2.6.1: Programme Outcomes (POs) and Course Outcomes (COs) for all Programmes offered by the Institution are stated and displayed on website

Index

Programme Outcomes B. Pharmacy

P E Society's Modern College of Pharmacy, Nigdi, Pune-44

Programme Outcomes (POs) for B. Pharmacy

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

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

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

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

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

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

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

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

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

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

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

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Programme Outcomes M. Pharmacy (Pharmaceutics)

Programme Outcomes (POs) for M. Pharmacy

Subject: Pharmaceutics

1. **Scientific knowledge:** To apply the scientific and technological principles to design, develop pharmaceutical dosage forms and drug delivery systems for better therapeutic results.
2. **Technological applications:** To utilize technical knowledge and identify any factors affecting the quality of pharmaceutical manufacturing processes.
3. **Modern tool usage:** Learn, select, apply appropriate methods, procedures, resources and modern computing tools with an understanding of the limitations for formulation development.
4. **Entrepreneurship:** To understand the basics of establishing and management of pharmaceutical enterprise and manufacturing.
5. **Practical skills:** To gain practical expertise in formulating and evaluating various user-friendly drug delivery systems for minor ailments to major diseases.
6. **Applied sciences:** To employ contemporary scientific knowledge viz., pharmacology, biotechnology for designing patient-centric pharmaceuticals.
7. **Computational and Statistical Methodologies:** Applying and utilizing the statistical tools with the aid of computer software to optimize the formulation development process.
8. **Pharmaceutical ethics:** To respect personal values and apply ethical principles in professional and social contexts. Demonstrate behaviors that recognize cultural, personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.
9. **Environment and sustainability:** To understand, protect and cooperate environmental concerns for sustaining biodiversity in pharmaceutical product development.
10. **Life-long learning:**To develop the habit of updating knowledge from time to time to meet industrial demands and social needs for having a fruitful career in Pharmacy.

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Programme Outcomes M. Pharmacy (Pharmaceutical Quality Assurance)

Programme outcomes(POs) for M. Pharmacy

Subject: Pharmaceutical Quality Assurance (MPQA)

1. **Knowledge**: To acquire knowledge on analytical techniques, product development, technology transfer, quality management systems, hazard management systems, quality control and quality assurance procedures, validation, computing methods, statistical methods, guidelines and regulations pertaining to pharmaceuticals and biopharmaceuticals.
2. **Analytical Reasoning**: To make sound judgements and decisions by gathering, analyzing and interpreting data, information and guidelines relevant to quality of pharmaceuticals.
3. Problem Solving: To systematically solve problems and issues by utilizing principles, tools, processes and systems relevant to the pharmaceutical industry.
4. **Modern Techniques**: To learn, choose and apply appropriate hyphenated methods, advanced instrumental techniques, quality management techniques and tools, computing and statistical tools and procedures with thoughtfulness of their applications.
5. **Experimental Ethics**: To uphold the moral standards and regulations outlined by the regulatory bodies of other nations and the Indian government that are pertinent to the pharmaceutical sector.
6. **Interdisciplinary engagement**: To utilize the knowledge and skills to engage in interdisciplinary work related to pharmaceuticals and healthcare activities
7. **Professional Identity**: To be a committed and responsible professional with skills and expertise in laboratory practices, analytical techniques, scientific tools, manufacturing and regulatory guidelines for ensuring safe and quality pharmaceutical products.
8. **Statistical Skills**: To apply and evaluate quantitative metrics to assure safety and quality of pharmaceuticals.
9. **Environment and Sustainability**: To develop methods, procedures and systems consistent with safety, environment preservation and sustainability.
10. **Lifelong Learning**: To actively participate in independent and lifelong learning in wider context of growing research, technological changes and regulatory changes.

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Programme Outcomes M. Pharmacy (Pharmaceutical Chemistry)

Programme Outcomes M. Pharmacy

Programme Outcomes(POs) for M. Pharmacy

Subject: Pharmaceutical Chemistry

1 **Chemistry Knowledge**: Acquire knowledge on design, development, synthesis, purification, characterization and biological evaluation of new molecules.

2 **Planning Abilities**: Demonstrate effective planning abilities, develop and implement plans and organize work to meet deadlines.

3 **Problem Solving**: To utilize the principles of synthetic techniques with clear and critical thinking, while solving problems and making decisions. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.

4 **Modern Techniques**: To learn, choose and apply appropriate spectroscopic, Insilco study, hyphenated methods and related computing tools with thoughtfulness of their applications.

5 **Experimental Ethics**: Honor personal values and apply ethical principles in professional and social contexts.

6 **Interdisciplinary Commitment**: To acquire skill oriented practical ability and utilize the needs of pharmaceutical chemistry in all other programs to emerge as potent researcher.

7 **Professional Identity**: Understand, analyze and communicate the role of pharmaceutical chemist in society.

