Guidelines, Quality by Design (QbD), and the importance of ISO 9000 and ISO 14000 standards.	C2
CO3	**Apply** their knowledge to real-world scenarios in the pharmaceutical industry. They will apply quality control tests for containers and packing materials, implement Good Laboratory Practices, and apply principles of calibration and validation in analytical methods.	C3
CO4	**Analyze** pharmaceutical processes and practices critically. They will analyze the organization and personnel responsibilities, facility design and maintenance, equipment selection and maintenance, and the handling of complaints and product recalls.	C4
CO5	**Evaluate** the quality documentation and audit processes in the pharmaceutical industry. They will assess the importance of quality review, document maintenance, and distribution records in ensuring product quality and regulatory compliance.	C5
CO6	**Create** a design quality assurance and management systems for pharmaceutical operations. They will create validation master plans and apply principles of good warehousing practice and materials management to ensure the quality and safety of pharmaceutical products.	C6

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BP607P Medicinal chemistry III – Practical

Course outcome number	Course Outcomes	Cognitive level
CO1	**Imitate** the laboratory procedures for the preparation of drugs and intermediates, such as sulphanilamide, 7-Hydroxy, 4-methyl coumarin, and Chlorobutanol.	P1
CO2	**Manipulate** chemical reagents, equipment, and techniques to synthesize the specified compounds accurately.	P2
CO3	**Perform** the drug preparation procedures with precision to achieve the desired outcomes.	P3
CO4	**Articulate** the principles and techniques used in drug assay procedures.	P4
CO5	**Develop** proficiency in drug likeliness screening using Lipinski's Rule of Five (RO5) and understand the principles of drug likeliness assessment.	P5

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BP608P Pharmacology III – Practical

Course outcome number	Course Outcomes	Psychomotor Level
CO1	Achieve precision in dose calculations for pharmacological experiments, ensuring accurate drug administration and dosing in various experimental setups.	P1
CO2	Imitation: determination of acute oral toxicity (LD50), acute skin irritation/corrosion, and acute eye irritation/corrosion, ensuring compliance with safety guidelines and ethical considerations.	P1
CO3	Demonstrate proficient manipulation skills in conducting experiments, including the mast cell stabilization assay, NSAID-induced ulcer model, and serum biochemical parameter estimation using semi-autoanalyzers.	P2
CO4	Articulate a clear understanding of the procedures involved in studying the effects of drugs on gastrointestinal motility, agonists and antagonists on guinea pig ileum, and the insulin hypoglycemic effect in rabbits, while explaining the scientific basis for each experiment.	P3
CO5	Naturalization & evaluate by conducting experiments with confidence, integrating knowledge and skills to design, execute, and troubleshoot experiments related work. Apply biostatistical methods, such as student's t-test, ANOVA, Chi-square test, and Wilcoxon Signed Rank test, to assess the significance of experimental results and draw meaningful conclusions.	P4& P5

BP609P Herbal Drug Technology – Practical

Course outcome number	Course outcome	Psychomotor level
CO1	Repeat the monograph analysis of herbal drugs from recent pharmacopoeias.	**P1,P2, P3**
CO2	Implement the right procedure for assessment of excipients of natural origin and alcohol content of Asava & Arista.	**P1,P2, P3**
CO3	Perfome the preliminary phytochemical screening of crude drugs and preparation, standardization of herbal cosmetics.	**P1,P2, P3**
CO4	Carry out the analysis of aldehyde content, phenol content and total alkaloids.	**P1,P2, P3, P5**
CO5	Demonstrate the preparation and standardization of different herbal formulation.	**P1,P2, P3, P5**

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Course of study for semester VII

