PES Modern College of Pharmacy, Nigdi, Pune
Course outcome 2023-24 B. Pharmacy

Semester	Subject Name	CO's
First Year Sem I 2019 pattern		
BP101T	HUMAN ANATOMY AND PHYSIOLOGY I–T Div (A)	1. To explain structure of various components, tissues and organs of human body systems. 2. Outline functions and Classify different components of human body systems 3. To Summarize and apply data of coordinated normal physiological pattern of different organs of each system. 4. To describe the various homeostatic mechanisms and their related disorders
	HUMAN ANATOMY AND PHYSIOLOGY I–T Div (B)	1. To explain structure of various components, tissues and organs of human body systems. 2. Outline functions and Classify different components of human body systems 3. To Summarize and apply data of coordinated normal physiological pattern of different organs of each system. 4. To describe the various homeostatic mechanisms and their related disorders
BP102T	PHARMACEUTICAL ANALYSIS I – T (A)	1. Assess the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs 2. Compare different types of titration method and expressing their concentration 3. Integrate various volumetric and electrochemical titrations. 4. Select various titration method for end point detection and oxidation and reduction mechanism reaction
	PHARMACEUTICAL ANALYSIS I – T (B)	1. Assess the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs. 2. Compare different types of titration methods and expressing their concentration 3. Integrate various volumetric and electrochemical titrations. 4. Select various titration method for end point detection and oxidation and reduction mechanism reaction
BP103T	PHARMACEUTICS I – T (A)	1. Introduction to history of pharmacy, development of pharmacy profession, industry in India, dosage form, prescription, posology, pharmaceutical calculation, powders, liquid dosage form, monophasic-biphasic liquid dosage form, semisolid dosage form and suppositories. 2. Explain and evaluate different preparation like powders, monophasic-biphasic liquid dosage form, semisolid dosage form and suppositories 3. Define & classify prescription, dosage form, posology, powders, liquid dosage form, monophasic-biphasic liquid dosage form, semisolid dosage form and suppositories. 4. Summarize the Advantage, Disadvantage & factors influencing powders, monophasic-biphasic liquid dosage form,

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		semisolid dosage form and suppositories
	PHARMACEUTICS I – T (B)	1. Introduction to history of pharmacy, development of pharmacy profession, industry in India, dosage form, prescription, posology, pharmaceutical calculation, powders, liquid dosage form, monophasic-biphasic liquid dosage form, semisolid dosage form and suppositories. 2. Explain and evaluate different preparation like powders, monophasic-biphasic liquid dosage form, semisolid dosage form and suppositories. 3. Define & classify prescription, dosage form, posology, powders, liquid dosage form, monophasic-biphasic liquid dosage form, semisolid dosage form and suppositories. 4. Summarize the Advantage, Disadvantage & factors influencing powders, monophasic-biphasic liquid dosage form, semisolid dosage form and suppositories
BP104T	PHARMACEUTICAL INORGANIC CHEMISTRY T (A)	1. Derive acquainted with the principles of limit tests. 2. Integrate and analyze the different anions, cations from inorganic pharmaceuticals. 3. Invent the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals 4. Derive acids, bases, buffers, water and different GIT agents and recall the fundamental principles of them 5. Develop the medicinal used of topical agents, gases and vapors', dental products, pharmaceuticals aid and radio pharmaceuticals. 6. Integrate about the major intra and extra cellular electrolytes, essential and trace elements, cationic and anionic components of inorganic drugs.
	PHARMACEUTICAL INORGANIC CHEMISTRY T (B)	1. Derive acquainted with the principles of limit tests. 2. Integrate and analyze the different anions, cations from inorganic pharmaceuticals. 3. Invent the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals 4. Derive acids, bases, buffers, water and different GIT agents and recall the fundamental principles of them 5. Develop the medicinal used of topical agents, gases and vapors', dental products, pharmaceuticals aid and radio pharmaceuticals. 6. Integrate about the major intra and extra cellular electrolytes, essential and trace elements, cationic and anionic components of inorganic drugs.
BP105T	COMMUNICATION SKILLS – T * (A&B)	1. Develop communication skills effectively with range of people in variety of setting, using different of modes and media 2. Integrate behavioral needs of pharmacist to function effectively in the area of pharmaceutical operations 3. To develop understanding and interpret subjects 4. To develop ability to apply what is learned 5. To focus on curricular, co-curricular and extracurricular activities 6. To develop graduates with ethics, morals and social sense and decision making
BP106RBT	REMEDIALBIOLOGY (A&B)	1. To identify a given plant part based on its macroscopic and microscopic characteristics.

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		2. To illustrate the classification of plants, plant cell and its organelles. 3. To describe the physiological processes in plants and humans. 4. To explain the type of tissues present in human body. 5. To discuss the anatomy and functions of systems of the human body 6. To appraise the coordinated working pattern of different organs of human body.
BP107P	HUMAN ANATOMY AND PHYSIOLOGY –P Div (A)	1. To summarize the basic knowledge of importance of Human Anatomy and Physiology in pharmacy field. 2. Apply knowledge in handling the laboratory equipment and models in order to study and compilation of data on tissues, blood estimations, cardiac and skeletal system 3. To develop practical skill in Students convergent with the techniques for identification, counting, estimation of hematological studies 4. Analyze data to investigate clinical situation based on results
	HUMAN ANATOMY AND PHYSIOLOGY –P Div (B)	1. To summarize the basic knowledge of importance of Human Anatomy and Physiology in pharmacy field. 2. Apply knowledge in handling the laboratory equipment and models in order to study and compilation of data on tissues, blood estimations, cardiac and skeletal system 3. To develop practical skill in Students convergent with the techniques for identification, counting, estimation of haematological studies 4. Analyze data to investigate clinical situation based on results
BP108P	PHARMACEUTICAL ANALYSIS I – P (A)	1. Assess the fundamentals of analytical chemistry and theory of electrochemical analysis of drugs 2. Evaluate various molar and normal solution in Pharmaceutical solution 3. Evaluate various volumetric and electrochemical titrations. 4. Measure end point detection in volumetric and electrochemical titrations
	PHARMACEUTICAL ANALYSIS I – P (B)	1. Assess the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs 2. Compare different types of titration methods and expressing their concentration 3. Integrate various volumetric and electrochemical titrations. 4. Select various titration method for end point detection and oxidation and reduction mechanism reaction
BP109P	PHARMACEUTICS I – P (A)	1. Demonstrate the skill of preparation and evaluation of various solid liquid and semisolid dosage forms. 2. Explain the principles of formulation and evaluation of powder preparations. 3. Calculate evaluation parameters like density, specific gravity, angle of repose, Carr's index and Hausner's ratio of pharmaceutical preparations. 4. Classify various dosage forms by using different criteria 5. Create labels in prescribed manner for various dosage forms.
	PHARMACEUTICS I	1. Demonstrate the skill of preparation and evaluation of various

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	– P (B)	solid liquid and semisolid dosage forms. 2. Explain the principles of formulation and evaluation of powder preparations. 3. Calculate evaluation parameters like density, specific gravity, angle of repose, Carr's index, Hausner's ratio, etc. of pharmaceutical preparations. 4. Classify various dosage forms by using different criteria 5. Create labels in prescribed manner for various dosage forms.
BP110P	PHARMACEUTICAL INORGANIC CHEMISTRY –P (Div A)	1. Recall the sources of limit tests, preparation and identification of compounds. 2. Demonstrate the preparation of inorganic pharmaceuticals. 3. Apply knowledge to perform modified limit tests. 4. Analyze various inorganic pharmaceutical compounds 5. Select suitable method for the preparation of inorganic pharmaceuticals. 6. Assess quality of inorganic pharmaceuticals.
	PHARMACEUTICAL INORGANIC CHEMISTRY –P (Div B)	1. Derive acquainted with the principles of limit tests. 2. Compose and Familiar with different classes of inorganic pharmaceuticals and their analysis 3. Integrate and analyze the anions, cations in different inorganic pharmaceuticals. 4. Invent the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals
BP111P	COMMUNICATION SKILLS – P* (A&B)	1. Develop etiquettes, mannerism, soft skill and communication skill 2. Develop presentation skills, listening skills and sophisticated nonverbal communication 3. Generate leadership quality, emotional intelligence and cognitive skills 4. Develop good interview skills with complete professional etiquettes.
BP112R BP	REMEDIAL BIOLOGY – P* (A&B)	1. To able to identify microscopy of tissues pertinent to stem, root, leaf, seed, fruit and flower. 2. To perform blood group detection, measurement of blood pressure and tidal volume. 3. To demonstrate different bones in human skeleton system, their location and significance.
First Year Semester II		
BP201T	HUMAN ANATOMY AND PHYSIOLOGY II – T (Div A)	1. To relate the basic knowledge about central nervous system including nervous tissue, brain and spinal cord. 2. To illustrate the structure and functions of gastrointestinal tract and to learn about ATP/CTP/BMR. 3. To learn about structure and functions of respiratory system and various mechanisms involved in regulation of respiration. 4. To categorize the anatomy of urinary system and physiology of urine formation/ maturation. 5. To appraise the essentiality of endocrine glands and their hormones 6. To predict the physiology of male and female reproductive organs and concepts of genetics.

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	HUMAN ANATOMY AND PHYSIOLOGY II – T (Div B)	1. To relate the basic knowledge about central nervous system including nervous tissue, brain and spinal cord. 2. To illustrate the structure and functions of gastrointestinal tract and to learn about ATP/CTP/BMR. 3. To learn about structure and functions of respiratory system and various mechanisms involved in regulation of respiration. 4. To categorize the anatomy of urinary system and physiology of urine formation/ maturation. 5. To appraise the essentiality of endocrine glands and their hormones 6. To predict the physiology of male and female reproductive organs and concepts of genetics.
BP202T	PHARMACEUTICAL ORGANIC CHEMISTRY I-T (Div A)	1. Derive and Understand the structure, name and the type of isomerism of the organic compound 2. Integrate the fundamentals of atomic structure, types of bonds, hybridization and addition compounds. 3. Compose the knowledge of reagents, organic reactions and electron displacement effects 4. Evaluate the rules of IUPAC nomenclature. Explain the structure, occurrence & stability of ions and free radicals. 5. Derive the concept of stereochemistry and also can relate and value them. 6. Understand and consider the Alkanes , Alkenes and Conjugated dienes and Alkyl halides 7. Understand, analyze Alcohols, Carbonyl compounds* (Aldehydes and ketones) 8. Utilize the principles of scientific Carboxylic acids, Aliphatic amines
	PHARMACEUTICAL ORGANIC CHEMISTRY I-T (Div B)	1. Derive and understand the structure, name and the type of isomerism of the organic compound. 2. Integrate the fundamentals of atomic structure, types of bonds, hybridization and addition compounds. 3. Evaluate the rules of IUPAC nomenclature. Explain the structure, occurrence & stability of ions and free radicals.. 4. Understand and consider the Alkanes , Alkenes and Conjugated dienes and Alkyl halides 5. Understand, analyze Alcohols, Carbonyl compounds* (Aldehydes and ketones) 6. Utilize the principles of scientific Carboxylic acids, Aliphatic amines
BP203T	BIOCHEMISTRY – T (Div-A)	1. To summarize biomolecules and to conclude, evaluate and discuss chemical nature and biological role of it with concepts in bioenergetics. 2. To Summarize & Compose biosynthesis and Metabolism of important biomolecules like carbohydrates, lipids, proteins and Nucleic acids. 3. Integrate, Compose, Explain & Discuss metabolism of biomolecules in pathological and physiological conditions. 4. To Compose, Assess, Explain and Discuss the genetic organization of mammalian genome and functions of DNA in

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		the synthesis of RNAs and proteins. 5. To summarize, justify and conclude catalytic role of enzymes, importance of enzyme in inhibitors in design of new drugs, therapeutic and diagnostics applications of enzymes
	BIOCHEMISTRY – T (Div-B)	1. Remember the qualitative analysis of carbohydrates and proteins 2. Understand the principle and clinical significance of blood glucose 3. Examine the constituents present in Urine and their clinical significance 4. Determine the effect of temperature and substrate concentration on salivary amylase activity 5. Elaborate the clinical significance of creatinine, proteins and cholesterol in blood
BP204T	PATHOPHYSIOLOGY – T (Div A)	1. Explain the pathogenesis and morphology of reversible and irreversible cell injury; enumerate various lipoproteins and describe lipoprotein disorders 2. Illustrate events involved in acute and chronic inflammation. 3. Recognize the biological significance of various hypersensitivity disorders. 4. Discuss the mechanisms involved in autoimmune diseases and allograft rejection 5. Discuss the etiopathogenesis of selected diseases 6. Describe the general biology of cancer, mechanism of shock and effects of radiation exposure
	PATHOPHYSIOLOGY – T (Div B)	1. Explain the pathogenesis and morphology of reversible and irreversible cell injury; enumerate various lipoproteins and describe lipoprotein disorders 2. Illustrate events involved in acute and chronic inflammation. 3. Recognize the biological significance of various hypersensitivity disorders. 4. Discuss the mechanisms involved in autoimmune diseases and allograft rejection 5. Discuss the etiopathogenesis of selected diseases 6. Describe the general biology of cancer, mechanism of shock and effects of radiation exposure
BP205T	COMPUTER APPLICATIONS IN PHARMACY – T * (A&B)	1. Apply the knowledge of mathematics and computing fundamentals to pharmaceutical applications for any given requirement. 2. Design and develop solutions to analyze pharmaceutical problems using computers. 3. Integrate and apply efficiently the contemporary IT tools to all Pharmaceutical related activities. 4. Solve and work with a professional context pertaining to ethics, social, cultural and regulations with regard to Pharmacy. 5. Student will learn relationship between ethics in clinical trials; computational tools etc. and their relevance to today's society are introduced to the student.
BP206T	ENVIRONMENTAL	1. Create awareness about environmental problems among

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	SCIENCES – T * (A&B)	learners and society at large. 2. Develop the knowledge about environmental issues and its allied problems 3. Develop an attitude of concern about the role of an individual in conservation of natural resources 4. Create an urge to participate in environmental protection, preservation and conservation 5. Integrate skill to help the society in identifying and solving environmental problems
BP207P	HUMAN ANATOMY AND PHYSIOLOGY II –P (Div A)	1. To summarize the basic knowledge of importance of Human Anatomy and Physiology-II in pharmacy field. 2. To understand the different mechanisms those govern normal working of various organs and systems of human body with the help of charts, models and demonstrations. 3. To develop practical skill in Students convergent with the techniques for identification, counting, determination of Platelet, differential leukocyte count, Arneth index, osmotic fragility and hematological studies 4. Apply knowledge to study Permanent slides and develop skills among students in recording of bodies various estimations and examinations.
	HUMAN ANATOMY AND PHYSIOLOGY II –P (Div B)	1. Recall the physiology of special senses with the help of models, charts and specimens. 2. Develop the knowledge on coordinating working of organs of various systems with the help of models, charts and specimens 3. Analyze the functions of cranial nerves by various sensory and motor functions 4. Determine blood cell count, Arneth index, osmotic fragility of RBCs, tidal volume and vital capacity
BP208P	PHARMACEUTICAL ORGANIC CHEMISTRY I– P (Div A)	1. Integrate the reaction, Possess knowledge and synthesis of organic compounds 2. Compose the reactivity/stability of compounds 3. Integrate , Analyze , identify/confirm the identification of organic compound 4. Recall, understand, apply and analyse the unknown organic compound by systematic qualitative analysis that includes preliminary test, detection of element ,solubility test, functional group test, mp, bp, derivatives
	PHARMACEUTICAL ORGANIC CHEMISTRY I– P (Div B)	1. Introduce safety measures in an organic laboratory and laboratory techniques 2. Access Systematic qualitative analysis of unknown organic compounds 3. Understand and Prepare of suitable solid derivatives from organic compounds 4. Explain Building of molecular models of structures containing various functional groups 5. Discuss the acidity of carboxylic acids and basicity of amines and mechanism of some named reaction 6. Describe the classification of organic compounds and nomenclature, isomerism and explain structural isomerism