8 **Rational Flexibility**: To engage in critical and logical thinking and to gain an overall knowledge in developing newer methods, impurity profiling and validation protocols those are useful in routine and laboratory purpose.

9 **Environment and Sustainability**: To understand and develop green chemistry approach.

10 **Lifelong Learning**: Understand and apply the concepts in day to day life activities for the benefit of self and for the welfare of society.

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Programme Outcomes M. Pharmacy (Pharmacology)

Programme Outcomes (POs) for M. Pharmacy

Subject: Pharmacology

1 Drug Expertise: Acquire knowledge on various classes of drugs and their mode of actions to unveil the remedies for many ailments.

2 Analytical Reasoning: Identify assumptions and reveal the evidence-based reason for the disease or disorder take place, to select the type of relevant treatment.

3 Experimental Ethics:Consider and follow ethics and guidelines specified by the authorities of various agencies and Government of India for animal congenial laboratory practice.

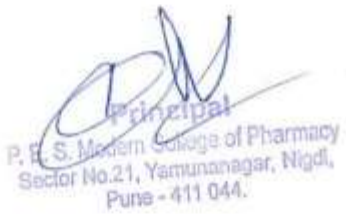
4 Interdisciplinary Engagement: Obtain skill oriented practical proficiency by exposing and utilizing the needs of pharmacy in all disciplines to emerge as potent researcher.

5 Professional Identity: Be committed and responsible person to play a proactive role with fidelity to community and empower society.

6 Statistical Skills: Apply and analyze quantitative metrics to gain safety data on dosage, also to compare the effectiveness among experimental groups.

7 Intellectual Flexibility: Engage in critical thinking and gain insight to identify, design and formulate pharmaceutical products that are in need of current aspects by using material from natural sources.

8 Lifelong learning: Understand and apply the concepts in day to day life activities for the benefit of self and for the welfare of society and its concerns.



Programme Outcomes Pharm D.

Programme Outcomes (POs) for PHARM.D

1 Comprehensive pharmacy and clinical knowledge: Demonstrate mastery and application of core knowledge and skills in relation to the evolving pharmaceutical, biomedical, clinical and epidemiological sciences. This includes competency in areas supporting high quality pharmacy practice (e.g., pharmaceutics, medicinal chemistry, pharmacokinetics, pharmacodynamics, pharmacology, pathophysiology, pharmacotherapeutics, and pharmaceutical care).

2 Patient centered care: Provide patient-centered care to diverse patients using the best available evidence and in consideration of patients' circumstances to devise, modify, implement, document and monitor pharmacotherapy care plans, either independently or as part of healthcare teams.

3 Problem solving and decision making: Demonstrate the ability to use observational, analytical and critical thinking skills to develop, implement and evaluate solutions that solve pharmacotherapy problems and build the ability to take decisions based on evidenced based practice.

4 Social and cultural awareness: Recognize social determinants of health and respect patients' cultural, social and religious perspectives to produce safe and appropriate medication use throughout society. Reflect their knowledge, experiences, values, attitudes, biases and beliefs, to show evidence of being self-aware and life-long learners.

5 Professionalism: Exhibit professional ethics, attitudes and behaviors by demonstrating patient advocacy, altruism, accountability, compassion, integrity and respect for others. Understand, analyze and communicate the value of their professional roles in society (Ex. Health care professionals, health promoters, educators, managers, employers and employees).

6 Innovation and entrepreneurship: Engage in innovative activities by using creative thinking to envision better ways of accomplishing professional goals. Utilize the principles of scientific enquiry and critical thinking while solving problems and making decisions in daily practice. Attain the key ability to start a community pharmacy or chain community pharmacies with patient care services.

7 Confidentiality and professional ethics: Practice ethically, maintaining patient confidentiality, responding to errors in care and professional misconduct (including plagiarism), and understanding principles of ethical research (including conflicts of interest and obtaining appropriate informed consent). Apply ethical principles while making decisions and take responsibility for the outcomes associated with decisions.

8 Interpersonal and communication skills: Demonstrate effective interpersonal written and verbal skills, adapt to socioeconomic and cultural factors as well as situational applications. Effectively educate families, patients, caregivers and other health care professional (HCPs). Function effectively in a team

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Course Outcomes

Academic Year 2022-23

Course Outcome (COs) for B. Pharmacy
A.Y.2022-23

Semester	Subject Name	COs
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, semisolid dosage form and suppositories
	PHARMACEUTICS I	1.Introduction to history of pharmacy, development of pharmacy

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	– T (B)	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.Knowledge of sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals 2.Understand the basic concepts of acidity /basicity, buffers and tonicity applicable in pharmaceuticals. 3.Understand the medicinal and pharmaceutical importance of inorganic compounds 4.Explain the concept of Extra and Intra cellular cations and anions and different GIT agents and recall the fundamental principles of them. 5.Acquire Knowledge regarding concepts and principles of radiopharmaceuticals
	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. 2.To illustrate the classification of plants, plant cell and its organelles.