BP701T Instrumental Methods of Analysis – Theory

Course outcome number	Course Outcomes	Cognitive level
CO1	**Recall** and describe the fundamental principles and concepts related to UV Visible spectroscopy, electronic transitions, and the basics of various spectroscopic techniques, including IR spectroscopy, flame photometry, and atomic absorption spectroscopy.	C1
CO2	**Understanding** of the underlying principles of various spectroscopic techniques and their applications. They will be able to explain the significance of chromophores, auxochromes, and spectral shifts in UV Visible spectroscopy and comprehend the factors affecting vibrations in polyatomic molecules in IR spectroscopy.	C2
CO3	**Apply** their knowledge to solve practical problems in the field of analytical chemistry. They will apply Beer and Lambert's law to calculate concentrations, choose appropriate instrumentation for specific applications, and troubleshoot deviations in spectroscopic measurements.	C3
CO4	**Analyze** and interpret complex spectral data. They will be able to analyze fluorescence phenomena, identify factors influencing fluorescence, and evaluate the impact of quenching. Additionally, they will analyze interferences and challenges in various chromatographic techniques.	C4
CO5	**Evaluate** the suitability of different spectroscopic and chromatographic techniques for specific analytical tasks. They will critically assess the advantages and disadvantages of various methods and make informed decisions about instrument selection and methodology.	C5
CO6	**Create** a design and implement analytical experiments using a variety of spectroscopic and chromatographic techniques. They will create analytical methods for the quantitative and qualitative analysis of substances and design experiments to address specific research questions in analytical chemistry. They will also demonstrate creativity in problem-solving and method development.	C6

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BP702T Industrial PharmacyII – Theory

Course outcome number	Course Outcomes	Cognitive level
CO1	To remember the Pilot plant scale up considerations for solids, liquid orals, semi solids and Historical overview of Regulatory Affairs, Regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professionals	C1
CO2	To understand the WHO guidelines for Technology Transfer(TT): Terminology, Technology transfer protocol, Transfer from R & D to production (Process, packaging and cleaning), Granularity of TT Process (API, excipients, finished products, packaging materials) Documentation, Premises and equipment's, qualification and validation, quality control, analytical method transfer, Approved regulatory bodies and agencies, Commercialization - practical aspects and problems (case studies), TT agencies in India - APCTD, NRDC, TIFAC, BCIL, TBSE / SIDBI; TT related documentation - confidentiality agreement, licensing, MoUs, legal issues and, Regulatory requirements for drug approval and, Indian Regulatory Requirement.	C2
CO3	To apply Concept of Quality, Total Quality Management, Quality by Design (QbD), Six Sigma concept, Out of Specifications (OOS), Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP for industries	C3

BP703T Pharmacy Practice – Theory

CO CODE	COURSE OUTCOME	COGNITIVE LEVEL
CO1	Describe the functioning of the hospital pharmacy. Identify and assess adverse drug reactions. Describe the functioning of the community pharmacy	C1
CO2	Recognize various drug distribution systems in the hospital	C2
CO3	Develop the contents of the hospital formulary	C3
CO4	Practice patient medication history interviews and patient counselling, Interpret clinical laboratory tests of specific disease states	C4
CO5	Describe the functioning of the pharmacy and therapeutic committee.	C5
CO6	Describe the functions and responsibilities of a clinical pharmacist	C6
CO7	Explain drug store management and inventory control	C7

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BP704T Novel Drug Delivery System – Theory

Course outcome number	Course Outcomes	Cognitive level
CO1	Recall the principles and rationale behind controlled drug delivery systems, including terminology, advantages, disadvantages, and the selection of appropriate drug candidates.	C1
CO2	Understand the different approaches to designing controlled release formulations based on diffusion, dissolution, and ion exchange principles, considering physicochemical and biological properties of drugs. Evaluate gastroretentive drug delivery systems, including floating, high-density, inflatable, and gastroadhesive systems, and understand their advantages and disadvantages.	C2
CO3	Identify various polymers used in controlled release drug delivery systems, classify them based on their properties, and analyze their advantages and applications in formulation. Discuss nasopulmonary drug delivery systems, including formulation of inhalers, nasal sprays, and nebulizers, for effective drug delivery via nasal and pulmonary routes.	C3
CO4	Analyze microencapsulation techniques, including the definition, advantages, and disadvantages, and apply knowledge of microspheres and microparticles in drug delivery systems. Explore targeted drug delivery concepts and approaches, including liposomes, niosomes, nanoparticles, and monoclonal antibodies, and assess their applications in drug delivery.	C4
CO5	Evaluate the principles of mucosal drug delivery systems, including bioadhesion, and evaluate formulation considerations for buccal delivery systems and implantable drug delivery systems. Examine ocular drug delivery systems, including intraocular barriers and ocular formulations, and identify methods to overcome challenges in drug delivery to the eye.	C5
CO6	Discuss the concept of implantable drug delivery systems, including osmotic pumps, and assess their advantages and disadvantages in drug delivery. Evaluate intrauterine drug delivery systems, including the development of intrauterine devices (IUDs), and analyze their advantages, disadvantages, and applications in drug delivery.	C6