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BP209P	BIOCHEMISTRY – P (Div-A)	1. To understand, remember and apply principles of biochemistry and to analyze, evaluate and create/conclude the biochemistry theory. 2. To evaluate, categorize, summarize and report carbohydrates, amino acids, proteins, normal and abnormal constituents of urine. 3. To prepare folin wu filtrate, determine and conclude serum level of creatinine, cholesterol, reducing sugars and proteins and to measure the pH of buffer solution. 4. To judge, explain, interpret the salivary amylase enzyme activity and able to summarize factors affecting it.
	BIOCHEMISTRY – P (Div-B)	1. To understand, remember and apply principles of biochemistry and to analyze, evaluate and create/conclude the biochemistry theory. 2. To evaluate, categorize, summarize and report carbohydrates, amino acids, proteins, normal and abnormal constituents of urine. 3. To prepare folin wu filtrate, determine and conclude serum level of creatinine, cholesterol, reducing sugars and proteins and to measure the pH of buffer solution. 4. To judge, explain, interpret the salivary amylase enzyme activity and able to summarize factors affecting it.
BP210P	COMPUTER APPLICATIONS IN PHARMACY – P	1. Know the various types of application of computers in pharmacy. 2. Know various types of databases. 3. Know various applications of databases in Pharmacy. 4. It enables us to prepare our students to become more ethical pharmaceutical technologists. 5. Know the web based tools for pharmacy practice 6. Apply the knowledge to design and develop digital tools for pharmaceutical applications
Second Year Semester III		
BP301T	Pharmaceutical Organic Chemistry II – Theory (Div A)	1. Summarize and understand the structure, name, theories, Classification & use of the organic compound as well as fatty acids and oils. 2. Support reasons for Acidity, Basicity, Reactivity & stability of organic compounds. 3. Derive methods of preparation & reactions of organic compounds. 4. Recommend particular chemical entities to predict the product problems. 5. Summarize isomerism with types and choose proper conformation & configuration for assigning them by building various projection formulas & generating their interconversions.
	Pharmaceutical Organic Chemistry II – Theory (Div B)	1. Summarize the structure, name, theories, Classification & use of the organic compound. 2. Support reasons for Acidity, Basicity, Reactivity & stability of organic compounds. 3. Derive methods of preparation & reactions of organic

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		compounds. 4. Recommend particular chemical entities to predict the product problems. 5. Smmarize isomerism with types and choose proper conformation & configuration for assigning them by building various projection formulas & generating their interconversions.
BP302T	Physical Pharmaceutics I – Theory (Div A)	1. Integrate and apply various physicochemical properties of drug and excipients in designing the dosage forms 2. Demonstrate basics involved in Solubility of drugs, states and properties of matter, surface and interfacial phenomenon and pH and buffer systems. 3. Distinguish the principles of complexation/ protein binding & to use them for calculations of drug release and stability constant. 4. Demonstrate ability to develop critical thinking and problem solving required to address problems related to dosage form design and evaluation. 5. Recognize and Apply basic rules and equations regarding physical principles essential for pharmaceutical applications
	Physical Pharmaceutics I – Theory (Div B)	1. Integrate and apply various physicochemical properties of drug and excipients in designing the dosage forms 2. Demonstrate basics involved in Solubility of drugs, states and properties of matter, surface and interfacial phenomenon and pH and buffer systems 3. Distinguish the principles of complexation/ protein binding & to use them for calculations of drug release and stability constant 4. Demonstrate ability to develop critical thinking and problem solving required to address problems related to dosage form design and evaluation 5. Recognize and Apply basic rules and equations regarding physical principles essential for pharmaceutical applications.
BP303T	Pharmaceutical Microbiology – Theory (Div A)	1. Determine the core concepts of microbiology, bacteria, culture media, identification test and microscopy with its application to pharmaceutical field. 2. Summarize and demonstrate sterilization methods, sterility testing and also acquire the knowledge about preservation and disinfection. 3. Prepare a detail scheme which involves basics of aseptic area, clean area classification 4. Discuss the concept of cell technology and its application in pharmaceutical industry. 5. Describe the spoilage, cell culture technology with its applications in pharmaceutical industries 6. Describe microbiological assay along with methods for standardization of antibiotics, vitamins and amino acids
	Pharmaceutical Microbiology – Theory (Div B)	1. Determine the core concepts of microbiology, bacteria, culture media, identification test and microscopy with its application to pharmaceutical field.

		2. Summarize and demonstrate sterilization methods, sterility testing and also acquire the knowledge about preservation and disinfection. 3. Prepare a detail scheme which involves basics of aseptic area, clean area classification 4. Discuss the concept of cell technology and its application in pharmaceutical industry. 5. Describe the spoilage, cell culture technology with its applications in pharmaceutical industries Describe microbiological assay along with methods for standardization of antibiotics, vitamins and amino acids
BP304T	Pharmaceutical Engineering – Theory (Div A)	1. Define drying, crystallization, flow of fluid, evaporation, heat transfer, distillation, corrosion, centrifugation, filtration, size reduction, size separation 2. Illustrate objective, mechanism & theories of drying, crystallization, flow of fluid, evaporation, heat transfer, distillation, corrosion, centrifugation, filtration, size reduction, size separation, material handling system 3. Explain the types & describe the factors affecting drying, crystallization, flow of fluid, evaporation, heat transfer, distillation, corrosion, centrifugation, filtration, size reduction, size separation, material handling system 4. Explain the principle, instrumentation, working & application of drying, crystallization, flow of fluid, evaporation, heat transfer, distillation, corrosion, centrifugation, filtration, size reduction, size separation, material handling system 5. Illustrate layout of industrial plant, industrial hazards & plant safety
	Pharmaceutical Engineering – Theory (Div B)	1. Define drying, crystallization, flow of fluid, evaporation, heat transfer, distillation, corrosion, centrifugation, filtration, size reduction, size separation 2. Illustrate objective, mechanism & theories of drying, crystallization, flow of fluid, evaporation, heat transfer, distillation, corrosion, centrifugation, filtration, size reduction, size separation, material handling system 3. Explain the types & describe the factors affecting drying, crystallization, flow of fluid, evaporation, heat transfer, distillation, corrosion, centrifugation, filtration, size reduction, size separation, material handling system 4. Explain the principle, instrumentation, working & application of drying, crystallization, flow of fluid, evaporation, heat transfer, distillation, corrosion, centrifugation, filtration, size reduction, size separation, material handling system 5. Illustrate layout of industrial plant, industrial hazards & plant safety
BP305P	Pharmaceutical Organic Chemistry II – Practical (Div A)	1. Use of various equipments and take safety measures while working in organic chemistry laboratory. 2. Demonstrate and perform laboratory techniques like recrystallization and steam distillation. 3. Identify, implement the separation and identification of given

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		binary mixture 4. Examine and evaluate the saponification value of given oil compounds 5. Explain, apply, and justify the principle and theory behind synthesis of compound 6. Develop and apply skill to synthesize compound and purify synthesized compounds.
	Pharmaceutical Organic Chemistry II – Practical (Div B)	1. Use of various equipments and take safety measures while working in organic chemistry laboratory. 2. Demonstrate and perform laboratory techniques like recrystallization and steam distillation. 3. Identify, implement the separation and identification of given binary mixture 4. Examine and evaluate the saponification value of given oil compounds 5. Explain, apply, and justify the principle and theory behind synthesis of compound 6. Develop and apply skill to synthesize compound and purify synthesized compounds.
BP306P	Physical Pharmaceutics I – Practical (Div A)	1 Exercise different pharmaceutical laboratory procedures used in determining various physical properties such as solubility, pka, surface tension, HLB, CMC, adsorption, partition coefficient, stability constant etc. 2 Design and Perform skillfully some laboratory experiments needed in pharmacy practice as determination of physical properties 3 Acquire and use technical vocabulary to discuss pharmaceutical problems. 4 Demonstrate knowledge about some important concepts from preformulation and formulation point of view. 5 Employ proper documentation system to record observations and analyze information gathered through experimentation.
	Physical Pharmaceutics I – Practical (Div B)	1 Exercise different pharmaceutical laboratory procedures used in determining various physical properties such as solubility, pka, surface tension, HLB, CMC, adsorption, partition coefficient, stability constant etc. 2 Design and Perform skillfully some laboratory experiments needed in pharmacy practice as determination of physical properties 3 Acquire and use technical vocabulary to discuss pharmaceutical problems. 4 Demonstrate knowledge about some important concepts from preformulation and formulation point of view. 1. Employ proper documentation system to record observations and analyze information gathered through experimentation.
BP307P	Pharmaceutical Microbiology – Practical (Div A)	1. Know the principle, construction and working of equipments and skill to handle microscope for observation of microbes 2. Prepare and sterilize nutrient broth, nutrient agar, slants, stabs and plates and adopt the skills required for maintaining strictly aseptic condition & handling inoculating loop, its sterilization

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		and inoculation procedure 3. Practice aseptic procedures for inoculation and examine sterility testing of pharmaceuticals 4. Practice different methods of sterilization and isolate pure culture of microorganism 5. Adapt the technique involved to see motility of bacteria i.e. hanging drop technique 6. Develop skill to execute morphology of bacteria by staining and determine quality of water by most probable number test (bacteriological analysis) 7. Differentiate Gram negative intestinal bacteria by performing IMVIC test 8. Learn standardization of pharmaceutical products microbiologically
	Pharmaceutical Microbiology – Practical (Div B)	1. Demonstrate theory and practical skills to prepare and view specimens using microscopy (bright field microscope) and staining procedures. 2. Practice aseptic techniques and be able to perform routine culture handling tasks safely and effectively 3. Use appropriate experimental microbiological lab equipment and methods 4. Recognize the various methods for identification of microorganisms and able to classify the bacteria 5. Develop culture media by understanding various physical growth requirements of bacteria 6. Write a document and report experimental protocol, results and conclusion
308P	Pharmaceutical Engineering –Practical (Div A)	1 Determine radiation heat constant, overall heat transfer, moisture content, loss on drying, humidity of air, uniformity index by double cone blender. 2 Explain the principle, instrumentation, working & application of rotary tablet machine, fluidized bed coater, fluid energy mill, dehumidifier, colloidal mill, planetary mixer, fluidized bed dryer, freeze dryer 3 Illustrate construction of drying curves, various size distribution curves & verify laws of size reduction by using different equation 4 Study the effect of time on rate of filtration, evaporation & crystallization 5 Demonstration of Steam distillation, colloid mill, planetary mixer, fluidized bed dryer, freeze dryer
	Pharmaceutical Engineering –Practical (Div B)	1. Determine radiation heat constant, overall heat transfer, moisture content, loss on drying, humidity of air, uniformity index by double cone blender. 2. Explain the principle, instrumentation, working & application of rotary tablet machine, fluidized bed coater, fluid energy mill, dehumidifier, colloidal mill, planetary mixer, fluidized bed dryer, freeze dryer

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		3. Illustrate construction of drying curves, various size distribution curves & verify laws of size reduction by using different equation 4. Study the effect of time on rate of filtration, evaporation & crystallization 5. Demonstration of Steam distillation, colloid mill, planetary mixer, fluidized bed dryer, freeze dryer
Second year 2019 pattern SEMESTER-IV		
BP401T	Pharmaceutical Organic Chemistry III– Theory (Div A)	1. Understand the methods of preparation and properties of organic compounds and apply them to actual experiments. 2. Know the stereo chemical aspects of organic compounds and stereo chemical reactions. 3. Know the medicinal uses and other applications of organic compounds 4. Classify heterocyclic compounds based on various criteria, predict their common as well as IUPAC name and recall their synthetic & physicochemical properties 5. Identify various rearrangement reactions and conclude the mechanism in the formation of a particular compound
	Pharmaceutical Organic Chemistry III– Theory (Div B)	1. Understand the methods of preparation and properties of organic compounds and apply them to actual experiments. 2. Know the stereo chemical aspects of organic compounds and stereo chemical reactions. 3. Know the medicinal uses and other applications of organic compounds 4. Classify heterocyclic compounds based on various criteria, predict their common as well as IUPAC name and recall their synthetic & physicochemical properties 5. Identify various rearrangement reactions and conclude the mechanism in the formation of a particular compound.
BP402T	Medicinal Chemistry I – Theory (Div A)	1. Recall, apply and illustrate SAR of different classes of drugs 2. Describe, apply, categorize and justify of Physiochemical properties of drug molecules in relation to drug ADME. 3. Classify , discuss and memorize different classes of drugs and receptors under ANS and CNS 4. Explain and determine some routes for the chemical synthesis of some drugs. 5. Describe and explain an outline of drug metabolic pathways, adverse effects and therapeutic values. 6. Compare and summarize the chemistry of drugs with respective to their pharmacological activity
	Medicinal Chemistry I – Theory (Div B)	1. Recall, apply and illustrate SAR of different classes of drugs 2. Describe, apply, categorize and justify of Physiochemical properties of drug molecules in relation to drug ADME. 3. Classify , discuss and memorize different classes of drugs and receptors under ANS and CNS 4. Explain and determine some routes for the chemical synthesis of some drugs. 5. Describe and explain an outline of drug metabolic pathways,

		adverse effects and therapeutic values. 6. Compare and summarize the chemistry of drugs with respective to their pharmacological activity
BP403T	Physical Pharmaceutics II – Theory (Div A)	1. Integrate and apply various physicochemical properties of drug and excipients in designing the dosage forms 2. Demonstrate basics involved in reaction kinetics in stability studies, deformation, colloidal systems and coarse dispersion systems, micromeritics and rheological studies. 3. Demonstrate ability to develop critical thinking and problem solving required to address problems related to dosage form design and evaluation. 4. Recognize and Apply basic rules and equations regarding physical principles essential for pharmaceutical applications
	Physical Pharmaceutics II – Theory (Div B)	1. Integrate and apply various physicochemical properties of drug and excipients in designing the dosage forms 2. Demonstrate basics involved in reaction kinetics in stability studies, deformation, colloidal systems and coarse dispersion systems, micromeritics and rheological studies. 3. Demonstrate ability to develop critical thinking and problem solving required to address problems related to dosage form design and evaluation. 4. Recognize and Apply basic rules and equations regarding physical principles essential for pharmaceutical applications
BP404T	Pharmacology I – Theory (Div-A)	1. To define the fundamental concepts of pharmacology and pharmacokinetics. 2. To understand the basics of pharmacodynamics, adverse reactions, drug interactions and drug discovery 3. To identify the role of neurohumoral transmission and drugs acting on peripheral nervous system 4. To analyze the functions of neurotransmitters and drugs acting on central nervous system. 5. To appraise the pharmacology of Psychopharmacological agents 6. To predict the effects of drugs against neurodegenerative disorders and to elaborate the concepts of drug addiction/abuse/tolerance/ dependence
	Pharmacology I – Theory (Div-B)	1. To define the fundamental concepts of pharmacology and pharmacokinetics. 2. To understand the basics of pharmacodynamics, adverse reactions, drug interactions and drug discovery 3. To identify the role of neurohumoral transmission and drugs acting on peripheral nervous system 4. To analyze the functions of neurotransmitters and drugs acting on central nervous system. 5. To appraise the pharmacology of Psychopharmacological agents 6. To predict the effects of drugs against neurodegenerative disorders and to elaborate the concepts of drug addiction/abuse/tolerance/ dependence
BP405T	Pharmacognosy and	1. Summarize the basic knowledge of importance and scope of