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		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 hematological 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, Carrs index and Hausners 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 – P (B)	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

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		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.
	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.

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		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 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, therapeutics and diagnostics applications of enzymes
	BIOCHEMISTRY – T	1.Remember the qualitative analysis of carbohydrates and proteins

	(Div-B)	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 SCIENCES – T * (A&B)	1.Create awareness about environmental problems among 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

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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
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.

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	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 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

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		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

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		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 equipment's 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.
	PHARMACEUTICAL ORGANIC CHEMISTRY II – PRACTICAL (DIV B)	1. Use of various equipment's 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	1 Exercise different pharmaceutical laboratory procedures used in

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	PHARMACEUTICS I – PRACTICAL (DIV A)	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. 5. 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 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 Mostprobable 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

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		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 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

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		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

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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 PHYTOCHEMISTRY I– THEORY (DIV- A)	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, properties, 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, properties, 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,

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		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 procedure 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 – PRACTICAL (DIV A)	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 4. Employ proper documentation system to record observations and analyze information gathered through experimentation.
	PHYSICAL PHARMACEUTICS 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 analyze 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

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		6. To predict various screening models for anticonvulsant,anxiolytic and local anesthetics 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 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–	1. Describe the concept of pre-formulation study for the development of pharmaceutical dosage forms.

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	THEORY (DIV A)	2. Design solid and liquid dosage forms; describe their manufacture and evaluate them for their quality. 3. Apply basic concepts of dosage forms; analyze techniques and equipment used in their manufacture and apply pharmacopeial 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. Analyze techniques and equipment used in manufacture of sterile parenteral products, ophthalmic products, cosmetics and pharmaceutical aerosols and apply pharmacopoeia 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 pharmacopeial 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 use, 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

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		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.
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 dont's of pharmacy profession keeping pharmaceutical Acts and Laws as the reference.

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	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 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 experiments on them 5. Calculate and compare experimental observations and results statistically

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	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 & 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. 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

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		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 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

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		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 biotechnological tasks. 3. To apply knowledge of immunology in healthcare and diagnostic purposes 4. To clarify equipment's 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 equipment's and the steps involved in production of biotechnologically derived product as well as methods to develop modern techniques in biotechnology field helpful to society

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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 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.

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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 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
Final year 2019 pattern SEMESTER-VII		
BP701T	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

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		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 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.
BP702T	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

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		drug products
BP703T	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.
BP704T	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.
BP705P	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

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		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 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.

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		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 noncommunicable 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 apply various techniques for the standardization 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 standardization 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	1. Discuss the fundamental & scope in cosmetic science & explain the concepts and summarize general additives, water,

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	(DIV A)	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. 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
BP811ET	ADVANCED INSTRUMENTATION TECHNIQUES	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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Course Outcomes (COs) for M Pharmacy

A. Y. 2022-2023

Subject Code	Subject Name	COS
Department: Pharmaceutics SEMESTER I		
MPAT 101T	Modern Pharmaceutical Analytical Techniques	1. Integrate and apply theoretical knowledge of various spectroscopic techniques available for analysis of drugs. 2. Understand and apply basic Knowledge of chromatographic and electrophoretic separation techniques. 3. Summarize the instrumentation of modern analytical techniques 4. Elucidate a structure based on UV, IR, NMR and Mass data. 5. Explain, Compare and appraise X-ray crystallographic and Thermal Techniques
MPH 102T	Drug Delivery System	1. To formulate and evaluate novel drug delivery systems 2. To justify selection criteria of drug and polymers for the development of novel drug delivery system 3. To understand and construct rate controlled drug delivery systems 4. To construct, justify and evaluate gastro-retentive drug delivery systems 5. To construct, justify and evaluate ocular drug delivery systems and transdermal drug delivery systems 6. To construct, justify and evaluate protein and peptide delivery systems and vaccine delivery systems.
MPH 103T	Modern pharmaceutics	1. Understand and analyze the concept of preformulation studies in oral solid dosage form development. 2. Compile and integrate preformulation data and apply this knowledge in development of disperse systems and parenterals. 3. Analyze and apply optimization and scale up techniques in formulation development and manufacturing. 4. Demonstrate and understand the concept of validation of pharmaceutical processes, equipment's and methods. 5. Outline and analyze the industrial management techniques and GMPconsiderations. 6. Evaluate and understand stability, compression, diffusion and dissolutionprocesses in drug product development.
MPH 104T	Regulatory Affair	1. Discuss the basic regulatory Documentation in pharmaceutical industry. 2. Discuss the preparation and submission of CTD,e-CTD. 3. Explain the chemistry, manufacturing controls and their regulatory importance in ANDA, NDA Submission & Approval process by different regulatory agencies.