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BP705P Instrumental Methods of Analysis – Practical

Course outcome number	Course Outcomes	Cognitive level
CO1	**Replicate** the techniques and procedures used in instrumental analysis, such as the determination of absorption maxima, colorimetry, flame photometry, and various chromatographic methods. They will demonstrate the ability to follow step-by-step instructions accurately	P1
CO2	**Manipulate** laboratory instruments effectively. They will demonstrate proficiency in using spectrophotometers, fluorimeters, flame photometers, and chromatography equipment to perform experiments like UV spectroscopy, colorimetry, and chromatographic separations.	P2
CO3	**Precision** in their practical work. They will be able to conduct quantitative analyses with a high degree of accuracy, particularly in techniques like UV-Spectrophotometry for drug assay and the determination of sodium and potassium by flame photometry.	P3
CO4	**Articulate** their experimental procedures clearly, both in writing and verbally. They will be able to explain the principles behind the techniques they use and effectively communicate their experimental results in a scientific manner.	P4
CO5	**Naturalization** through repeated practice and hands-on experience, students will achieve a level of naturalization in their analytical skills. They will become adept at selecting appropriate analytical methods for specific substances, troubleshooting issues that may arise during experiments, and adapting their approaches to challenging samples.	P5

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BP802ET SOCIAL AND PREVENTIVE PHARMACY (Theory)

Course outcome number	Course Outcomes	Cognitive level
CO1	Define and evaluate the concept of public health.	C1
CO2	Understand the social causes of diseases and the social problems faced by the sick.	C2
CO3	Illustrate the relationship between food, nutrition, and health.	C3
CO4	Analyze the socio-cultural factors related to health and disease, as well as the impact of urbanization and poverty on health.	C4
CO5	Facilitate the general principles of prevention and control of diseases, such as cholera, SARS, Ebola virus, etc.,	C5

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BP803ET **PHARMACEUTICAL MARKETING MANAGEMENT – THEORY**

Course outcome number	Course Outcomes	Cognitive level
CO1	Define Pharma marketing, various functions and scope of marketing.	C1
CO2	Explain how different methods are used to analyze substances in pharmaceuticals. Describe how limit tests identify impurities in medicines. Share the basics of titrating strong, weak, and very weak acids and bases, and how neutralization curves work. Discuss the techniques of diazotization titrations,the principles of conductometry and where it's applied.	C2
CO3	Apply non-aqueous titration methods like acidimetry and alkalimetry to find out how much Sodium benzoate and Ephedrine HCl are in a sample. Conduct and describe precipitation titrations using techniques such as Mohr's, Volhard's, Modified Volhard's, and Fajans method, with a specific focus on determining the amount of sodium chloride. Utilize complexometric titration methods to measure the concentration of Magnesium sulfate and calcium gluconate.	C3
CO4	Examine the origins of potential mistakes in pharmaceutical analysis, clarify the types of errors that can occur, and demonstrate ways to minimize these errors. Gain a grasp of the fundamentals of gravimetric analysis, encompassing the process when a solid forms, the possibility of unintended substances adhering to it, and the subsequent steps. Apply these concepts to determine the quantity of barium sulfate in a sample. Conduct a redox titration using potassium iodate and elucidate the core principles involved and the situations where this method might be employed.	C4
CO5	Evaluate the accuracy and precision of pharmaceutical analysis results by applying appropriate methods of chemical analysis, ensuring the quality and purity of pharmaceutical solutions.	C5
CO6	Create charts, diagrams, and highlights to make complex pharmaceutical analysis data easy to understand and present.	C6

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BP804ET PHARMACEUTICAL REGULATORY SCIENCE

(THEORY)

Course outcome number	Course Outcomes	Cognitive level
CO1	To recall the stages of drug discovery, drug development process innovator and generic products, generic drug product development, concept of generics and regulatory concepts like basic terminology, guidance, regulations, laws acts, orange book and purple book.	**C1**
CO2	To understand the regulatory authorities and agencies of India, united states, European union, Australia, japan, Canada (organization structure and types of application) and procedure for export of pharmaceutical products.	C2
CO3	To apply the guidelines of regulatory agencies like USFDA, EU, MHRA, TGA, and ROW countries in approval process for drug approval.	C3
CO4	To analyze the technical document like drug master, CTD, ECTD and, ACTD for preparation of dossier.	C4
CO5	To evaluate the format and working procedure of clinical trials, GCP obligation of investigators, sponsors and monitors for conducting clinical trial.	C5
CO6	To build the ability to develop or suggest some guideline for clinical trial protocol, and safety monitoring in clinical trials.	c6