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	Phytochemistry I– Theory (Div- A)	pharmacognosy and phytochemistry I in pharmacy field and its role in various systems of medicines 2. Apply knowledge of pharmacognostic study and quality control of crude drugs 3. Describe biological source, chemical nature, proprties, identification tests and uses of crude drugs as well as plant products of natural origin (Primary & secondary metabolites) 4. Classify crude drugs and explain importance of cultivation, collection, processing, evaluation, preservation and storage of drugs of natural origin as well as plant tissue culture
	Pharmacognosy and Phytochemistry I– Theory (Div- B)	1. Summarize the basic knowledge of importance and scope of pharmacognosy and phytochemistry I in pharmacy field and its role in various systems of medicines 2. Apply knowledge of pharmacognostic study and quality control of crude drugs 3. Describe biological source, chemical nature, proprties, identification tests and uses of crude drugs as well as plant products of natural origin (Primary & secondary metabolites) 4. Classify crude drugs and explain importance of cultivation, collection, processing, evaluation, preservation and storage of drugs of natural origin as well as plant tissue culture
BP406P	Medicinal Chemistry I – Practical (Div A)	1. Understand, discuss and Synthesize the medicinally important compounds / drug intermediates such as 1,3-pyrazole, 1,3-oxazole, Benzimidazole, Benztriazole, 2,3- diphenyl quinoxaline, Benzocaine, Phenytoin, Phenothiazine Barbiturate. 2. Understand, determine and develop the recrystallization poceducre for organic compound and monitor reactions by TLC 3. Determine, develop and apply the purification procedure for synthesized organic compounds by column chromatography 4. Understand, discuss and determine and perform the procedure of Partition coefficient and Ionization constants
	Medicinal Chemistry I – Practical (Div B)	1. Understand, discuss and Synthesize the medicinally important compounds / drug intermediates such as 1,3-pyrazole, 1,3-oxazole, Benzimidazole, Benztriazole, 2,3- diphenyl quinoxaline, Benzocaine, Phenytoin, Phenothiazine Barbiturate. 2. Understand, determine and develop the recrystallization poceducre for organic compound and monitor reactions by TLC 3. Determine, develop and apply the purification procedure for synthesized organic compounds by column chromatography 4. Understand, discuss and determine and perform the procedure of Partition coefficient and Ionization constants
BP407P	Physical Pharmaceutics II	1. Exercise different pharmaceutical laboratory procedures used

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	– Practical (Div A)	in determining various physical properties such as micrometric properties, viscosity, order of reaction, etc. 2. Design and perform skillfully some laboratory experiments needed in pharmacy practice from preformulation and formulation point of view 3. Acquire and use technical vocabulary to discuss pharmaceutical problems 4. Employ proper documentation system to record observations and analyze information gathered through experimentation.
	Physical Pharmaceuties II – Practical (Div B)	1. Exercise different pharmaceutical laboratory procedures used in determining various physical properties such as micrometric properties, viscosity, order of reaction, etc. 2. Design and perform skillfully some laboratory experiments needed in pharmacy practice from preformulation and formulation point of view 3. Acquire and use technical vocabulary to discuss pharmaceutical problems 1. Employ proper documentation system to record observations and analyze information gathered through experimentation.
BP408P	Pharmacology I – Practical (Div A)	1. To learn about basic instruments, common laboratory animals used in experimental pharmacology and to organize animal house as per the CPCSEA guidelines. 2. To demonstrate the common laboratory techniques like routes of administration , blood withdrawal, anesthetics and euthanasia used for animal studies 3. To interpret the effects of various drugs on rabbit eye and ciliary motility of frog oesophagus in correlation with humans 4. To analyse the effect of drugs acting as enzyme inducers, skeletal muscle relaxants and affecting locomotor activity in laboratory animal 5. To evaluate the stereotype and anticatatonic activity of drugs in rats/mice 6. To predict various screening models for anticonvulsant ,anxiolytic and local anaesthetics activity
	Pharmacology I – Practical (Div B)	1. Students would have understood the different list of equipment's and animals used for pharmacological actions of different categories of drugs 2. To study the in detailed mechanism of drug action at organ system/cellular/ macromolecular levels. 3. Demonstrate the use of EX- Pharma software to study effect of different categories of drug along with mechanism of action. 4. To observed the effect of drugs on animals by simulated experiments. 5. Explain the ideas about correlation of pharmacology with other bio medical sciences
BP409P	Pharmacognosy and Phytochemistry I – Practical (Div A)	1. Understand, analyze and differentiate between the various crude drugs 2. Perform Quantitative analysis of the various crude drugs 3. Design the extraction techniques by selecting suitable solvents 4. Analyze and differentiate between authentic and adulterated

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		drugs 5. Develops hands on skills in micrometry
	Pharmacognosy and Phytochemistry I – Practical (Div B)	1. Understand, analyze and differentiate between the various crude drugs 2. Perform Quantitative analysis of the various crude drugs 3. Design the extraction techniques by selecting suitable solvents 4. Analyze and differentiate between authentic and adulterated drugs 5. Develops hands on skills in micrometry
Third year 2019 pattern SEMESTER-V		
BP501T	Medicinal Chemistry II – Theory (Div A)	1. Recall, apply and illustrate SAR of different classes of drugs 2. Classify , discuss and memorize different classes of drugs and receptors under Antihistaminic, cardiovascular system, Endocrine system, antidiabetic and Local anesthetics 3. Explain and determine some routes for the chemical synthesis of some drugs. 4. Describe and explain an outline of drug metabolic pathways, adverse effects and therapeutic values. 5. Compare and summarize the chemistry of drugs with respective to their pharmacological activity
	Medicinal Chemistry II – Theory (Div B)	1. Recall, apply and illustrate SAR of different classes of drugs 2. Classify , discuss and memorize different classes of drugs and receptors under Antihistaminic, cardiovascular system, Endocrine system, antidiabetic and Local anesthetics 3. Explain and determine some routes for the chemical synthesis of some drugs. 4. Describe and explain an outline of drug metabolic pathways, adverse effects and therapeutic values. 1. Compare and summarize the chemistry of drugs with respective to their pharmacological activity
BP502T	Industrial Pharmacy-I– Theory (Div A)	1. Describe the concept of pre-formulation study for the development of pharmaceutical dosage forms. 2. Design solid and liquid dosage forms; describe their manufacture and evaluate them for their quality. 3. Apply basic concepts of dosage forms; analyse techniques and equipment used in their manufacture and apply pharmacopoieal specifications during evaluation of solid, liquid dosage forms 4. Construct sterile parenteral products and ophthalmic preparations; manufacture and evaluate them for their quality. 5. Design cosmetic products, pharmaceutical aerosols and evaluate them. Describe pharmaceutical packaging materials required for various dosage forms and illustrate quality control tests for them. 6. Analyse techniques and equipment used in manufacture of sterile parenteral products, ophthalmic products, cosmetics and

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		drugs 5. Develops hands on skills in micrometry
	Pharmacognosy and Phytochemistry I – Practical (Div B)	1. Understand, analyze and differentiate between the various crude drugs 2. Perform Quantitative analysis of the various crude drugs 3. Design the extraction techniques by selecting suitable solvents 4. Analyze and differentiate between authentic and adulterated drugs 5. Develops hands on skills in micrometry
Third year 2019 pattern SEMESTER-V		
BP501T	Medicinal Chemistry II – Theory (Div A)	1. Recall, apply and illustrate SAR of different classes of drugs 2. Classify , discuss and memorize different classes of drugs and receptors under Antihistaminic, cardiovascular system, Endocrine system, antidiabetic and Local anesthetics 3. Explain and determine some routes for the chemical synthesis of some drugs. 4. Describe and explain an outline of drug metabolic pathways, adverse effects and therapeutic values. 5. Compare and summarize the chemistry of drugs with respective to their pharmacological activity
	Medicinal Chemistry II – Theory (Div B)	1. Recall, apply and illustrate SAR of different classes of drugs 2. Classify , discuss and memorize different classes of drugs and receptors under Antihistaminic, cardiovascular system, Endocrine system, antidiabetic and Local anesthetics 3. Explain and determine some routes for the chemical synthesis of some drugs. 4. Describe and explain an outline of drug metabolic pathways, adverse effects and therapeutic values. 1. Compare and summarize the chemistry of drugs with respective to their pharmacological activity
BP502T	Industrial Pharmacy-I– Theory (Div A)	1. Describe the concept of pre-formulation study for the development of pharmaceutical dosage forms. 2. Design solid and liquid dosage forms; describe their manufacture and evaluate them for their quality. 3. Apply basic concepts of dosage forms; analyse techniques and equipment used in their manufacture and apply pharmacopoieal specifications during evaluation of solid, liquid dosage forms 4. Construct sterile parenteral products and ophthalmic preparations; manufacture and evaluate them for their quality. 5. Design cosmetic products, pharmaceutical aerosols and evaluate them. Describe pharmaceutical packaging materials required for various dosage forms and illustrate quality control tests for them. 6. Analyse techniques and equipment used in manufacture of sterile parenteral products, ophthalmic products, cosmetics and

		pharmaceutical aerosols and apply pharmacopoieal specifications during their evaluation and interpret their quality.
	Industrial Pharmacy-I– Theory (Div B)	1. Describe the concept of pre-formulation study for the development of pharmaceutical dosage forms. 2. Design solid and liquid dosage forms; describe their manufacture and evaluate them for their quality. 3. Apply basic concepts of dosage forms; analyse techniques and equipment used in their manufacture and apply pharmacopoieal specifications during evaluation of solid, liquid dosage forms 4. Construct sterile parenteral products and ophthalmic preparations; manufacture and evaluate them for their quality. 5. Design cosmetic products, pharmaceutical aerosols and evaluate them. Describe pharmaceutical packaging materials required for various dosage forms and illustrate quality control tests for them. 6. Analyse techniques and equipment used in manufacture of sterile parenteral products, ophthalmic products, cosmetics and pharmaceutical aerosols and apply pharmacopoieal specifications during their evaluation and interpret their quality.
BP503T	Pharmacology II – Theory (Div-A)	1. Describe, explain and summarize the classification, mechanism of action, pharmacological action, pharmacokinetic, therapeutic uses , adverse drug reaction, drug interaction and contraindications of drug acting on Cardiovascular system, endocrine system and urinary system 2. Describe the pharmacology of drugs used in the management of cardiovascular diseases. 3. To study the pharmacology of drugs used as Diuretics and anti-diuretics. 4. Describe pharmacology of drugs that affect the major endocrine gland and their hormones 5. To study the principles and applications of bioassay 6. Explain and outline correlation of pharmacology with related medical sciences.
	Pharmacology II – Theory (Div-B)	1. Describe, explain and summarize the classification, mechanism of action, pharmacological action, pharmacokinetic, therapeutic uses , adverse drug reaction, drug interaction and contraindications of drug acting on Cardiovascular system, endocrine system and urinary system 2. Describe the pharmacology of drugs used in the management of cardiovascular diseases. 3. To study the pharmacology of drugs used as Diuretics and anti-diuretics. 4. Describe pharmacology of drugs that affect the major endocrine gland and their hormones 5. To study the principles and applications of bioassay 6. Explain and outline correlation of pharmacology with related medical sciences.

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BP504T	Pharmacognosy and phytochemistry II– Theory (Div A)	1. Sketch & relate the origin of phytoconstituents by biogenetic pathway & summarize the various techniques for their investigation 2. Develop and design the technique for extraction, isolation, purification of phytoconstituents for medicinal, agricultural, food & healthcare industry 3. Design & explain various methods for determination of authenticity of crude drugs, extracts, phytoconstituents, formulation & detect their adulteration 4. Develop themselves to design a method for analysis, detection, purification of various extracts, phytoconstituents & herbal raw materials. 5. Correlate various techniques involved in extraction, isolation, estimation & application of phytoconstituents
	Pharmacognosy and phytochemistry II– Theory (Div B)	1. Sketch & relate the origin of phytoconstituents by biogenetic pathway & summarize the various techniques for their investigation 2. Develop and design the technique for extraction, isolation, purification of phytoconstituents for medicinal, agricultural, food & healthcare industry 3. Design & explain various methods for determination of authenticity of crude drugs, extracts, phytoconstituents, formulation & detect their adulteration 4. Develop themselves to design a method for analysis, detection, purification of various extracts, phytoconstituents & herbal raw materials. 5. Correlate various techniques involved in extraction, isolation, estimation & application of phytoconstituents
BP505T	Pharmaceutical Jurisprudence – Theory (Div A)	1. To impart basic knowledge on important legislations related to the profession of pharmacy in India. 2. To understand definition, committees, rules, scope, functioning and offences and penalties of various Indian pharmaceutical Acts and Laws 3. To understand objective and ethics of various pharmaceutical Acts and Laws. 4. To impart basic knowledge of development of Pharmaceutical Legislation and enforcement of various Pharmaceutical Acts and laws. 5. To be able to relate dynamics of pharmaceutical profession to the Acts and Laws applicable 6. To be able to analyse dos and donts of pharmacy profession keeping pharmaceutical Acts and Laws as the reference.
	Pharmaceutical Jurisprudence – Theory (Div B)	1. To impart basic knowledge on important legislations related to the profession of pharmacy in India. 2. To understand definition, committees, rules, scope, functioning and offences and penalties of various Indian