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		4. Describe the process of Preparation of Dossiers and their submission to regulatory agencies in different Countries. 5. What are Clinical trials requirements & different approval procedures for conducting clinical trials.
MPH 105P	Pharmaceutics Practical I	1. Understand and apply the analytical methods for pharmaceutical compounds. 2. Compile and integrate various analytical techniques for estimation of drug alone or in combination. 3. Analyze and evaluate formulation aspects of different drug delivery systems. 4. Demonstrate and understand in vitro dissolution studies and effect of various parameters on dissolution of drug. 5. Outline and perform preformulation studies as a significant step in drug product development. 6. Demonstrate and apply the concept of preformulation studies in product life cycle.
Department: Pharmaceutical Quality Assurance		
MPAT 101T	Modern Pharmaceutical Analytical Techniques	1. Integrate and apply theoretical knowledge of various spectroscopic techniques available for analysis of drugs. 2. Understand and apply basic Knowledge of chromatographic and electrophoretic separation techniques. 3. Summarize the instrumentation of modern analytical techniques 4. Elucidate a structure based on UV, IR, NMR and Mass data. 5. Explain, Compare and appraise X-ray crystallographic and Thermal Techniques
MQA 102T	Quality Management Systems	1. Explain the basic concepts, terminology and factors affecting the framework of quality, quality control and quality management systems and implement the same. 2. Explain the scope of quality certifications applicable to pharmaceutical industries. 3. Demonstrate the effective utilization of different QMS tools for monitoring and improving product quality and process performance within the regulatory framework. 4. Suggest suitable guidelines for quality management which can be applied to pharmaceutical industry.
MQA 103T	Quality control and Quality Assurance	1. Explain significance of quality in pharmaceutical manufacturing and understand the responsibilities of QA & QC departments. 2. Explain role of national and international regulatory agencies in deciding quality standards. 3. Follow cGMP while working in Pharmaceutical industry. 4. Describe various aspects of documentation 5. Perform analysis of raw materials, IPQC and FPQC of drug products and other manufacturing operations and controls.

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		6. Explain different guidelines related to Pharmaceutical industry.
MQA 104T	Product development technology transfer	1. Describe the regulatory principles and requirements of drug discovery and product development 2. Relate and execute the concept of pre-formulation studies for various formulations 3. Explain in detail the requirements for the pilot plant and scale up 4. Categorize and use various pharmaceutical packaging systems 5. Implement the concept of technology transfer from R & D to production plant
MQA 105P	Pharmaceutical Quality Assurance Practical I	Course outcomes: The learner will be able to 1. Perform qualitative and quantitative analysis of pharmacopoeial compounds in bulk and in their formulations. 2. Perform experiments on various analytical instruments such as UV Vis spectrophotometer, HPLC, GC etc. 3. Demonstrate use of tools for quality management. 4. Perform quality control tests for drugs, raw materials, dosage forms and primary and secondary packaging materials. 5. Perform experiments on pre-formulation studies.
Department: Pharmaceutical Chemistry		
MPAT 101T	Modern Pharmaceutical Analytical Techniques	1. Integrate and apply theoretical knowledge of various spectroscopic techniques available for analysis of drugs. 2. Understand and apply basic Knowledge of chromatographic and electrophoretic separation techniques. 3. Summarize the instrumentation of modern analytical techniques. 4. Elucidate a structure based on UV, IR, NMR and Mass data. 5. Explain, Compare and appraise X-ray crystallographic and Thermal Techniques.
MPC 102T	Advanced Organic Chemistry I	1. To recall, apply and interpret basic aspects of organic intermediates and different types of reactions. 2. To understand and appraise mechanisms and applications of various named reactions. 3. To recognize and apply different synthetic reagents and protecting groups used in organic synthesis. 4. To explain and understand name reactions including heterocyclic compounds. 5. To understand and apply the concept of disconnection to develop synthetic routes for small target molecules. 6. To recall and apply retrosynthetic pathways in organic synthesis.
MPC 103T	Advanced Medicinal Chemistry	1. Plan strategies and prepare new chemical entities as potential drugs by following the process of drug discovery knowledge.

