1. Course Outcomes (COs)

Course Name	Course Code	Course Outcomes	
B. Pharm 3rd Sem			
Pharmaceutical Organic Chemistry II Theory	BP301T	**C301.1**	Explain the evidence in derivation of benzene structure, aromaticity, electrophilic substitution, effect of substituents, identify the aromatic, anti-aromatic and nonaromatic compounds, uses of some aromatic compounds. *(Level 3)*
		C301.2	Illustrate the preparation and reactions of phenols, acidity of phenols, uses of some phenolic compounds, the preparation and reactions of aromatic amines, basicity of aromatic amines, uses of diazonium salts, the preparation and reactions of aromatic carboxylic acids, acidity of aromatic carboxylic acids, reactions of benzoic acid, preparation and reactions of polynuclear hydrocarbons (naphthalene) and their structure and uses. (*Level 3*)
		C301.3	Explain preparation and reactions of polynuclear hydrocarbons (anthracene, phenanthrene, diphenylmethane, triphenylmethane) and their structure and uses, the preparation and reactions of cycloalkanes, Baeyer's strain theory, Coulson and Moffitt's modification, Sachse Mohr's theory. (*Level 3*)
		C301.4	Explain the chemical nature of fats and oils, reactions of fatty acids and fats and oils, Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination (*Level 2*).
Physical Pharmaceutics I Theory	BP302T	**C302.1**	Apply physical pharmacy concepts of solubility and distribution law in the formulation development and evaluation of dosage forms. (*Level 3)*
		C302.2	Articulate the interrelationships between physical principles of states of matter and physiochemical properties of drug molecules. Recognize various laws, theories, and equations related to solid, liquid & gases matter which is essential for pharmaceutical formulations. (*Level 3)*

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		C302.3	Illustrate the concept of surface tension and principles of complexation/protein binding for the development of dosage form. *(Level 4)*
		C302.4	Relate the significance of pH, buffers, buffer equation, and buffer capacity in pharmaceutical and biological systems. *(Level 2)*
Pharmaceutical Microbiology Theory	BP303T	**C303.1**	Understand branches, history, scope and applications of Microbiology, microscopic techniques, and illustrate bacterial structure, growth, isolation, preservation and measurement. (*Level-4*)
		C303.2	Identify bacteria by staining technique and biochemical tests. Discuss sterilization methods with its evaluation & sterility indicators. Explain viruses & fungi with respect to Morphological characteristics, Cultivation and reproduction. *(Level 3)*
		C303.3	Describe disinfectants with evaluation and factors influencing its action. Outline & discuss Aseptic area, test for sterility, sources of contamination & its prevention. Describe microbiological assay, Standardization & assessment of antibiotics, vitamins & amino acid. *(Level 4)*
		C303.4	Discuss types, assessment & factors affecting microbial spoilage. Explain preservation of pharmaceutical products & their microbial stability. Outline animal cell culture techniques with its application. *(Level 4)*
Pharmaceutical Engineering Theory	BP304T	**C304.1**	Discuss various laws, theories and mechanisms involved in different unit processes. *(Level 2)*
		C304.2	Explain the engineering principle, construction, and working of various equipment involved in various unit processes in pharma industries. *(Level 2)*
		C304.3	Demonstrate and analyse the performance of equipment's and summarize various factors affecting different unit operations. *(Level 3)*
		C304.4	Discuss the factors affecting during the selection of material and various preventive methods used for corrosion control for pharmaceutical industries. *(Level 2)*
Pharmaceutical Organic Chemistry		**C305.1**	Upon completion of the course, the student shall be able to standardize the reagents, determine the Acid value,