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		pharmaceutical Acts and Laws 3. To understand objective and ethics of various pharmaceutical Acts and Laws. 4. To impart basic knowledge of development of Pharmaceutical Legislation and enforcement of various Pharmaceutical Acts and laws. 5. To be able to relate dynamics of pharmaceutical profession to the Acts and Laws applicable. 6. To understand the pharmacy profession keeping pharmaceutical Acts and Laws as the reference.
BP506P	Industrial Pharmacy-I – Practical (Div A)	1. Formulate solid and liquid dosage forms, manufacture and evaluate them. 2. Perform calculations needed to perform evaluation tests of solid and liquid dosage forms and interpret the results 3. Analyse the rational and use of ingredients in formulation and category of respective formulation 4. Select and use appropriate equipment and apparatus needed for the particular preparation 5. Formulate sterile parenteral products and ophthalmic preparations, prepare and evaluate them. 6. Prepare labels to suit regulatory requirements and select proper packaging (container and closure) and labeling materials for preparations
	Industrial Pharmacy-I – Practical (Div B)	1. Formulate solid and liquid dosage forms, manufacture and evaluate them. 2. Perform calculations needed to perform evaluation tests of solid and liquid dosage forms and interpret the results 3. Analyse the rational and use of ingredients in formulation and category of respective formulation 4. Select and use appropriate equipment and apparatus needed for the particular preparation 5. Formulate sterile parenteral products and ophthalmic preparations, prepare and evaluate them. 6. Prepare labels to suit regulatory requirements and select proper packaging (container and closure) and labeling materials for preparations
BP507P	Pharmacology II – Practical (Div A)	1. Demonstrate the biological evaluation of drugs by in vitro and in vivo methods and to study different physiological salt solutions 2. Analyze knowledge how to deal with experimental animals to test the potency of drugs. 3. Compare, select, locate and isolate different organs/tissues from the laboratory animals used in pharmacological experiments. 4. Develop skills in handling animals and perform and evaluate

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		experiments on them 5. Calculate and compare experimental observations and results statistically
	Pharmacology II – Practical (Div B)	1. Demonstrate the biological evaluation of drugs by in vitro and in vivo methods and to study different physiological salt solutions 2. Analyze knowledge how to deal with experimental animals to test the potency of drugs. 3. Compare, select, locate and isolate different organs/tissues from the laboratory animals used in pharmacological experiments. 4. Develop skills in handling animals and perform and evaluate experiments on them 5. Calculate and compare experimental observations and results statistically
BP508P	Pharmacognosy and Phytochemistry II – Practical (Div A)	1. Modify the techniques for isolation & purification of significant phytoconstituents 2. Develop & modify the techniques involved in analysis of crude drugs & their extracts 3. Design various analytical parameters required for the authentication of crude drugs, Extracts, Oils etc. 4. Judge various crude drugs on the basis of their morphological & microscopical Studies. 5. Evaluate the purity &/or stability of various unorganized crude drugs & oils.
	Pharmacognosy and Phytochemistry II – Practical (Div B)	1. Modify the techniques for isolation & purification of significant phytoconstituents 2. Develop & modify the techniques involved in analysis of crude drugs & their extracts 3. Design various analytical parameters required for the authentication of crude drugs, Extracts, Oils etc. 4. Judge various crude drugs on the basis of their morphological & microscopical Studies. 5. Evaluate the purity &/or stability of various unorganized crude drugs & oils.
Thrid year 2019 pattern SEMESTER-VI		
BP601T	Medicinal Chemistry III – Theory (Div A)	1. Recall, apply and illustrate SAR of different classes of drugs 2. Understand and apply the chemistry of drugs with respective to their biological activity. 3. Describe and explain an outline of drug metabolic pathways, adverse effects and therapeutic values. 4. Explain and determine some routes for the chemical synthesis of some drugs. 5. Understand and apply importance of drug design and different techniques of drug design.

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		6. Classify, discuss and memorize different classes of drugs under Antibiotics, anti-infective, antimalarial, antimycobaterial, antiviral, antifungal, anttiprotozoal, anthelmintic and antineoplastic agents.
	Medicinal Chemistry III – Theory (Div B)	1. Recall, apply and illustrate SAR of different classes of drugs 2. Understand and apply the chemistry of drugs with respective to their biological activity. 3. Describe and explain an outline of drug metabolic pathways, adverse effects and therapeutic values. 4. Explain and determine some routes for the chemical synthesis of some drugs. 5. Understand and apply importance of drug design and different techniques of drug design. 6. Classify, discuss and memorize different classes of drugs under Antibiotics, anti-infective, antimalarial, antimycobaterial, antiviral, antifungal, anttiprotozoal, anthelmintic and antineoplastic agents.
BP602T	Pharmacology III – Theory (Div A)	1. Understand the pharmacological concepts of drugs acting on respiratory system. 2. Understand pharmacological concepts of drugs acting on Gastrointestinal tract. 3. Clarify the pharmacological features of common and important drugs as antibiotics and chemotherapeutic agents. 4. Describe the pharmacology of immunosuppressant and immunostimulants. 5. Explain principles of toxicology and treatment of various poisonings. 6. Correlate toxicology and its pharmacology with different types of disease and poisoning.
	Pharmacology III – Theory (Div B)	1. Understand the pharmacological concepts of drugs acting on respiratory system. 2. Understand pharmacological concepts of drugs acting on Gastrointestinal tract. 3. Clarify the pharmacological features of common and important drugs as antibiotics and chemotherapeutic agents. 4. Describe the pharmacology of immunosuppressant and immunostimulants. 5. Explain principles of toxicology and treatment of various poisonings. 1. Correlate toxicology and its pharmacology with different types of disease and poisoning.
BP603T	Herbal Drug Technology – Theory (Div A)	1. Describe and explain herbs as a raw materials source from the cultivation of herbal drug products. 2. Discuss and apply various guidelines issued by WHO in relation to cultivation, collection, storage, etc. in order to ethically develop pharmaceutical dosage forms. 3. Describe and explain the concept of health and pathogenesis, philosophical basis, diagnosis & treatment aspects of Ayurveda, Unani, Siddha & Homeopathic system of medicine; understand & explain the method of preparation of Ayurvedic

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		dosage forms; understand the importance of novel drug delivery of natural products like liposomes, phytosomes; herbs used in cosmetic preparation & the method of their formulations. 4. Understand health benefits and potentials of Nutraceuticals, Describe and explain Herbal-Drug and Herb-food interactions. 5. Describe and explain Good Manufacturing Practices (GMP), patenting and regulatory issues of herbal drugs
	Herbal Drug Technology – Theory (Div B)	1. Describe and explain herbs as a raw materials source from the cultivation of herbal drug products. 2. Discuss and apply various guidelines issued by WHO in relation to cultivation, collection, storage, etc. in order to ethically develop pharmaceutical dosage forms. 6. Describe and explain the concept of health and pathogenesis, philosophical basis, diagnosis & treatment aspects of Ayurveda, Unani, Siddha & Homeopathic system of medicine; understand & explain the method of preparation of Ayurvedic dosage forms; understand the importance of novel drug delivery of natural products like liposomes, phytosomes; herbs used in cosmetic preparation & the method of their formulations. 7. Understand health benefits and potentials of Nutraceuticals, Describe and explain Herbal-Drug and Herb-food interactions. Describe and explain Good Manufacturing Practices (GMP), patenting and regulatory issues of herbal drugs
BP604T	Biopharmaceutics and Pharmacokinetics – Theory (Div A)	1. Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance 2. Calculate the plasma drug concentration-time data & the pharmacokinetic parameters 3. Describe the processes & kinetics of drug absorption, distribution, metabolism, excretion, elimination. 4. Discuss & Understand the concepts of bioavailability and bioequivalence of drug products and their significance 5. Collaborate the concept of dissolution and application of in vitro in vivo correlation in drug product development
	Biopharmaceutics and Pharmacokinetics – Theory (Div B)	1. Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance 2. Calculate the plasma drug concentration-time data & the pharmacokinetic parameters 3. Describe the processes & kinetics of drug absorption, distribution, metabolism, excretion, elimination. 4. Discuss & Understand the concepts of bioavailability and bioequivalence of drug products and their significance 5. Collaborate the concept of dissolution and application of in vitro in vivo correlation in drug product development.
BP605T	Pharmaceutical Biotechnology – Theory (Div A)	1. Summarize the basic knowledge of Biotechnology and its scope in pharmacy 2. To assess understanding about use of advanced biotechnological terms, principles and methods to solve

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		biotechnological tasks. 3. To apply knowledge of immunology in healthcare and diagnostic purposes 4. To clarify equipments and the steps involved in production of biotechnologically derived product as well as methods to develop modern techniques in biotechnology field helpful to society
	Pharmaceutical Biotechnology – Theory (Div B)	1. Summarize the basic knowledge of Biotechnology and its scope in pharmacy 2. To assess understanding about use of advanced biotechnological terms, principles and methods to solve biotechnological tasks. 3. To apply knowledge of immunology in healthcare and diagnostic purposes 1. To clarify equipments and the steps involved in production of biotechnologically derived product as well as methods to develop modern techniques in biotechnology field helpful to society
BP606T	Quality Assurance –Theory (Div A)	1. Understand and analyze cGMP aspects in a pharmaceutical industry 2. Explain the concept of quality management and elaborate quality responsibilities of QA & QC departments 3. Compile and discuss quality certifications applicable to pharmaceutical industries and their scope 4. Understand document maintenance in pharmaceutical industry and judge the importance of documentation. 5. Explain quality control of packaging materials; understand good laboratory practices and identify its importance. 6. Outline calibration and validation principles and good warehouse practices
	Quality Assurance –Theory (Div B)	1. Understand and analyze cGMP aspects in a pharmaceutical industry 2. Explain the concept of quality management and elaborate quality responsibilities of QA & QC departments 3. Compile and discuss quality certifications applicable to pharmaceutical industries and their scope 4. Understand document maintenance in pharmaceutical industry and judge the importance of documentation. 5. Explain quality control of packaging materials; understand good laboratory practices and identify its importance. Outline calibration and validation principles and good warehouse practices
BP607P	Medicinal chemistry III – Practical (Div A)	1. Use of Various equipment & and take safety measures while working in medical chemistry laboratory 2. Explain, apply, and justify the principle and theory behind synthesis of compound of our interest 3. Develop and apply skill to synthesize compound and purify synthesized compounds. 4. Develop and apply skill to synthesize by microwave assisted

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		synthesis as green chemistry approach. 5. Predict and derive physicochemical properties of synthesized compound. 6. Develop virtual learning and skill of drawing structures and determining physicochemical parameters using online free software.
	Medicinal chemistry III – Practical (Div B)	1. Use of Various equipment & and take safety measures while working in medical chemistry laboratory 2. Explain, apply, and justify the principle and theory behind synthesis of compound of our interest 3. Develop and apply skill to synthesize compound and purify synthesized compounds. 4. Develop and apply skill to synthesize by microwave assisted synthesis as green chemistry approach. 5. Predict and derive physicochemical properties of synthesized compound. 6. Develop virtual learning and skill of drawing structures and determining physicochemical parameters using online free software.
BP608P	Pharmacology III – Practical (Div A)	1. Understand the effect of drugs on various muscles and tissues on animal. 2. Study toxicity of drug using given data. 3. Evaluate corrosion/irritation of test substances on animals. 4. Study Biostatistics methods in experimental pharmacology.
	Pharmacology III – Practical (Div B)	1. Understand the effect of drugs on various muscles and tissues on animal. 2. Study toxicity of drug using given data. 3. Evaluate corrosion/irritation of test substances on animals. 1. Study Biostatistics methods in experimental pharmacology
BP609P	Herbal Drug Technology – Practical (Div A)	1. Classify and analyze various herbal raw materials required for formulation of herbal products. 2. Develop skills for evaluation of various Ayurvedic formulations such as Asava, Arista. Design and evaluate various excipients of natural origin. 3. Design, evaluate, optimize & develop cosmetic formulations like creams, lotions and shampoos. 4. Design, evaluate, optimize & develop standardized extract in formulations like syrups, mixtures and tablets. 5. Discuss about the analysis of a Monograph of herbal drugs from recent Pharmacopoeias. 6. Design, optimize analysis methods for determination of aldehydes, phenols and alkaloids in medicinal herbs, herbal products.
	Herbal Drug Technology – Practical (Div B)	1. Classify and analyze various herbal raw materials required for formulation of herbal products. 2. Develop skills for evaluation of various Ayurvedic formulations such as Asava, Arista. Design and evaluate various excipients of natural origin. 3. Design, evaluate, optimize & develop cosmetic

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		formulations like creams, lotions and shampoos. 4. Design, evaluate, optimize & develop standardized extract in formulations like syrups, mixtures and tablets. 5. Discuss about the analysis of a Monograph of herbal drugs from recent Pharmacopocias. 6. Design, optimize analysis methods for determination of aldehydes, phenols and alkaloids in medicinal herbs, herbal products
Final year 2019 pattern SEMESTER-VII		
BP701 T	Instrumental Methods of Analysis- Theory (Div A)	1. To explain, discuss and integrate theory and principle of various analytical techniques like UV/Visible Spectroscopy, FTIR spectroscopy, Fluorimetry, Flame Photometry, Atomic absorption spectroscopy, Nepheloturbidimetry, Adsorption and partition column chromatography, Paper chromatography, Thin layer chromatography, HPTLC, Theory of Chromatography, Gas chromatography, High performance liquid chromatography (HPLC), Ion exchange chromatography, Gel chromatography. 2. To explain, discuss, compose, demonstrate and evaluate instrumentation in UV/Visible Spectroscopy, FTIR spectroscopy, Fluorimetry, Flame Photometry, Atomic absorption spectroscopy, Nepheloturbidimetry, Adsorption and partition column chromatography, Paper chromatography, Thin layer chromatography, HPTLC, Theory of Chromatography, Gas chromatography, High performance liquid chromatography (HPLC), Ion exchange chromatography, Gel chromatography. 3. To apply, compare, rank and justify the analytical tools UV/Visible Spectroscopy, FTIR spectroscopy, Fluorimetry, Flame Photometry, Atomic absorption spectroscopy, Nepheloturbidimetry, Adsorption and partition column chromatography, Paper chromatography, Thin layer chromatography, HPTLC, Theory of Chromatography, Gas chromatography, High performance liquid chromatography (HPLC), Ion exchange chromatography, Gel chromatography. 4. To summarize, integrate, analyze, critique, compare and discuss UV/Visible Spectroscopy, FTIR spectroscopy, Fluorimetry, Flame Photometry, Atomic absorption spectroscopy, Nepheloturbidimetry, Adsorption and partition column chromatography, Paper chromatography, Thin layer chromatography, HPTLC, Theory of Chromatography, Gas chromatography, High performance liquid chromatography (HPLC), Ion exchange chromatography, Gel chromatography.
	Instrumental Methods of Analysis- Theory (Div B)	1. To describe, discuss and summarize theory and principle of analytical techniques like UV Visible spectroscopy, Fluorimetry, IR spectroscopy, Flame Photometry, Atomic absorption spectroscopy, Nepheloturbidometry, Adsorption and partition column chromatography, Thin layer chromatography, Paper chromatography, Electrophoresis, Gas

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		chromatography, High performance liquid chromatography (HPLC), Ion exchange chromatography, Gel chromatography, Affinity chromatography 2. Explain, discuss, and demonstrate in details the above instruments. 3. Understand, discuss and compare the applications of instruments. 4. Understand, discuss, interpret and elucidate the data obtained from above spectroscopic instruments.
BP702 T	Industrial pharmacy-II-Theory (Div A)	1. Understand and analyse the process of pilot plant and scale up of pharmaceutical dosage forms 2. Explain and elaborate the process of technology transfer from lab scale to commercial batch 3. Compile and discuss different Laws and Acts that regulate pharmaceutical industry 4. Compile and explain different quality management systems in pharmaceutical industry 5. Understand the approval process and regulatory requirements for drug products
	Industrial pharmacy-II-Theory (Div B)	1. Understand and analyse the process of pilot plant and scale up of pharmaceutical dosage forms 2. Explain and elaborate the process of technology transfer from lab scale to commercial batch 3. Compile and discuss different Laws and Acts that regulate pharmaceutical industry 4. Compile and explain different quality management systems in pharmaceutical industry 5. Understand the approval process and regulatory requirements for drug products
BP703 T	Pharmacy Practice – Theory (Div A)	1. Apply the basic knowledge of various drug distribution methods, pharmacy stores management and inventory control procedures. 2. Classify the drug interactions and adverse drug reactions. 3. Describe and justify the concept of hospital formulary, therapeutic drug monitoring and Patient counselling. 4. Understand the ethical concerns in clinical pharmacy. 5. Apply the concepts of professional ethics by producing safe and appropriate medication use throughout society. 6. Interpret and justify the use of various clinical laboratory tests.
	Pharmacy Practice – Theory (Div B)	1. Understand and apply all the basic knowledge related to the hospital administration, inventory procedures and Pharmacy management as well as drug interactions. 2. Classify and understand the drug stores in community pharmacy and its management. 3. Describe and justify the concept of hospital formulary, therapeutic drug monitoring and Patient counselling. 4. Understand the ethical concerns in clinical pharmacy. 5. Apply the concepts of professional ethics by producing safe and appropriate medication use throughout society. 6. Interpret and justify the use of various clinical laboratory tests.