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		2. 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. 3. Understand the concept of, & design of peptidomimetics including the chemistry of prostaglandins, leukotrienes and thromboxanes. 4. Rationally design the enzyme inhibitors in medicine. 5. Understand the concept of amp; design prodrugs, analogs and peptidomimetics and drug resistance.
MPC 104T	Chemistry of Natural Products	1. Understand, discuss and determine the natural products as leads for new pharmaceuticals 2. Explain, discuss, and demonstrate the introduction, classification, isolation, purification, molecular modification and biological activity of natural outcoming organic substances. 3. Understand, discuss the recombinant DNA technology and crude drugs used in diabetic, liver dysfunction and antitumor therapy 4. Understand, discuss and determine the structural characterization of natural compounds.
MPC 105P	Pharmaceutical Chemistry Practical - I	1. Synthesize compounds of medicinal importance and characterize the synthesized compounds using physicochemical and spectroscopic methods. 2. Purify organic solvents using column chromatographic techniques. 3. Isolate and characterize the isolated compounds using physicochemical and spectroscopic techniques and carry out degradation reactions on selected plant constituents. 4. Operate, demonstrate, apply and record UV Vis spectrophotometer, column chromatography, HPLC, GC, fluorimetry and flame photometry 5. Perform degradation reactions on selected plant constituents 6. 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: Pharmacology		
MPAT 101T	Modern Pharmaceutical Analytical Techniques	1. Integrate and apply theoretical knowledge of various spectroscopic techniques available for analysis of drugs. 2. Understand and apply basic Knowledge of chromatographic and electrophoretic separation techniques. 3. Summarize the instrumentation of modern analytical techniques 4. Elucidate a structure based on UV, IR, NMR and Mass data. 5. Explain, Compare and appraise X-ray crystallographic

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		and Thermal Techniques
MPL 102T	Advanced pharmacology - I	1. Discuss the pathophysiology and pharmacotherapy of certain diseases 2. Explain the mechanism of drug actions at cellular and molecular level 3. Understand the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases 4. Summarize, classify and apply epidemiology, etiology, pathophysiology sign and symptoms, diagnosis, complications, treatment and management of disease affecting CVS, CNS. 5. Understand and summarize different autocoids and their role in physiological Functioning
MPL 103T	Pharmacological and toxicological screening methods - I	1. 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. 2. Describe the various laboratory animals used in experimental pharmacology and their applications. 3. Classify the various preclinical screening methods involved in experimental pharmacology 4. Describe the various preclinical screening methods involved in experimental pharmacology 5. Summarize the general principles and methods of immunoassay 6. Outline the limitations of animal experimentations justifying the use of alternative methods for animal studies
MPL 104T	Cellular and Molecular Pharmacology	1. Understand the basics of cell biology, recombinant DNA technology and transfer of genes to mammalian cells. 2. Apprehend the genetic elements of DNA, fingerprint analysis and various molecular techniques applicable in drug discovery. 3. Apply the knowledge of molecular pharmacology and biomarkers in drug discovery process. 4. Demonstrate molecular biology techniques as applicable for drug discovery. 5. Explain the molecular pathways affected by drugs.
MPL 105P	Pharmacological Practical - I	1. To demonstrate the biological evaluation of drugs by in vitro and in vivo methods 2. To analyse knowledge how to deal with experimental animals to test the potency of drugs. 3. To develop skills in handling animals and perform and evaluate experiments on them. 4. To calculate and compare experimental observations and results statistically. Student can differentiate between actual experimental results or if these results are due to chance. 5. Manage her / his time effectively by performing

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		pharmacological activity on experimental animals.
SEMESTER-II PHARMACEUTICS		
MPH 201T	Molecular Pharmaceutics (Nano Tech and Targeted DDS)	1. To integrate the knowledge of various approaches for development of TDDS 2. To discuss and elaborate the criteria for selection of drugs and polymers for the development of TTDS 3. To demonstrate basics involved in the formulation and evaluation of TDDS 4. To integrate and apply various concepts and strategies for improving targeting and absorption in the design of TDDS
MPH 202T	Advanced Biopharm. and Pharmacokinetics	1. Understand and analyze the concept of biopharmaceutics and pharmacokinetic. 2. Compile and integrate pharmacokinetic data and derive the pharmacokinetic models and parameters that best describe the process of drug absorption, distribution and metabolism. 3. Analyze and apply critical evaluation of biopharmaceutics studies involving drug product equivalency. 4. Demonstrate and understand the design and evaluation of dosage regimens of the drugs using pharmacokinetic and biopharmaceutics parameters. 5. Outline and analyze the potential clinical pharmacokinetic problems and application of basics of pharmacokinetic. 6. Demonstrate and apply the applications of biopharmaceutics and pharmacokinetic in drug delivery development.
MPH 203T	Computer Aided Drug Development	1. Discuss the role of Computer Aided Drug Delivery in drug discovery 2. Explain different Computer Aided Drug Delivery techniques and their applications 3. Demonstrate various strategies to design and develop new drug-like molecules 4. Explain in detail the working with molecular modeling software to design new drug molecules 5. Discuss various in silico virtual screening protocols
MPH 204T	Cosmetic and Cosmeceuticals	1. Use knowledge of regulatory aspects and biological aspects as a fundamental need for the development of cosmetics and cosmeceuticals. 2. Discuss the various building blocks used in cosmetics and cosmeceuticals formulations. 3. Develop and evaluate various cosmetics and cosmeceutical formulations with desired safety, stability, and efficacy 4. Discuss the current technologies in the market. 5. Explain guidelines and challenges in formulating herbal cosmetics