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II Practical	BP305P		Saponification value, Iodine value of oils and fats (*Level 3*).
		C305.2	Upon completion of the course, the student shall be able to illustrate the principle, reaction and procedure involved in determine the Acid value, Saponification value, Iodine value of oils and fats (*Level 2*).
		C305.3	Upon completion of the course, the student shall be able to synthesize organic compounds, determine their physical constants, and understand recrystallization and steam distillation (*Level 3*).
		C305.4	Upon completion of the course, the student shall be able to illustrate the reaction, principle, calculations and procedure involved in the synthesis of organic compounds (*Level 2*).
Physical Pharmaceutics I Practical	BP306P	**C306.1**	Understand the basic concepts of practical aspects in Physical Pharmaceutics-I. *(Level 2)*
		C306.2	Evaluate physicochemical properties of drug molecules. *(Level 4)*
		C306.3	Determine and demonstrate the use of physicochemical properties in formulation development and evaluation of drug/dosage forms. *(Level 3)*
		C306.4	Judge in-depth understanding of students-related concepts of Physical Pharmaceutics-I. *(Level 3)*
Pharmaceutical Microbiology Practical	BP307P	**C307.1**	Write general concepts in microbiology associated with sterilization, staining techniques, microbial assay, and different processes used in microbial analysis. *(Level 3)*
		C307.2	Analyze and differentiate given microbial culture using differential staining techniques, perform isolation & sub-culturing of microorganisms. *(Level 4)*
		C307.3	Perform & sappraise assay of antibiotics, sterility testing and identify the given culture of organism by biochemical test, perform morphological identification and special characteristics by simple staining techniques. *(Level 4)*
		C307.4	Explain the basic knowledge and principle behind different experiments of pharmaceutical microbiology. *(Level 2)*

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Pharmaceutical Engineering Practical	BP308P	**C308.1**	Examine particle size and size distribution by sieving method. *(Level 3)*
		C308.2	Calculate radiation constant and overall heat transfer coefficient. *(Level 4)*
		C308.3	Illustrate drying rate and Humidity of air. *(Level 4)*
		C308.4	Analyze factors affecting on different unit operation process. *(Level 4)*
B. Pharm 4th Sem			
Pharmaceutical Organic Chemistry III Theory	BP401T	**C401.1**	Illustrate the Stereo isomerism, Optical isomerism, Optical activity, enantiomerism, diastereoisomerism, meso-compounds, Elements of symmetry, chiral and achiral molecules, DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature, Reactions of chiral molecules, Racemic modification and resolution of racemic mixture, Asymmetric synthesis. *(Level 3)*
		C401.2	Illustrate Geometrical isomerism, Nomenclature of geometrical isomers, Methods of determination of configuration of geometrical isomers. Conformational isomerism in Ethane, n-Butane and Cyclohexane, Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity, Stereospecific and stereoselective reactions (*Level 3*).
		C401.3	Explain Nomenclature and classification of heterocyclic compounds, Synthesis, reactions and medicinal uses of, Pyrrole, Furan, and Thiophene, Relative aromaticity and reactivity of Pyrrole, Furan and Thiophene, Synthesis, reactions and medicinal uses of Pyrazole, imidazole, Oxazole and Thiazole, Pyridine, Quinoline, Isoquinoline, Acridine and Indole, Basicity of pyridine, Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives (*Level 2*).
		C401.4	Explain the Reactions of synthetic importance like Metal hydride reduction (NaBH4 and LiAlH4), Clemmensen reduction, Birch reduction, Wolff Kishner reduction, Oppenauer-oxidation and Dakin reaction, Beckmanns rearrangement and Schmidt rearrangement, Claisen-Schmidt condensation (*Level 2*).
Medicinal		**C402.1**	Define the concepts of medicinal chemistry like sources

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Chemistry I Theory	BP402T		of drugs, metabolism, factors affecting metabolism, phase I and phase II reactions. Also explain and correlate physicochemical properties with action of drug. *(Level 3)*
		C402.2	Understand and connect the biosynthesis, catabolism of Adrenaline, Nor-adrenaline along with describe the classification, MoA, SAR, Pharmacokinetics and therapeutic uses of Adrenergic agonist & antagonist drugs. *(Level 4)*
		C402.3	Explain the biosynthesis, catabolism of Acetylcholine as well as describe the classification, MOA, SAR, Pharmacokinetics and therapeutic uses of Cholinergic agonist & antagonist drugs. *(Level 3)*
		C402.4	Interpret structural activity relationship, mode of action and summarize chemical synthesis and therapeutic application of CNS drugs like Sedative Hypnotics, Anticonvulsant, and Antipsychotics. *(Level 3)*
Physical Pharmaceutics II Theory	BP403T	**C403.1**	Explain types and properties of colloidal systems. Formulate and evaluate suspensions and emulsions. *(Level 2)*
		C403.2	Relate the nature of flow of liquids & deformation of solids under stress and its measurement. *(Level 2)*
		C403.3	Estimate and measure the size, shape and surface area of powder. *(Level 5)*
		C403.4	Apply mathematical models to determine the rate and order of reaction, shelf life and explain various factors influencing reaction rates *(Level 3)*
Pharmacology I Theory	BP404T	**C404.1**	Define and explain the various terminologies of general pharmacology and pharmacokinetics. *(Level 2)*
		C404.2	Describe the principles of pharmacodynamics, receptor theories, adverse drug reaction, drug interaction and drug discovery. *(Level 3)*
		C404.3	Explain the pharmacological effects of neurotransmitters and compute the pharmacology of drugs acting on peripheral nervous system. *(Level 3)*
		C404.4	Explain the pharmacology of central nervous system acting drugs and study significance of neurohumoral transmission in the central nervous system. *(Level 3)*
Pharmacognosy and		**C405.1**	Outline the history and scope of Pharmacognosy; Classify Drugs of Natural origin (DONO), elaborate on