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BP704 T	Novel Drug Delivery System- Theory (Div A)	1. Illustrate the basic knowledge of novel drug delivery system concept with respect to classification and definition of various novel drug delivery systems. 2. Illustrate the basic knowledge for selection of drug and various excipients for designing and formulation of novel drug delivery system 3. Discuss the application, advantages and disadvantages of novel drug delivery system over conventional dosage forms. 4. Discuss the various approaches for development of NDDS.
	Novel Drug Delivery System- Theory (Div B)	1. Illustrate the basic knowledge of novel drug delivery system concept with respect to classification and definition of various novel drug delivery systems. 2. Illustrate the basic knowledge for selection of drug and various excipients for designing and formulation of novel drug delivery system 3. Discuss the application, advantages and disadvantages of novel drug delivery system over conventional dosage forms. 4. Discuss the various approaches for development of NDDS.
BP705 P	Instrumental Methods of Analysis- Practical (Div A)	1. To understand, discuss and determine working principle of instruments UV/Visible spectrophotometer, Flame photometer, fluorescence spectrophotometer, colorimeter, HPLC, FTIR, TLC and paper chromatography. 2. To explain, discuss, demonstrate and perform the practical procedure for quantitative and qualitative analysis of drugs or ions. 3. To interpret and summarize the data obtained from UV/Visible spectrophotometer, Flame photometer, fluorescence spectrophotometer, colorimeter, HPLC, FTIR, TLC and paper chromatography. 4. To calculate and estimate the results from observations and summarized data.
	Instrumental Methods of Analysis- Practical (Div B)	1. Understand, discuss and determine the working principles of instruments such as UV, colorimeter, fluorimetry, flame photometry, HPLC, FTIR, TLC and Paper Chromatography. 2. Explain, discuss, and demonstrate the practical procedure for quantitative and qualitative analysis of drugs or ions 3. Interpret and summarize the data obtained from instruments 4. Calculate and estimate the results from summarized data.
BP706PS	Practice School* (Div A)	1. To develop and illustrate the techniques for quantification of API and Formulation by Modern Analytical instruments 2. To Plan various quality control parameters, understand the Good Laboratory Practices and Document maintenance required in a pharmaceutical industry. 3. Develop the hands-on expertise in animal handling as well as on the advanced instruments such as auto analyzer and hematology analyzer. 4. Develop basic skills, demonstrate use of modern equipments in formulation development and documentation practices.
	Practice School* (Div B)	1. To develop and illustrate the techniques for quantification of API and Formulation by Modern Analytical instruments

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		2. To Plan various quality control parameters, understand the Good Laboratory Practices and Document maintenance required in a pharmaceutical industry. 3. Develop the hands-on expertise in animal handling as well as on the advanced instruments such as auto analyzer and hematology analyzer. 4. Develop basic skills, demonstrate use of modern equipments in formulation development and documentation practices
Final year SEMESTER-VIII 2019 Pattern		
BP801T	Biostatistics and Research Methodology	1. Demonstrate knowledge about basic concepts about research and the methodology to conduct industrial and clinical research. 2. Explain the basic statistical concepts, terminology, tools, Regression calculation and parametric test. 3. Describe the appropriate statistical methods required for a particular research design Non parametric test, Introduction to research, Graphs and designing the methodology. 4. Demonstrate the use of softwares like M.S. Excel, SPSS, R and MINITAB, Hypothesis testing and clinical trial. 5. Demonstrate use of tools for design, analysis and optimization of experiments like factorial designs, RSM methodology and response surface methodology.
BP802T	Social and Preventive Pharmacy	1. Understand and solve the current issues related to health and pharmaceutical problems within the country and worldwide. 2. Develop a critical way of thinking based on current healthcare development. 3. Evaluate alternative ways of solving problems related to health and pharmaceutical issues. 4. Describe the Objectives, functioning and importance of national programmes for prevention and control of diseases. 5. Outline community services offered in urban and rural areas. 6. Illustrate the general measures of prevention and control of infections and diseases
	Social and Preventive Pharmacy (Div B)	1. Understand and solve the current issues related to health and pharmaceutical problems within the country and worldwide. 2. Develop a critical way of thinking based on current healthcare development. 3. Evaluate alternative ways of solving problems related to health and pharmaceutical issues. 4. Describe the Objectives, functioning and importance of national programmes for prevention and control of diseases. 5. Outline community services offered in urban and rural areas with respect to prevention and control of communicable and non communicable disease. 6. Illustrate the general measures of prevention and control of infections and diseases.
BP806ET	Quality Control and Standardization of Herbals (Div A)	1. Select and compare various test protocols and parameters for the standardization of herbal drugs and formulations 2. Link and hypothesize the parameters for evaluation and to

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		apply various techniques for the standardisation of Herbal products. 3. Differentiate between the raw material, finished products based upon assessing their quality 4. Explain, Correlate and implement various guidelines for sustaining the quality, safety and efficacy of herbal materials and also for their registration in Indian and International markets
	Quality Control and Standardization of Herbals (Div B)	1. Select and compare various test protocols and parameters for the standardization of herbal drugs and formulations 2. Link and hypothesize the parameters for evaluation and to apply various techniques for the standardisation of Herbal products. 3. Differentiate between the raw material, finished products based upon assessing their quality 4. Explain, Correlate and implement various guidelines for sustaining the quality, safety and efficacy of herbal materials and also for their registration in Indian and International markets
BP808ET	Cell and Molecular Biology- Theory (Div A)	1. Understand cell and molecular biology history, cellular composition and functioning of cell biology. 2. Learn chemical foundations of cell biology. 3. To explain cellular membrane structure and function properties and functions of DNA, Cell Cycle. 4. Depict basic molecular genetics mechanisms. 5. Comprehend the cell signaling pathways with their regulations
	Cell and Molecular Biology- Theory (Div B)	1. Understand cell and molecular biology history, cellular composition and functioning of cell biology. 2. Learn chemical foundations of cell biology. 3. To explain cellular membrane structure and function properties and functions of DNA, Cell Cycle. 4. Depict basic molecular genetics mechanisms. 5. Comprehend the cell signaling pathways with their regulations
BP809ET	Cosmetic Science-Theory (Div A)	1. Discuss the fundamental & scope in cosmetic science & explain the concepts and summarize general additives, water, perfume, preservatives colors, humectants, binders used in cosmetics 2. Explain theoretical aspects in formulation and evaluation of skin care products, hair care products, shaving preparation, baby care products & dental preparation. 3. Develop and evaluate skin care products, hair care products, shaving preparation, baby care products, nail care product & dental preparation. 4. Design and develop cosmetics formulation for hair, eyes, nail, dental and baby care products 5. Illustrate the concept of cosmetics, cosmeceuticals & cosmeceutical agents
	Cosmetic Science-Theory (Div B)	1. Define and classify cosmetic & cosmecutical product, Cosmetic excipients, skin care product, Hair care product,sun protection product.

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		2. Describe Advantage, disadvantage and application of cosmetic & cosmecutical product, Cosmetic excipients, skin care product, Hair care product, sun protection product. 3. Illustrate the evaluation parameters and analytical method of Cosmetic product, cosmetic excipients, skin care product, Hair care product, sun protection product. 4. Explain the problem associated with oral cavity, skin and hair. 5. Understand the principle, mechanism of action and formulation aspect of skin, hair, oral cavity, antiperspants and deodorants
BP811ET	Advanced Instrumentation Techniques (Div A& B)	1. Understand, discuss and determine in detail the theory and principle of H- NMR, C- NMR spectroscopy, mass spectrometry, thermal methods, X-Ray diffraction method, calibration, of radio immune assay, electrophoresis,extraction techniques and hyphenated techniques. 2. Explain, discuss, and demonstrate in details the above instruments. 3. Understand, discuss and compare the applications of instruments. 4. Understand, discuss, interpret and elucidate the data obtained from above spectroscopic instruments.

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ACADEMIC YEAR 2023-2024

COURSE OUTCOMES

Course: M. Pharm **SEMESTER: I**

Subject Code	Subject Name	CO
Department: Pharmacology		
MPAT 101T	Modern Pharmaceutical Analytical Techniques	MPAT101T CO1: Integrate and apply theoretical knowledge of various spectroscopic techniques available for analysis of drugs. MPAT101T CO2: Understand and apply basic Knowledge of chromatographic and electrophoretic separation techniques. MPAT101T CO3: Summarize the instrumentation of modern analytical techniques. MPAT101T CO4: Elucidate a structure based on UV, IR, NMR and Mass data. MPAT101T CO5: Explain, Compare and appraise X-ray crystallographic and Thermal Techniques.
MPL 102T	Advanced pharmacology I	MPL102T CO1: Discuss the pathophysiology and pharmacotherapy of certain diseases. MPL102T CO2: Explain the mechanism of drug actions at cellular and molecular level. MPL102T CO3: Understand the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases. MPL102T CO4: Summarize, classify and apply epidemiology, etiology, pathophysiology sign and symptoms, diagnosis, complications, treatment and management of disease affecting CVS, CNS. MPL102T CO5: Understand and summarize different autocoids and their role in physiological functioning.
MPL 103T	Pharmacological and Toxicological Screening Methods-I	Upon completion of this course, students will be able to- MPL103T CO1: Illustrate the regulations and ethical requirements for use of experimental animals and be able to explain various good laboratory practices for their maintenance and handling. MPL103T CO2: Describe the various laboratory animals used in experimental pharmacology and their applications. MPL103T CO3: Classify the various preclinical screening methods involved in experimental pharmacology.

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		MPL103T CO4: Describe the various preclinical screening methods involved in experimental pharmacology. MPL103T CO5: Summarize the general principles and methods of immunoassay. MPL103T CO6: Outline the limitations of animal experimentations justifying the use of alternative methods for animal studies.
MPL104T	Cellular and Molecular Pharmacology	MPL104T CO1: Understand the basics of cell biology, recombinant DNA technology and transfer of genes to mammalian cells. MPL104T CO2: Apprehend the genetic elements of DNA, fingerprint analysis and various molecular techniques applicable in drug discovery. MPL104T CO3: Apply the knowledge of molecular pharmacology and biomarkers in drug discovery process. MPL104T CO4: Demonstrate molecular biology techniques as applicable for drug discovery. MPL104T CO5: Explain the molecular pathways affected by drugs.
MPL 105P	Pharmacological Practical I	MPL105P CO1: To demonstrate the biological evaluation of drugs by in vitro and in vivo methods. MPL105P CO2: To analyze knowledge how to deal with experimental animals to test the potency of drugs. MPL105P CO3: To develop skills in handling animals and perform and evaluate experiments on them. MPL105P CO4: To calculate and compare experimental observations and results statistically. Student can differentiate between actual experimental results or if these results are due to chance. MPL105P CO5: Manage her / his time effectively by performing pharmacological activity on experimental animals.
Department: Pharmaceutical Chemistry		
MPAT 101T	Modern Pharmaceutical Analytical Techniques	MPAT101T CO1: Integrate and apply theoretical knowledge of various spectroscopic techniques available for analysis of drugs. MPAT101T CO2: Understand and apply basic Knowledge of chromatographic and electrophoretic separation techniques. MPAT101T CO3: Summarize the instrumentation of modern analytical techniques. MPAT101T CO4: Elucidate a structure based on UV, IR, NMR and Mass data.

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		MPAT101T CO5: Explain, Compare and appraise X-ray crystallographic and Thermal Techniques.
MPC102T	Advanced Organic Chemistry I	MPC102T CO1: Recall, apply and interpret basic aspects of organic intermediates and different types of reactions. MPC102T CO2: Understand and appraise mechanism and applications of various named reactions. MPC102T CO3: Recognize and apply different synthetic reagent and protecting groups used in organic synthesis. MPC102T CO4: Explain and understand name reactions including heterocyclic compounds. MPC102T CO5: Understand and apply the concept of disconnection to develop synthetic routs for small target molecule. MPC102T CO6: Recall and apply retrosynthetic pathways in organic synthesis.
MPC 103T	Advanced Medicinal Chemistry	MPC103T CO1: Plan strategies and prepare new chemical entities as potential drugs by following the process of drug discovery knowledge. MPC103T CO2: Synthesize new generation of molecules of various classes, and understand role of stereochemistry and drug action and apply the knowledge of chirality for better drug action. MPC103T CO3: Understand the concept of & design of peptidomimetics including the chemistry of prostaglandins, leukotrienes and thromboxanes. MPC103T CO4: Rationally design the enzyme inhibitors in medicine. MPC103T CO5: Understand the concept of design prodrugs, analogs and peptidomimetics and drug resistance.
MPC 104T	Chemistry of Natural Products	MPC104T CO1: Understand, discuss and determine the natural products as leads for new pharmaceuticals MPC104T CO2: Explain, discuss, and demonstrate the introduction, classification, isolation, purification, molecular modification and biological activity of natural occurring organic substances MPC104T CO3: Understand, discuss the recombinant DNA technology and crude drugs used in Diabetic, liver dysfunction and antitumor therapy MPC104T CO4: Understand, discuss and determine the structural characterization of natural compounds

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MPC 105P	Pharmaceutical Chemistry Practical -I	MPC105P CO1: Synthesize compounds of medicinal importance and characterize the synthesized compounds using physicochemical and spectroscopic methods. MPC105P CO2: Purify organic solvents using column chromatographic techniques. MPC105P CO3: Isolate and characterize the islolated compounds using physicochemical and spectroscopic techniques. MPC105P CO4: Operate, demonstrate, apply and record UV Vis spectrophotometer, column chromatography, HPLC, GC, fluorimetry and flame photometry. MPC105P CO5: Perform degradation reactions on selected plant constituents. MPC105P CO6: Isolate, characterize melting point, mixed melting point, molecular weight determination, functional group analysis, co-chromatographic technique for identification of isolated compounds and interpretation of UV and IR data.
Department: Pharmaceutical Quality Assurance		
MPAT 101T	Modern Pharmaceutical Analytical Techniques	MPAT101T CO1: Integrate and apply theoretical knowledge of various spectroscopic techniques available for analysis of drugs. MPAT101T CO2: Understand and apply basic Knowledge of chromatographic and electrophoretic separation techniques. MPAT101T CO3: Summarize the instrumentation of modern analytical techniques MPAT101T CO4: Elucidate a structure based on UV, IR, NMR and Mass data. MPAT101T CO5: Explain, Compare and appraise X-ray crystallographic and Thermal Techniques.
MQA 102T	Quality Management Systems (2019 pattern)	The learner will be able to MQA 102T -CO1: Explain the basic concepts, terminology and factors affecting the framework of quality, quality control and quality management systems and implement the same. MQA 102T -CO2: Explain the scope of quality certifications applicable to Pharmaceutical industries. MQA 102T -CO3: Demonstrate the effective utilization of different QMS tools for monitoring and improving product quality and process performance within the regulatory framework.