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BP805ET PHARMACOVIGILANCE - THEORY

After a successful completion of the course, the students will be able to

CO CODE	COURSE OUTCOME	COGNITIVE LEVEL
CO1	Discuss the importance of drug safety monitoring and the development of pharmacovigilance program	C1
CO2	Identify adverse drug reactions and manage it	C2
CO3	Explain international standards for classification of diseases and drugs	C3
CO4	Describe about national and international pharmacovigilance program and the terminologies used	C4
CO5	Develop and establish pharmacovigilance program in an organization	C5
CO6	Recognize various methods of drug safety surveillance and communication in pharmacovigilance and adverse drug reactions evaluate drug safety in special population	C6
CO7	Explain the methods to generate safety data during the phases of clinical trial and recognize the role of ICH and GCP guidelines.	C7

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BP808ET **CELL AND MOLECULAR BIOLOGY THEORY**

Course outcome number	Course Outcomes	Cognitive level
CO1	Define key terms related to Cell and Molecular Biology, including cell properties, membrane structure, and cellular reproduction.	C1
CO2	Explain the flow of molecular information, focusing on DNA structure, functioning, and its relationship with RNA.	C2
CO3	Apply knowledge of amino acids and protein structure to understand protein synthesis pathways.	C3
CO4	Analyze the introduction of cell signals and receptors, identifying signaling pathways and their components.	C4
CO5	Evaluate the consequences of misregulation in signaling pathways and the role of protein kinases in cellular functioning.	C5

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BP809ET COSMECTICS SCIENCE– THEORY

Course outcome number	Course Outcomes	Cognitive level
CO1	Classify and define Cosmetics and Cosmeceuticals as per Indian and EU regulations	C1
CO2	Describe the role of cosmetic excipients and building blocks in the formulation of cosmetics	C2
CO3	Explain the structure and function of the skin, hair, teeth and gum	C3
CO4	Design cosmetics and cosmeceuticals that address the problems of dry skin, acne, dermatitis, prickly heat, wrinkles, blemishes, hair fall, Dandruff, body odour, bleeding gums, mouth odour, teeth discoloration and sensitive teeth.	C4
CO5	Analysing the BIS specification and analytical methods for shampoo, skin- cream and toothpaste. Measurement of TEWL, Skin Color, Hair tensile strength, Hair combing properties Soaps, and syndet bars. Evolution and skin benefits.	C5

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Course of study for semester VIII

BP 811 ET ADVANCED INSTRUMENTATION TECHNIQUES (Theory)

Course outcome number	Course Outcomes	Cognitive level
CO1	**Recall** and explain the fundamental principles of Nuclear Magnetic Resonance spectroscopy (H-NMR and C-NMR), including chemical shift, factors affecting chemical shift, coupling constant, Spin-spin coupling, relaxation, and describe their significance in analytical chemistry.	C1
CO2	**Understanding** of Mass Spectrometry principles, including fragmentation and ionization techniques (electron impact, chemical ionization, MALDI, FAB).	C2
CO3	**Apply** this knowledge to interpret mass spectra and discuss the key analyzers (Time of flight and Quadrupole) and their applications. calibration and validation techniques as per ICH and USFDA guidelines to various analytical instruments such as electronic balance, UV-Visible spectrophotometer, IR spectrophotometer, Fluorimeter, Flame Photometer, HPLC, and GC	C3
CO4	**Analyze** the principles of Thermal Methods of Analysis, specifically Thermogravimetric Analysis (TGA), Differential Thermal Analysis (DTA), and Differential Scanning Calorimetry (DSC). Analyze the principles, components, methods, limitations, and applications of Radioimmune Assay.	C4
CO5	**Evaluate** how these techniques are applied in the characterization of materials and the determination of thermal properties. Evaluate the importance and components of Radioimmune assays, critically assessing the various methods and their suitability for specific applications.	C5
CO6	**Create** a design and perform hyphenated techniques such as LC-MS/MS, GC-MS/MS, and HPTLC-MS for advanced analytical purposes to solve complex analytical challenges.	C6

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