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MPH 205P	Pharmaceutics Practical II	1. Understand and evaluate the effect of various factors on development of formulation of drug. 2. Compile and apply different types of in vitro dissolution studies of drug formulation and its comparison with marketed product. 3. Analyze and understand the techniques in ex vivo and in situ evaluation of the formulation for its performance. 4. Demonstrate and understand various software's in optimization of the formulation 5. Outline and learn various in silico methods used in formulation development and optimization. 6. Demonstrate and apply the formulation knowledge and skills in development of herbal formulations.
Department: Pharmaceutical Quality Assurance		
MQA 201T	Hazard and Safety Management	1. 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 & firebased hazards, fire protection system. 2. Impart basic knowledge about the environment and its allied problems related to air, chemical, firebased hazards, fire protection system. 3. Illustrate the different sources and types of environmental studies, air, chemical & fire based hazards. 4. 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	1. Explain the concepts, importance, scope types, methodology and application of calibration, qualification and validation activities in pharma industry 2. Prepare protocols for qualification and validation of instruments, facilities and processes as per guidelines. 3. Explain the importance of patent and intellectual property rights 4. Suggest methodology for qualification of laboratory, analytical and manufacturing equipments. 5. Suggest methodology for validation of utilities, analytical methods, cleaning methods, computerized systems and manufacturing processes of various dosage forms.
MQA 203T	Audits and Regulatory Compliance	1. Explain methodology of auditing in different department of pharmaceutical industry like production, vendor, microbiological laboratory, quality assurance 2. Illustrate CGMP practices and regulation of production department, microbiological department, quality assurance & engineering department 3. Understand the process of carrying out audits in

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		departments like production, quality assurance and different laboratories of the pharmaceutical industry. 4. Understand preparation of audit report and check list of auditing which is required by various departments of pharmaceutical industry like vendor, production, packaging, laboratory, quality assurance etc. 5. Understand the role and importance of Quality systems and audits in pharmaceutical manufacturing environment, auditing of vendors & production department, auditing of microbiological laboratory and auditing of quality assurance & engineering department.
MQA 204T	Pharmaceutical Manufacturing Technology	1. Students will be able to develop and demonstrate the common practice in thepharmaceutical industry developments, plant layout and production planning. 2. Students will be able to understand and integrate the knowledge aboutprinciples and practices of aseptic process technology. 3. Students will be able to understand and integrate the knowledge about principles and practices of non-sterile manufacturing technology. 4. Students will be able to understand the principles and practices of packagingtechnology. 5. Students will be able to design and understand the principles andimplementation of Quality by design (QbD) and process analytical technology (PAT) inpharmaceutical manufacturing.
MQA 205P	Pharmaceutical Quality Assurance Practical II	1. Perform qualitative and quantitative analysis of certain pharmaceutical contaminants and drugs 2. Analyze and validate pharmaceutical facilities, processes, methods and equipment 3. Study qualification of pharmaceutical equipment 4. Create checklist for pharmaceutical facilities 5. Design plant layout for sterile and nonsterile products 6. Perform case study on certain quality management tools.
Department Pharmaceutical Chemistry		
MPC 201T	Advanced Spectral Analysis	1. Understand, discuss and determine in detail the theory and principle of chromatography and hyphenated techniques, Thermal methods of analysis, Bioassay, ELISA, Radioimmunoassay, ATR-IR. 2. Explain, discuss, and demonstrate in details the instruments of above technique. 3. Understand, discuss and compare the applications of instruments. 4. Understand, discuss, interpret and elucidate the data of Woodward Fieser rule and IR, NMR, Mass, DSC, DTA TG, Interpretation of organic compounds.
MPC 202T	Advanced Organic Chemistry - II	1. Apply the principles and techniques of green chemistry in synthesis of organic compounds. 2. Synthesize chiral compounds using various methods of