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		MQA 102T -CO4: Suggest suitable guidelines for quality management which can be applied to pharmaceutical industry.
MQA103T	Quality Control and Quality Assurance	MQA103T CO1: Explain significance of quality in pharmaceutical manufacturing and understand the responsibilities of QA & QC departments. MQA103T CO2: Explain role of national and international regulatory agencies in deciding quality standards. MQA103T CO3: Follow cGMP while working in Pharmaceutical industry. MQA103T CO4: Describe various aspects of documentation. MQA103T CO5: Perform analysis of raw materials, IPQC and FPQC of drug products and other manufacturing operations and controls. MQA103T CO6: Explain different guidelines related to Pharmaceutical industry.
MQA104T	Product Development and Technology Transfer	Upon completion of this course, the student should be able to: MQA104T CO1: describe the regulatory principles and requirements of drug discovery and product Development. MQA104T CO2: relate and execute the concept of pre-formulation studies for various formulation. MQA104T CO3: explain the detailed knowledge about pilot plant scale-up. MQA104T CO4: categorize and use various pharmaceutical packaging systems. MQA104T CO5: implement the concept of technology transfer from R&D to production plant.
MQA105P	Pharmaceutical Quality Assurance Practical I	MQA105P CO1: Perform qualitative and quantitative analysis of pharmacopoeial compounds in bulk and in their formulations MQA105P CO2: Perform experiments on various analytical instruments such as UV Vis spectrophotometer, HPLC, GC etc. MQA105P CO3: Demonstrate use of tools for quality management. MQA105P CO4: Perform quality control tests for drugs, raw materials, dosage forms and primary and secondary packaging materials. MQA105P CO5: Perform experiments on pre-formulation studies.

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Department: Pharmaceutics		
MPAT101T	Modern Pharmaceutical Analytical Techniques	MPAT101T CO1: Integrate and apply theoretical knowledge of various spectroscopic techniques available for analysis of drugs. MPAT101T CO2: Understand and apply basic Knowledge of chromatographic and electrophoretic separation techniques. MPAT101T CO3: Summarize the instrumentation of modern analytical techniques. MPAT101T CO4: Elucidate a structure based on UV, IR, NMR and Mass data. MPAT101T CO5: Explain, Compare and appraise X-ray crystallographic and Thermal Techniques.
MPH102T	Drug Delivery System	MPH102T CO1: To formulate and evaluate novel drug delivery systems. MPH102T CO2: To justify selection criteria of drug and polymers for the development of novel drug delivery system. MPH102T CO3: To understand and construct rate controlled drug delivery systems. MPH102T CO4: To construct, justify and evaluate gastroretentive drug delivery systems. MPH102T CO5: To construct, justify and evaluate ocular drug delivery systems and transdermal drug delivery systems. MPH102T CO6: To construct, justify and evaluate protein and peptide delivery systems and vaccine delivery systems.
MPH103T	Modern Pharmaceutics	On successful completion of following theory topics, a learner should be able to; MPH103T CO1: Understand and analyze the concept of preformulation studies in oral solid dosage form development. MPH103T CO2: Compile and integrate preformulation data and apply this knowledge in development of disperse systems and parenterals. MPH103T CO3: Analyze and apply optimization and scale up techniques in formulation development and manufacturing. MPH103T CO4: Demonstrate and understand the concept of validation of pharmaceutical processes, equipment's and methods. MPH103T CO5: Outline and analyze the industrial management techniques and GMP considerations.

		MPH 103T CO6: Evaluate and understand stability, compression, diffusion and dissolution processes in drug product development.
MPH104T	Regulatory Affair	MPH104T CO1: Discuss the basic regulatory Documentation in pharmaceutical industry. MPH104T CO2: Discuss the preparation and submission of CTD,e-CTD. MPH104T CO3: Explain the chemistry, manufacturing controls and their regulatory importance in Anda,Nda Submission & Approval process by different regulatory agencies. MPH104T CO4: Describe the process of Preparation of Dossiers and their submission to regulatory agencies in different countries. MPH104T CO5: What are Clinical trials requirements & different approval procedures for conducting clinical trials.
MPH105P	Pharmaceutics Practical I	On successful completion of following theory topics, a learner should be able to; MPH105P CO1: Understand and apply the analytical methods for pharmaceutical compounds. MPH105P CO2: Compile and integrate various analytical techniques for estimation of drug alone or in combination. MPH105P CO3: Analyze and evaluate formulation aspects of different drug delivery systems. MPH105P CO4: Demonstrate and understand in vitro dissolution studies and effect of various parameters on dissolution of drug. MPH105P CO5: Outline and perform preformulation studies as a significant step in drug product development. MPH105P CO6: Demonstrate and apply the concept of preformulation studies in product life cycle.

Course: M. Pharm **SEMESTER: II**

Subject Code	Subject Name	CO
Department: Pharmacology		
MPL 201T	Advanced Pharmacology II (SEM 2)	Upon completion of this course, students will be able to- MPL201T CO1: Recall the pathophysiological aspects of different endocrine disorders, be able to classify different drugs used in endocrine disorders and be able to describe the pharmacological aspects associated with them.

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		MPL201T CO2: Identify the etiological aspects of various infective disorders, be able to classify different drugs used in infective disorders and be able to summarize their pharmacology in relevance to the management of different microbial infections. MPL201T CO3: Recall the pathophysiological aspects of different GIT disorders, be able to classify different drugs used in GIT disorders and be able to describe their pharmacological aspects. MPL201T CO4: Illustrate the current scenario of tuberculosis, HIV, cancer and respiratory disorders in society, be able to classify the drugs used in management of these diseases and be able justify the use of these drugs for management of these diseases. MPL201T CO5: Outline the different aspects of free radical pharmacology and be able to summarize the role of various antioxidants in management of free radical induced diseases.
MPL 202T	Pharmacological and toxicological screening methods II (SEM 2)	MPL202T CO1: Explain the various types of toxicity studies. MPL202T CO2.Appreciate the importance of ethical and regulatory requirements for toxicity studies. MPL202T CO3: Demonstrate the practical skills require conducting the preclinical toxicity studies. MPL202T CO4: To study Importance and applications of toxicokinetic studies. MPL202T CO5: To study and apply good laboratory practices and its importance in drug development.
MPL203T	Principles of Drug Discovery	MPL203T CO1: Outline the various stages of drug discovery. MPL203T CO2: Justify the importance of the role of genomics, proteomics and bioinformatics in drug discovery. MPL203T CO3: Apply the knowledge of various targets, biomarkers and in vitro screening techniques for drug discovery. MPL203T CO4: Summarize various lead seeking and lead optimization methods. MPL203T CO5: Integrate the concepts of computer aided drug design in drug discovery.
MPL 204T	Clinical research and pharmacovigilance (SEM 2)	MPL204T CO1: Explain the regulatory requirements for conducting clinical trial.

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		MPL204T CO2: Demonstrate the types of clinical trial designs. MPL204T CO3: Explain the responsibilities of key players involved in clinical trials. MPL204T CO4: Execute safety monitoring, reporting and close-out activities. MPL204T CO5: Explain the principles of Pharmacovigilance. MPL204 CO6: Detect new adverse drug reaction and their assessment. Perform the adverse drug reaction reporting systems and communication in Pharmacovigilance.
MPL 205P	Pharmacological practical II (SEM 2)	MPL205P CO1: To demonstrate the biological evaluation of drugs by in vitro and in vivo methods MPL205P CO2: To analyze knowledge how to deal with experimental animals to test the potency of drugs. MPL205P CO3: Compare, select, locate and isolate different organs/tissues from the laboratory animals used in pharmacological experiments as well as by simulated experiments which give an idea on the recent methods of bioassay. MPL205P CO4: To develop skills in handling animals and perform and evaluate experiments on them. MPL205P CO5: To calculate and compare experimental observations and results statistically. Student can differentiate between actual experimental results or if these results are due to chance. MPL205P CO6: Manage her / his time effectively by performing pharmacological activity on experimental animals.
Department: Pharmaceutical Chemistry		
MPC201T	Advanced Spectral Analysis	MPC201T CO1: To explain, discuss and integrate theory and principle of various analytical techniques like UV and IR spectroscopy, NMR spectroscopy, Mass Spectroscopy, Chromatography, Thermal methods of analysis MPC201T CO2: To apply the knowledge of UV and IR spectroscopy, NMR spectroscopy, Mass Spectroscopy, Chromatography, Thermal methods of analysis for identification, characterization and quantification of drugs. MPC201T CO3: To understand, explain and interpret UV, IR, NMR, and Mass spectra of various organic compounds MPC201T CO4: To understand, distinguish and apply theoretical and practical skills of hyphenated techniques

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		like GC MS, GCAAS, LC MS, LC FTIR, LC NMR, CE MS, and LC MS MS
MPC 202T	Advanced Organic Chemistry - II	MPC202T CO1: Apply the principles and techniques of Green chemistry in synthesis of organic compounds. MPC202T CO2: Synthesize chiral compounds using various methods of asymmetric synthesis based on the stereochemistry. MPC202T CO3: Apply the techniques of peptide synthesis. MPC202T CO4: Apply the principles of photochemical and pericyclic reactions. MPC202T CO5: Use different methods of catalysis and catalysts in synthesis of organic compounds.
MPC 203T	Computer Aided Drug Design	MPC 203T CO1 To utilize various molecular modeling softwares in the design of novel drug-like molecules. MPC 203T CO2 To apply the various softwares for physicochemical property prediction. MPC 203T CO3 To understand how current drugs were developed by using pharmacophores modeling and docking technique. MPC 203T CO4 To study Case studies in Molecular Modeling to apply those in development of novel entities by the use of computer aided drug design. MPC 203T CO5 Discuss History, different techniques and applications of Computer aided drug design & apply them to determine route for designing new molecules. MPC 203T CO6 To know history, physicochemical parameters, applications and statistical methods used to develop QSAR & apply these concepts in developing best QSAR model.
MPC 204T	Pharmaceutical Process Chemistry	MPC204T CO1: Assess Synthetic strategy Stages of process in Bench, pilot and large scale. MPC204T CO2: Outline Industrial Safety MSDS (Material Safety Data Sheet and Personal Protection Equipment (PPE) Fire hazards, Occupational Health & Safety Assessment Series 1800 (OHSAS-1800) and ISO-14001. MPC204T CO3: Classify Extraction Filtration Distillation Evaporation Crystallization operations in Pharmaceutical process chemistry. MPC204T CO4: Summarize Nitration, Halogenation and Oxidation and Reduction operations in Pharmaceutical process chemistry and Case study on industrial reduction process.

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		MPC204T CO5: Select Fermentation used in production of medicine and Reaction progress kinetic analysis useful for scale-up.
MPC 205P	Pharmaceutical Chemistry Practical -II	MPC205P CO1: Compare synthesis of API's / intermediates by different synthetic routes and use various approaches for synthesis of organic compounds. MPC205P CO2: Synthesize organic compounds using microwave technique. MPC205P CO3: Design drug molecules using computer aided drug design. MPC205P CO4: Interpret and characterize synthesized organic compounds using FT–IR, NMR, CNMR and Mass spectra. MPC205P CO5: Describe, discuss and compare study of synthesis of APIs/intermediates by different synthetic routes and assignments on regulatory requirements in API. MPC205P CO6: Describe, discuss, explain and demonstrate calculation of ADMET properties of drug molecules and its analysis using softwares Pharmacophore modeling, 2D–QSAR based experiments, 3D–QSAR based experiments, docking study based experiment, virtual screening based experiment.
Department: Pharmaceutical Quality Assurance		
MQA201T	Hazard and Safety Management	MQA201T CO1: Understand the basic concept behind studies of multidisciplinary nature of environment and empower ideas to clear mechanism and management in different kinds of hazard management system like ecosystem, air, chemical & fire based hazards, fire protection system. MQA201T CO2: Impart basic knowledge about the environment and its allied problems related to air, chemical, fire-based hazards, and fire protection systems. MQA201T CO3: Illustrate the different sources and types of environmental studies, air, chemical & fire-based hazards. MQA201T CO4: Describe and Illustrate safety guidelines, rules, regulation to prevent environmental hazards like air, chemical & fire based hazards and its risk management system.
MQA 202T	Pharmaceutical Validation	The learner will be able to MQA 202T-CO1: Explain the concepts, importance, scope types, methodology and application of calibration, qualification and validation activities in pharma industry.

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		MQA 202T-CO2: Prepare protocols for qualification and validation of instruments, facilities and processes as per guidelines. MQA 202T-CO3: Explain the importance of patent and intellectual property rights MQA 202T-CO4: Suggest methodology for qualification of laboratory, analytical and manufacturing equipments. MQA 202T-CO5: Suggest methodology for validation of utilities, analytical methods, cleaning methods, computerized systems and manufacturing processes of various dosage forms.
MQA203T	Audits and Regulatory Compliance	MQA203T Describe the importance of auditing. MQA203T Explain the different methods of auditing MQA203T Understand the process of carrying out audits in departments like production, quality assurance, and different laboratories of the pharmaceutical industry. MQA203T Design and carry out the audit process and prepare an audit report. MQA203T Prepare audit checklist for audits.
MQA204T	Pharmaceutical Manufacturing Technology	MQA204T CO1: Understand and discuss common practices in manufacturing of sterile and non-sterile dosage forms in pharmaceutical industry. MQA204T CO2: Understand, analyze and describe principles and processes in production planning, manufacturing of sterile and non-sterile dosage forms, in selecting containers and closures and in quality monitoring tools. MQA204T CO3: Elaborate legal requirements for pharmaceutical industry development, plant layout and compile steps of production planning. MQA204T CO4: Construct sterile product manufacturing and non-sterile product manufacturing technology and differentiate them. MQA204T CO5: Compile, classify and compare different containers and closures for pharmaceuticals and to correlate stability aspects of packaging materials. MQA204T CO6: Understand and elaborate principles of Quality by Design (QbD) and Process Analytical Technology (PAT) in pharmaceutical manufacturing.
MQA205P	Pharmaceutical Quality Assurance Practical II	MQA205P CO1: Perform qualitative and quantitative analysis of certain pharmaceutical contaminants and drugs. MQA205P CO2: Analyze and validate pharmaceutical facilities, processes, methods and equipment.