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Phytochemistry I Theory	BP405T		sources and quality control aspects of DONO. *(Level 4)*
		C405.2	Describe cultivation and collection of medicinal plants with various factor involved. Explain processing of DONO and methods for conservation of medicinal plants. Explain basic aspects of plant tissue culture with applications. *(Level 4)*
		C405.3	Explain the concept of edible vaccines. Describe role of Pharmacognosy in different traditional systems of medicine. Explain secondary metabolite with respect to Definition, classification, properties and test for identification. *(Level 4)*
		C405.4	Elaborate on plant fibers, Hallucinogens, Teratogens and Natural allergens. Describe the source, composition, preparation, evaluation and applications of carbohydrates, protein, enzymes of natural origin, lipids & Marine drugs. *(Level 4)*
Medicinal Chemistry I Practical	BP406P	**C406.1**	Upon completion of the course, the student shall be able to synthesize drugs or intermediates, determine their physical constants, carry out recrystallization and illustrate the reaction, principle, calculations and procedure involved in the synthesis. *(Level 3)*
		C406.2	Upon completion of the course, the student shall be able to standardize the reagents, perform the assay of drugs and illustrate the principle, reaction and procedure involved in it. *(Level 3)*
		C406.3	Upon completion of the course, the student shall be able to determine the partition coefficient of drugs and explain the principle and procedure involved in it. *(Level 2)*
		C406.4	Understand the physicochemical properties of drugs and calculate the such properties by applying the experimental approach. *(Level 3)*
Physical Pharmaceutics II Practical	BP407P	**C407.1**	Understand the basic concepts of practical aspects in Physical Pharmaceutics-II. *(Level 2)*
		C407.2	Demonstrate the use of physicochemical properties in the formulation development and evaluation of dosage forms like viscosity, powder characteristics, etc. *(Level 3)*
		C407.3	Evaluate the suspensions, rheological, kinetic, and Micromeretics properties of drug molecules and their

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			formulations. (*Level 3)*
		C407.4	Judge in-depth understanding of students-related concepts of Physical Pharmaceutics-II. *(Level 3)*
Pharmacology I Practical	BP408P	**C408.1**	Describe introduction and instruments used in experimental pharmacology along with experimental animals and Explain CPCSEA guidelines, basic experimental techniques and routes of drug administration in experimental animals. *(Level 2)*
		C408.2	Evaluate effects of drugs on sleeping time in mice, rabbit eye and frog. *(Level 3)*
		C408.3	Evaluate effects of drugs using actophotometer, rota-rod apparatus and anticonvulsant activity. *(Level 3)*
		C408.4	Evaluate effects of drugs for their stereotype and anti-catatonic activity, anxiolytic and local anesthetic activity by different methods. *(Level 3)*
Pharmacognosy and Phytochemistry I Practical	BP409P	**C409.1**	Write theoretical concept associated with cultivation, collection and evaluation of Drugs of Natural Origin. *(Level 3)*
		C409.2	Perform qualitative and quantitative microscopic evaluation of crude drugs. *(Level 4)*
		C409.3	Identify the unorganized drugs on the basis of chemical test. Appraise extractive value, moisture content, swelling & foaming index for given sample of crude drug. *(Level 4)*
		C409.4	Explain the basic knowledge involved in cultivation, collection, processing and evaluation of Drugs of Natural Origin. *(Level 3)*

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