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		asymmetric synthesis based on the stereochemistry. 3. Apply the techniques of peptide synthesis. 4. Apply the principles of photochemical and pericyclic reactions 5. Use different methods of catalysis and catalysts in synthesis of organic compounds.
MPC 203T	Computer Aided Drug Design	1. To utilize various molecular modeling software in the design of novel drug-like molecules. 2. To apply the various software for physicochemical property prediction. 3. To understand how current drugs were developed by using pharmacophores modeling and docking technique. 4. To study Case studies in Molecular Modeling to apply those in the development of novel entities by the use of computer-aided drug design. 5. Discuss the History, different techniques, and applications of Computer-aided drug design & apply them to determine routes for designing new molecules. 6. To know the history, physicochemical parameters, applications, and statistical methods used to develop QSAR & apply these concepts in developing the best QSAR model.
MPC 204T	Pharmaceutical Process Chemistry	1. Assess Synthetic strategy Stages of process in Bench, pilot and large scale. 2. 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. 3. Classify Extraction Filtration Distillation Evaporation Crystallization operations in pharmaceutical process chemistry. 4. Summarize Nitration, Halogenation and Oxidation and Reduction operations in Pharmaceutical process chemistry and Case study on industrial reduction process. 5. Select Fermentation used in production of medicine and Reaction progress kinetic analysis useful for scale-up.
MPC 205P	Pharmaceutical Chemistry Practical -II	1. Compare synthesis of API's / intermediates by different synthetic routes and use various approaches for synthesis of organic compounds. 2. Synthesize organic compounds using microwave technique 3. Design drug molecules using computer aided drug design. 4. Interpret and characterize synthesized organic compounds using FT–IR, NMR, CNMR and Mass spectra 5. Describe, discuss and compare study of synthesis of APIs/intermediates by different synthetic routes and assignments on regulatory requirements in API.

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		6. Describe, discuss, explain and demonstrate calculation of ADMET properties of drug molecules and its analysis using softwares Pharmacophore modelling, 2D–QSAR based experiments, 3D–QSAR based experiments, docking studybased experiment, virtual screening-based experiment
Department: Pharmacology		
MPL 201T	Advanced Pharmacology II	1. 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. 2. 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. 3. 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. 4. 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. 5. 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	1. Explain the various types of toxicity studies. 2. Appreciate the importance of ethical and regulatory requirements for toxicity studies. 3. Demonstrate the practical skills require conducting the preclinical toxicity studies. 4. To study Importance and applications of toxicokinetic studies. 5. To study and apply good laboratory practices and its importance in drug development
MPL 203T	Principles of Drug Discovery	1. Outline the various stages of drug discovery. 2. Justify the importance of the role of genomics, proteomics and bioinformatics in drug discovery. 3. Apply the knowledge of various targets, biomarkers and *in vitro* screening techniques for drug discovery. 4. Summarize various lead seeking and lead optimization methods. 5. Integrate the concepts of computer aided drug design in drug discovery.
MPL 204T	Clinical research and pharmacovigil.	1. Explain the regulatory requirements for conducting clinical trial. 2. Demonstrate the types of clinical trial designs.

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		3. Explain the responsibilities of key players involved in clinical trials. 4. Execute safety monitoring, reporting and close-out activities. 5. Explain the principles of Pharmacovigilance. Detect new adverse drug reaction and their assessment. Perform the adverse drug reaction reporting systems and communication in Pharmacovigilance.
MPL 205P	Pharmacological Practical II	1. To demonstrate the biological evaluation of drugs by in vitro and in vivo methods 2. To 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 as well as by simulated experiments which give an idea on the recent methods of bioassay. 4. To develop skills in handling animals and perform and evaluate experiments on them. 5. To calculate and compare experimental observations and results statistically. Student can differentiate between actual experimental results or if these results are due to chance. 6. Manage her / his time effectively by performing pharmacological activity on experimental animals.

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Course Outcomes (COs) for Pharmacy Practice

A.Y.2022-23

	Subject	Course Outcome
FIRST YEAR PHARM D.		
1.1 T	Human Anatomy and Physiology (Theory)	CO1.Understand Basic terminologies used, prefixes & suffixes used to identify body parts and directional terms as well as relevance and significance to Health Sciences. CO2.Understand various homeostatic mechanisms and their imbalances of various systems. CO3.Understand the coordinated working pattern of different organs of each system. CO4.Understand interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body. CO5.Understand the importance of health education and health promotion.
1.1 P	Human Anatomy and Physiology (Practical)	CO1.Understand the construction, working, care and handling of instruments, glassware's and equipment's required for practical. CO2.Understand the significance of Bleeding time, Clotting time, Blood group detection, Haemoglobin detection and measurement of blood pressure. CO3.Knowledge of mechanism of White Blood Cell Count, Red Blood Cell Count and Erythrocytes Sedimentation rate of blood sample. CO4.Demonstration of various systems with the help of charts and models. CO5.Understand the mechanism of experimental physiology
1.2 T	Pharmaceutics (Theory)	CO1. Integrate the knowledge related to introduction and classification of dosage form, prescription and posology. CO2. Build knowledge about the historical background and development of Pharmacy profession including different pharmacopoeias. CO3. Develop and demonstrate solid dosage form like powders and granules and pharmaceutical calculations related to weights and measures. CO4. Build knowledge of liquid dosage form including both monophasic and biphasic dosage form. CO5. Investigate information related to suppositories and surgical aids. CO6. Develop knowledge related to different galenical products and its extraction processes along with incompatibilities associated with dosage form
1.2 P	Pharmaceutics (Practical)	CO1. Demonstrate the skill of preparation and evaluation of various solid and liquid dosage forms. CO2. Explain principles of formulation and evaluation of dosage forms. CO3. Calculate evaluation parameters like density, specific gravity, angle of repose, carr's index and hausner'sratio of pharmaceutical preparation.