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		MQA205P CO3: Study qualification of pharmaceutical equipment. MQA205P CO4: Create checklist for pharmaceutical facilities. MQA205P CO5: Design plant layout for sterile and nonsterile products. MQA205P CO6: Perform case study on certain quality management tools.
Department: Pharmaceutics		
MPH201T	Molecular Pharmaceutics (Nano Tech and Targeted DDS)	MPH201T CO1: To integrate the knowledge of various approaches for development of TDDS. MPH201T CO2: To discuss and elaborate the criteria for selection of drugs and polymers for the development of TTDS. MPH201T CO3: To demonstrate basics involved in the formulation and evaluation of TDDS. MPH201T CO4:To integrate and apply various concepts and strategies for improving targeting and absorption in the design of TDDS.
MPH202T	Advanced Biopharmaceutics & Pharmacokinetics	On successful completion of following theory topics, a learner should be able to; MPH202T CO1: Understand and analyze the concept of biopharmaceutics and pharmacokinetic. MPH202T CO2: Compile and integrate pharmacokinetic data and derive the pharmacokinetic models and parameters that best describe the process of drug absorption, distribution and metabolism. MPH202T CO3: Analyze and apply critical evaluation of biopharmaceutic studies involving drug product equivalency. MPH202T CO4: Demonstrate and understand the design and evaluation of dosage regimens of the drugs using pharmacokinetic and biopharmaceutic parameters. MPH202T CO5: Outline and analyze the potential clinical pharmacokinetic problems and application of basics of pharmacokinetic. MPH202T CO6: Demonstrate and apply the applications of biopharmaceutics and pharmacokinetic in drug delivery development.
MPH203T	Computer Aided Drug Development	MPH203T CO1 Discuss the role of Computer Aided Drug Delivery in drug discovery. MPH203T CO2 Explain different Computer Aided Drug Delivery techniques and their applications.

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		MPH203T CO3 Demonstrate various strategies to design and develop new drug-like molecules. MPH203T CO4 Explain in detail the working with molecular modeling software to design new drug molecules. MPH203T CO5 Discuss various in silico virtual screening protocols.
MPH204T	Cosmetic & Cosmeceuticals	Upon completion of the course, the students shall be able to understand: MPH204T CO1: Using knowledge of regulatory and biological aspects is a fundamental need for developing cosmetics and cosmeceuticals. MPH204T CO2: Discuss the various building blocks used in cosmetics and cosmeceuticals formulations. MPH204T CO3: Develop and evaluate various cosmetics and cosmeceutical formulations with the desired safety, stability, and efficacy. MPH204T CO4: Discuss the current technologies in the market. MPH204T CO5: Explain guidelines and challenges in formulating herbal cosmetics
MPH205P	Pharmaceutics Practical II	On successful completion of following theory topics, a learner should be able to; MPH205P CO1: Understand and evaluate the effect of various factors on development of formulation of drug. MPH205P CO2: Compile and apply different types of in vitro dissolution studies of drug formulation and its comparison with marketed product. MPH205P CO3: Analyze and understand the techniques in ex vivo and in situ evaluation of the formulation for its performance. MPH205P CO4: Demonstrate and understand various software's in optimization of the formulation MPH205P CO5: Outline and learn various in silico methods used in formulation development and optimization. MPH205P CO6: Demonstrate and apply the formulation knowledge and skills in development of herbal formulations.

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ACADEMIC YEAR 2023-2024

COURSE OUTCOME

Course: Pharm D

First Year		
Subject Code	**Subject Name**	**CO**
1.1T	Human Anatomy and Physiology	1.1T CO1: To recall the terminologies in the human anatomy and physiology, along with learn the functions of human cell 1.1T CO2: To summarize the functions of tissue, bones and joints in the skeleton 1.1T CO3: To explain the functions of formed elements in the blood along with lymph and its role in immunity 1.1T CO4: To compare the anatomical features of heart, lungs and GIT and to analyze their physiology 1.1T CO5: To assess the structure and function of brain, spinal cord and cranial nerves and to interpret the physiology of urinary system 1.1T CO6: To elaborate the physiology of endocrine glands, reproductive organs, sensory organs and to discuss the physiology skeletal muscles
1.1P	Human Anatomy and Physiology	1.2P CO1: Illustrate different types of Tissues and explain various Anatomical models 1.2P CO2: Identify the bones of skeletal system 1.2P CO3: Determine Blood cell count, Hemoglobin, Blood grouping, ESR, Bleeding time and Clotting time 1.2P CO4: Record Blood Pressure, Pulse rate, Body temperature 1.2P CO5: Choose family planning devices and conduct Pregnancy diagnosis test 1.2P CO6: construct and record simple curves using frog gastroenemius sciatic nerve
1.2T	Pharmaceutics	1.2T CO1: Integrate the knowledge related to introduction and classification of dosage form, prescription and posology 1.2T CO2: Build knowledge about the historical background and development of Pharmacy profession including different pharmacopoeias 1.2T CO3: Develop and demonstrate solid dosage form like powders and granules and pharmaceutical calculations related to weights and measures

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		1.2T CO4: Build knowledge of liquid dosage form including both monophasic and biphasic dosage form 1.2T CO5: Investigate information related to suppositories and surgical aids 1.2T CO6: Develop knowledge related to different galenical products and its extraction processes along with incompatibilities associated with dosage form
1.2P	Pharmaceutics	1.2P CO1: Demonstrate the skill of preparation and evaluation of various solid and liquid dosage forms 1.2P CO2: Explain principles of formulation and evaluation of dosage forms 1.2P CO3: Calculate evaluation parameters like density, specific gravity, angle of repose, carr's index and hausner's ratio of pharmaceutical preparation 1.2P CO4: Classify various dosage forms by using different criteria 1.2P CO5: Create labels in prescribed manner for various dosage forms 1.2P CO6: Build knowledge regarding different types of incompatibilities for safety, efficacy and therapeutic effect of dosage forms
1.3T	Medicinal Biochemistry	1.3T CO1: Define the basic concepts in medicinal biochemistry and clinical chemistry 1.3T CO2: Apply concepts and knowledge of medicinal biochemistry to clinical scenarios 1.3T CO3: Critically interpret how the biomolecules acts on the body and its mechanisms 1.3T CO4: Link the biochemical reactions and pathways of several diseases 1.3T CO5: Explain the common laboratory values in clinical chemistry 1.3T CO6: Use the scientific laboratory equipment in order to gather and analyze data on medicinal biochemistry
1.3P	Medicinal Biochemistry	1.3P CO1: Evaluate and analyze presence of various biomolecules/ normal and abnormal constituents in body fluids using qualitative and quantitative tests 1.3P CO2: Understand and analyze the catalytic activity of enzymes and the importance of isoenzymes in the diagnosis of diseases 1.3P CO3: Apply the biochemical principles of organ function tests of the kidney, liver, and endocrine gland 1.3P CO4: Understand the importance of levels of various biomolecules in body fluids
1.4T	Pharmaceutical Organic Chemistry	1.4T CO1: Explain the physical properties of organic compounds 1.4T CO2: Identify the structures of a given organic compound and give the nomenclature

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		1.4T CO3: Draw the mechanisms involved in various named organic reactions 1.4T CO4: Analyse the reactivity, orientation and stability of organic reactions 1.4T CO5: Predict the products obtained through simple organic reactions 1.4T CO6: To study on some important official organic compounds
1.4P	Pharmaceutical Organic Chemistry	1.4P CO1: Compose different classes of organic pharmaceuticals using some named organic reactions with mechanisms 1.4P CO2: Apply stereo models and explain the structural aspects of organic compounds 1.4P CO3: Integrate and Analyze the elements in different organic pharmaceuticals by Performing organic qualitative analysis 1.4P CO4: Identify various classes of organic compounds by systematic qualitative analysis 1.4P CO5: Analyse various organic pharmaceuticals
1.5T	Pharmaceutical Inorganic Chemistry	1.5T CO1: To discuss and explain the principles and procedures of analysis of drugs 1.5T CO2: To apply and determine the applications of inorganic pharmaceuticals in analysis of drug 1.5T CO3: To discuss the fundamentals of analytical chemistry and examine inorganic pharmaceuticals regarding their monograph 1.5T CO4: To justify the importance of inorganic pharmaceuticals in preventing and curing disease 1.5T CO5: Knowledge about the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals 1.5T CO6: To have been introduced to a variety of inorganic drug classes
1.5P	Pharmaceutical Inorganic Chemistry	1.5P CO1: Perform the limit test for certain impurities like chloride, sulphate, iron, arsenic, lead and heavy metals as per the Indian Pharmacopoeia 1.5P CO2: Determine percentage purity of given pharmaceutical drugs by titrimetric analysis 1.5P CO3: Perform qualitative analysis of given inorganic mixtures 1.5P CO4: Identify the Inorganic compounds through various chemical tests 1.5P CO5: Know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals 1.5P CO6: Use different methods for preparation of Inorganic substances

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Second Year		
Subject Code	**Subject Name**	**CO**
2.1T	Pathophysiology	2.1T CO1: Describe the etiology and pathogenesis of selected diseases 2.1T CO2: Knowledge the signs and symptoms of disease 2.1T CO3: Identify complications of diseases 2.1T CO4: Know most commonly encountered pathophysiological state and/or disease mechanism as well as any clinical testing requirements 2.1T CO5: Students will make correlation between pathophysiology and clinical skills they are learning in their allied health science programs 2.1T CO6: Students will understand how the various organ systems are interrelated, and use this understanding to promote a holistic approach towards the evaluation and treatment of patients
2.2T	Pharmaceutical Microbiology	2.2T CO1: To list the branches, scope of microbiology and morphology of microbes 2.2T CO2: To explain the methods of identification, cultivation and preservation of various microorganisms 2.2T CO3: To apply the principles of sterilization in pharmaceutical processing and sterility testing 2.2T CO4: To compare different types of immunological reactions, antigens, vaccines and their role in immunity 2.2T CO5: To evaluate microbiological standards of pharmaceuticals and presence of pathogens 2.2T CO6: To elaborate the characteristics, mode of infection, diagnosis, prophylaxis and treatment of bacterial, fungal and viral infectious agents
2.2P	Pharmaceutical Microbiology	2.2P CO1: To recal different techniques of sterilization and equipment used in microbiology laboratory 2.2P CO2: To interpret characteristics of microbes using staining techniques, Isolation methods and quantitative estimation 2.2P CO3: To construct standard graphs for estimating antibiotics and vitamins using microbes 2.2P CO4: To test for possible microbial contamination in a given sample 2.2P CO5: To estimate qualitatively and quantitatively the amount of microbes in a sample 2.2P CO6: To choose the correct method for evaluating the microbes by serological and bacteriological methods

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2.3T	Pharmacognosy & Phytopharmaceuticals	2.3T CO1: Develop and design agricultural & storage requirement of crude drugs & explain detailed pharmacognostic account of medicinal plants 2.3T CO2: Develop and design the technique for extraction, isolation, purification of phytoconstituents for medicinal, agricultural, food & healthcare industry 2.3T CO3: Design & explain various methods for determination of authenticity of crude drugs, extracts, phytoconstituents, formulations & detect their adulteration 2.3T CO4: Develop themselves to design a method for analysis, detection, purification of various extracts, phytoconstituents & herbal raw materials. 2.3T CO5: Correlate various herbal crude drugs & their method of extraction, chemistry & pharmacognostic details including their medicinal applications
2.3P	Pharmacognosy & Phytopharmaceuticals	2.3P CO1: Judge various crude drugs on the basis of their morphological & microscopical studies 2.3P CO2: Design various analytical parameters required for the authentication of crude drugs, extracts, oils etc. 2.3P CO3: Illustrate the anatomical architecture of various crude drugs & its significance for the plants & for its analysis 2.3P CO4: Evaluate the purity &/or stability of various unorganized crude drugs & oils 2.3P CO5: Correlate the various staining reagents required for the authentication of crude drugs during microscopy
2.4T	Pharmacology-I	2.4T CO1: Relate pharmacokinetics and pharmacodynamics of a drug with drug action 2.4T CO2: Identify the factors modifying drug action 2.4T CO3: Assess drug interactions and detect adverse drug reactions 2.4T CO4: Classify and explain the pharmacology of drugs acting on various systems 2.4T CO5: Correlate and apply the knowledge of pharmacology as therapeutically
2.4P	Pharmacology-I	2.4P CO1: Utilize and handle the Experimental animals 2.4P CO2: Assess and handle the computerized simulated software programme such as COLPHARM 2.4P CO3: Compare the effects of various drugs on animals 2.4T CO4: Test and Utilize the instruments used in experimental Pharmacology

		2.4P CO5: recommend physiological salt solutions for different isolated tissues 2.4P CO6: Apply different routes of drug administration and the techniques of Euthanasia and analgesia in laboratory animals
2.5T	Community Pharmacy	2.5T CO1: Know the pharmaceutical care services 2.5T CO2: Understand the business and professional practice management skills in community pharmacies 2.5T CO3: Patient counselling and provide health screening services to public in community pharmacy 2.5T CO4: Respond to minor ailments and provide appropriate medication 2.5T CO5: Encourage patients for rational drug therapy 2.5T CO6: Show empathy and sympathy to patients
2.6T	Pharmacotherapeutics-I	2.6T CO1: To recall the pathophysiology of cardiovascular disorders and relate their etiology with the therapeutic approach including treatment controversies. 2.6T CO2: To outline the concept of essential drugs use and rational drug therapy and summarize the choice of drugs with justification in various disease conditions 2.6T CO3: To identify various types of respiratory and endocrine disorders with respect to clinical features and laboratory investigations, list their complications along with replacement in their management 2.6T CO4: To distinguish between various disease conditions and analyse the results with drug induced disorders 2.6T CO5: To select the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy among pediatric, geriatric, pregnant and lactating women. 2.6T CO6: To develop competency to design individual care plan for cardiovascular, respiratory, ocular and hormonal disorders
2.6P	Pharmacotherapeutics-I	2.6P CO1: To recall the pathophysiology of cardiovascular disorders and relate their etiology with the therapeutic approach including treatment controversies 2.6P CO2: To outline the concept of essential drugs use and rational drug therapy and summarize the choice of drugs with justification in various disease conditions 2.6P CO3: To identify various types of respiratory and endocrine disorders with respect to clinical features and laboratory investigations, list their complications along with replacement in their management

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		2.6P CO4: To distinguish between various disease conditions and analyze the results with drug induced disorders 2.6P CO5: To select the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy among pediatric, geriatric, pregnant and lactating women 2.6P CO6: To develop competency to design individual care plan for cardiovascular, respiratory, ocular and hormonal disorders

Third Year		
Subject Code	**Subject Name**	**CO**
3.1T	Pharmacology-II	3.1T CO1: Explicate the pharmacological actions of different categories of drugs 3.1T CO2: Understand the mechanism of drug action at organ system/ sub cellular/ macromolecular level 3.1T CO3: Illustrate the application of basic pharmacological knowledge in the prevention and treatment of various diseases 3.1T CO4: Enlighten the effect of drugs on animal by simulated experiments 3.1T CO5: Explain the correlation of pharmacology with other biomedical science 3.1T CO6: Elucidate the signal transduction mechanism of various mechanism
3.1P	Pharmacology-II	3.1P CO1: Illustrate the experimental pharmacology, instrumental pharmacology, CPCSEA guidelines and common laboratory animals 3.1P CO2: Demonstrate of Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies 3.1P CO3: Explain different route of drug administration in rat & mice, effect of hepatic microsomal enzyme inducers, Anticonvulsant effect of drugs by MES and PTZ method 3.1P CO4: Explain in details effect of drugs on ciliary motility of frog oesophagus, on rabbit eye, skeletal muscle relaxants using rota-rod apparatus, on locomotor activity using actophotometer, of stereotype and anti-catatonic activity of drugs on rats/mice, anxiolytic activity of drugs using rats/mice, local anesthetics by different methods

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		3.1P CO5: Judge various terms and factors that influence the pharmacokinetics and Pharmacodynamics and Build the concept of discovery and development of New drugs-Preclinical and clinical studies 3.1P CO6: They would have understood the pharmacological aspects of drugs used to treat ailment of different organ systems of the body. 3.1P CO7: They would appreciate the importance of drug discovery by preclinical and clinical trials 3.1P CO8: They would have finally learnt to apply the knowledge of drugs practically using simulated pharmacological experiments
3.2T	Pharmaceutical Analysis	3.2T CO1: Assess quality Assurance and validation methods concept with guidelines and their regulations and Understand the concepts of calibration and validation various pharmaceutical analytical instruments 3.2T CO2: Explain Introduction, theory, instrumentation and application in the different types of chromatography and spectroscopic technique 3.2T CO3: Categorize the electrometric methods, theoretical aspects, Instrumentation, Interpretation of data and analytical applications 3.2T CO4: Understand the principles of analytical techniques and its application in analysis of drugs
3.2P	Pharmaceutical Analysis	3.2P CO1: Develop mobile phase for separation and identification of drugs by Chromatography 3.2P CO2: Operate various instruments to develop practical skill 3.2P CO3: Interpret the data obtained through UV, IR, NMR, spectra and report the result 3.2P CO4: Summarize theoretical knowledge on various instrumental technique
3.3T	Pharmacotherapeutics-II	3.3T CO1: To remember and recall the pathophysiology of selected diseases and rationale for drug therapy 3.3T CO2: To identify various therapeutic approaches for the management of selected diseases 3.3T CO3: To apply the concepts of various drug therapies and identify the controversies in drug therapy 3.3T CO4: To assess the drug therapy by preparing individual therapeutic plan based on diagnosis 3.3T CO5: To evaluate the patient specific parameters relevant in initiating drug therapy and monitoring therapy

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		3.3T CO6: To create a pharmaceutical care plan, design a list of patient counselling points on the specific illness
3.3P	Pharmacotherapeutics-II	3.3P CO1: To remember and recall the pathophysiology and management of cardiovascular, respiratory, endocrine diseases and viral infections 3.3P CO2: To identify various drug interactions and rationalize the prescription 3.3P CO3: To plan the quality use of medicines surrounding the therapeutic agents in the treatment of selected diseases 3.3P CO4: To analyze the clinical skills in the therapeutic management of selected disease conditions 3.3P CO5: To prioritize the treatment strategies for better patient outcome and discuss the controversies in treatment
3.4T	Pharmaceutical Jurisprudence	3.4T CO1: Illustrate pharmaceutical legislation in India concepts, principle and significance of pharmaceutical ethics drafted by PCI 3.4T CO2: Compile and describe objectives, legal definitions, do's and don'ts, penalties in case of breach of act mentioned under various pharmaceutical acts and rules thereunder 3.4T CO3: Practice legal provisions for import, manufacture, sale of drugs and cosmetics and schedules thereunder and similarly, provisions under Pharmacy Act 3.4T CO4: Organize and describe provisions under medicinal and toilet preparation act and narcotic drug and psychotropic substances act 3.4T CO5: Analyse and describe salient features of drugs and magic remedies act and essential commodities act relevant to drugs price control order 3.4T CO6: Examine provisions made under drugs price control order, prevention of cruelty to animal act, patent and design act and prescription and non-prescription product
3.5T	Medicinal Chemistry	3.5T CO1: Understand Modern concepts of rational drug design 3.5T CO2: Derive and understand the Structural influences on mechanism of pharmacologic action (structure-activity relationship) 3.5T CO3: Evaluate the chemistry of drugs with respect to their pharmacological activity 3.5T CO4: Summarize the mechanism pathways of different class of medicinal compounds

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		3.5T CO5: Illustrate chemical nomenclature, brand names of important marketed products and their side effects 3.5T CO6: Analyse and apply Diagnostic agents
3.5P	Medicinal Chemistry	3.5P CO1: Access the fundamentals of medicinal chemistry and theory of analysis of drugs 3.5P CO2: Perform synthesis of medicinal compounds 3.5P CO3: Perform purification and evaluation of synthesized compounds 3.5P CO4: Analyse pharmaceutical drugs using appropriate assay method 3.5P CO5: Study and Analyse monographs of important drugs 3.5P CO6: Determine physical properties of organic compounds with respect to QSAR analysis
3.6T	Pharmaceutical Formulations	3.6T CO1: Integrate the knowledge related to different pharmaceutical dosage forms 3.6T CO2: Develop and prepare various pharmaceutical dosage forms 3.6T CO3: Analyse different pharmaceutical dosage forms according to their evaluation parameters 3.6T CO4: Integrate knowledge regarding different terms like bioavailability and bioequivalence 3.6T CO5: Study role of various pharmaceutical dosage forms
3.6P	Pharmaceutical Formulations	3.6P CO1: Develop different types of dosage form according to route of administration 3.6P CO2: Develop and prepare various pharmaceutical dosage forms 3.6P CO3: Analyse different dosage forms according to their evaluation parameters 3.6P CO4: Design labels according to different types of pharmaceutical dosage forms 3.6P CO5: Integrate knowledge regarding principle involved in formulation and role of various pharmaceutical dosage forms
Fourth Year		
Subject Code	**Subject Name**	**CO**
4.1T	Pharmacotherapeutics-III	4.1T CO1: To explain the etiopathogenesis of selected gastrointestinal, hematological, neurological and psychiatric diseases 4.1T CO2: To discuss the principles of evidence based therapy and pain management

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		4.1T CO3: To identify the patient-specific parameters relevant in initiating and monitoring drug therapy and adverse effects 4.1T CO4: To discuss the therapeutic approach in the management of selected diseases and controversies in drug therapy 4.1T CO5: To prepare individualized therapeutic plans based on diagnosis 4.1T CO6: To recognize the role of pharmacist in essential and rational drug use
4.1P	Pharmacotherapeutics-III	4.1P CO1: To identify drug interactions and rationalize the prescription 4.1P CO2: To discuss the therapeutic approach to management of selected diseases 4.1P CO3: To prepare individualized therapeutic plans based on diagnosis 4.1P CO4: To conduct patient counselling 4.1P CO5: To conduct planned experiments and prepare laboratory report in a standard format
4.2T	Hospital Pharmacy	4.2T CO1: To apply and analyze structure, organisation and functions of hospital and hospital pharmacist 4.2T CO2: To understand, Prepare and implement budget, inventory control in various drug policies 4.2T CO3: To analyze and evaluate various hospital drug policies to develop hospital pharmacy news letters hospital formulary 4.2T CO4: To define, classify and prepare various drug distribution methods for inpatients and outpatients including narcotic and controlled drugs 4.2T CO5: To understand and explain the procurement, manufacturing and storage process of various formulations and handling of radio pharmaceuticals 4.2T CO6: To develop programmes for professional upraising continuously and to build inter professional relations in the hospitals
4.2P	Hospital Pharmacy	4.2P CO1: To understand various drug distribution systems in hospital 4.2P CO2: To extend the professional practice management skills in hospital pharmacy 4.2P CO3: To utilize various methods for the preparation and labeling of pharmaceutical products such as powders and intravenous solutions 4.2P CO4: To recommend the solutions to overcome the drug interaction and adverse drug reactions 4.2P CO5: To appreciate various store management and inventory control

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		4.2P CO6: To solve drug related problems through prescription analysis and individualized dose
4.3T	Clinical Pharmacy	4.3T CO1: Assess, Detect and monitor ADRs 4.3T CO2: Design, analyze, interpret and formulate the drug or medicine information 4.3T CO3: Interview Medication history and Drug utilization review and Provide clinical pharmacy services 4.3T CO4: Solve Drug and Poison information Queries and provide disease related counseling to patient 4.3T CO5: Relate common medical abbreviations, terminologies and lab results used in clinical practice and interpret the data obtained through laboratory tests 4.3T CO6: Inspect the potential sources of Medication error and act for its prevention
4.3P	Clinical Pharmacy	4.3P CO1: To create awareness in patients by counselling them on various diseases and drugs using clinical knowledge and communication skills 4.3P CO2: To conduct comprehensive and meticulous medication history interview for the preparation of individualized pharmaceutical care plan 4.3P CO3: To interpret laboratory results of specific disease states mentioned and correlating with patient drug therapy while monitoring disease progression 4.3P CO4: To provide response to a drug and poison information queries using modified systemic approach by critically appraising the biomedical literature 4.3P CO5: To report and assess causality of adverse drug reactions to establish acausal relation between an ADR and a drug
4.4T	Biostatistics & Research Methodology	4.4T CO1: To Demonstrate knowledge about basic concepts about research and the methodology to conduct research 4.4T CO2: To simplify the understanding of statistical methods in epidemiology and be conscious about its relative, attributable risks 4.4T CO3: To learn to utilize the computer applications and their advantages in both hospital, community pharmacy 4.4T CO4: To Develop an appropriate framework for research studies including study design, method of data collection, sampling techniques, report writing
4.5T	Biopharmaceutics & Pharmacokinetics	4.5T CO1: To recall basic concepts of absorption, distribution, metabolism and excretion of drugs 4.5T CO2: To understand the mechanisms, interpret various factors affecting drug absorption, distribution, metabolism and excretion of drugs

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		4.5T CO3: To apply the pharmacokinetic models for the determination of Pharmacokinetic parameters 4.5T CO4: To examine multiple dosage regimens based on pharmacokinetic Parameters for maximizing therapeutic effectiveness and patient compliance 4.5T CO5: To evaluate various pharmacokinetic parameters for the drugs exhibiting saturation kinetics 4.5T CO6: To design the bioavailability testing protocol of a drug and compare the bioequivalence between marketed products
4.5P	Biopharmaceutics & Pharmacokinetics	4.5P CO1: To recall the concepts in biopharmaceutics, basic pharmacokinetic parameters and their significance 4.5P CO2: To interpret the effect of surfactant, diluents, lubricant and polymorphism on rate of drug dissolution 4.5P CO3: To solve bioavailability parameters of drugs by using plasma data and methods to improve bioavailability 4.5P CO4: To analyze absorption rate constant, KE, biological half-life, mean residence time and mean absorption time for the given data 4.5P CO5: To estimate the extent of protein biding by equilibrium dialysis or dynamic dialysis methods 4.5P CO6: To predict the pharmacokinetic parameters for the given data as per one compartment and two compartment models
4.6T	Clinical Toxicology	4.6T CO1: To understand the general principles involved in the management of poisoning with toxicokinetics parameters 4.6T CO2: To Evaluate the role of antidotes, supportive care, gut decontamination and elimination enhancement in poisoning 4.6T CO3: To distinguish the clinical symptoms and to plan various managements of pesticides, drugs acting on CNS, hydrocarbons, caustics and radiation poisoning 4.6T CO4: To categorize the toxic symptoms and management of venomous snake bites, toxicity of plants and contaminated foods and heavy metals 4.6T CO5: To compare the characteristics and specific standard treatment guideline for the treatment of various toxins 4.6T CO6: To design several preventive approaches to reduce unintended poisoning
4.7T	Pharmacotherapeutics I & II	4.7T CO1: Identify drug interactions, controversies and adverse effects of drug therapy

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		4.7T CO2: Discuss the various methods involved in the diagnosis of selected disease state 4.7T CO3: Identify Goals of therapy and therapeutic approach to management of diseases 4.7T CO4: Describe the pathophysiology of selected disease states and explain the rationale for drug therapy 4.7T CO5: Describe the individualized therapeutic plan based upon the diagnosis
4.7P	Pharmacotherapeutics I & II	4.7P CO1: Propose the therapeutic management of selected diseases 4.7P CO2: Plan individualized therapeutic plans based on diagnosis 4.7P CO3: Identify patient specific parameters relevant in initiating drug therapy and monitoring therapy 4.7P CO4: Develop evidence based medicine therapeutic plan according to patient 4.7P CO5: Modify the controversies in drug therapy
Fifth Year		
Subject Code	**Subject Name**	**CO**
5.1T	Clinical Research	5.1T CO1: Discuss the Pharmacological and Toxicological considerations in process of development of new drugs 5.1T CO2: Discuss the principles and phases in clinical trial of drug 5.1T CO3: Explain the guidelines for ethics and safe monitoring in clinical trial of a drug 5.1T CO4: Design the documents of clinical trial 5.1T CO5: Distinguish the guidelines of national and international regulatory bodies for clinical trial 5.1T CO6: Recognize differing roles and obligations of the Investigator, Sponsor and Institutional Review Board
5.2T	Pharmacoepidemiology and Pharmacoeconomics	5.2T CO1: Define Pharmacoepidemiology and Pharmacoeconomics & explain its aim, need and application 5.2T CO2: Calculate various outcome and drug use measures involved in pharmacoepidemiology 5.2T CO3: Demonstrate competency in the design, conduct and evaluation of Pharmacoepidemiology studies 5.2T CO4: Summarize the methods used in Pharmacoepidemiology and Pharmacoeconomic analysis 5.2T CO5: Solve various case studies by applying the concepts of pharmacoepidemiology and Pharmacoeconomics in designing a good outcome

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5.3T	Clinical Pharmacokinetics & Pharmacotherapeutic Drug Monitoring	5.3T CO1: To Discuss the pharmacokinetic principles to individualize drug therapy in patient care situations 5.3T CO2: To Determine dose, dosing intervals and dosage adjustments of a drug for a given patient 5.3T CO3: To Apply the principles of pharmacokinetics to analyse and predict drug interactions 5.3T CO4: To Prepare protocol for TDM of drugs for selected diseases 5.3T CO5: To Discuss the concept of genetic polymorphism in metabolism, transport and target of a drug

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