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		CO4. Classify various dosage forms by using different criteria. CO5. Create labels in prescribed manner for various dosage forms. CO6. Build knowledge regarding different types of incompatibilities for safety, efficacy and therapeutic effect of dosage forms.
1.3T	Medicinal Biochemistry (Theory)	CO1.To summarize biomolecules and to conclude, evaluate and discuss chemical nature and biological role of it with concepts in bioenergetics. CO2.To summarize, justify and conclude catalytic role of enzymes, importance of enzyme in inhibitors in design of new drugs, therapeutics and diagnostics applications of enzymes. CO3.To summarize, explain, discuss and compose, synthesis and metabolism of important biomolecules like carbohydrates, lipids, proteins, nucleic acids and the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins. CO4.Understand biological/physiological role, to evaluate and discuss chemical nature, storage, metabolism, biochemical principles. CO5.Identify, interpret, analyze and infer test of organ function tests of kidney, liver, lipid and immunochemical techniques. CO6.To understand, summarize, illustrate and investigation of biomolecules in body fluid.
1.3P	Medicinal Biochemistry (Practical)	CO1.Evaluate and analyze presence of various biomolecules/ normal and abnormal constituents in body fluids using qualitative and quantitative tests. CO2.Understand and analyze the catalytic activity of enzymes and importance of isoenzymes in diagnosis of diseases. CO3.Apply the biochemical principles of organ function tests of kidney, liver and endocrine gland. CO4.Understand importance of levels of various biomolecules in body fluids.
1.4T	Pharmaceutical Organic Chemistry (Theory)	CO1.Explain the physical properties of organic compounds CO2.Identify the structures of a given organic compound and give the nomenclature CO3.Explain the mechanisms involved in various named organic reactions CO4.Illustrate the reactivity, orientation and stability of organic reactions CO5.Identify the products obtained through simple organic reactions CO6.Summarize the studies on some important official organic compounds
1.4 P	Pharmaceutical Organic Chemistry(Practical)	CO1.Compose different classes of organic pharmaceuticals using some named organic reactions with mechanisms CO2.Apply stereo models and explain the structural aspects of organic compounds CO3.Integrate and Analyze the elements in different organic pharmaceuticals by Performing organic qualitative analysis CO4.Identify various classes of organic compounds by systematic

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		qualitative analysis CO5.Analyze various organic pharmaceuticals
1.5 T	Pharmaceutical Inorganic Chemistry (Theory)	CO1.To discuss and explain the principles and procedures of analysis of drugs. CO2.To apply and determine the applications of inorganic pharmaceuticals in analysis of drug. CO3.To discuss the fundamentals of analytical chemistry and examine inorganic pharmaceuticals regarding their monograph. CO4.To justify the importance of inorganic pharmaceuticals in preventing and curing disease. CO5.Knowledge about the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals CO6.To have been introduced to a variety of inorganic drug classes
1.5P	Pharmaceutical Inorganic Chemistry (Practical)	CO1.Perform the limit test for certain impurities like chloride, sulphate, iron, arsenic, lead and heavy metals as per the Indian Pharmacopoeia CO2.Determine percentage purity of given pharmaceutical drugs by titrimetric analysis CO3.Perform qualitative analysis of given inorganic mixtures. CO4.Identify the Inorganic compounds through various chemical tests. CO5.Know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals CO6.Use different methods for preparation of Inorganic substances
		SECOND YEAR PHARM D.
2.1T	Pathophysiology (Theory)	CO1.To understand the process of cell injury by various etiological agents, morphology of cellinjury and cellular adaptations. CO2.To summarize the events of acute and chronic inflammation and to relate them to theprocess of wound healing. CO3.To apply the knowledge of immune tolerance and Human Leucocytic antigen system inunderstanding the process of organ transplantation, autoimmunity and hypersensitivity reactions. CO4.To assess the need of balanced diet and the effect of radiation and air pollution onhuman body. CO5.To appraise the principles of physical, chemical and biologic carcinogenesis and toevaluate the pathological changes observed in a cancer tissue. CO6.To adapt the principles of cell injury, inflammation and immunepathology inunderstanding pathogenesis of various disease states and their clinical features and complications.
2.2T	Pharmaceutical Microbiology (Theory)	CO1.To list the branches, scope of microbiology and morphology of microbes. CO2.To explain the methods of identification, cultivation and preservation of various microorganisms. CO3.To apply the principles of sterilization in pharmaceutical processing and sterility testing.

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		CO4.To compare different types of immunological reactions, antigens, vaccines and their role in immunity. CO5.To evaluate microbiological standards of pharmaceuticals and presence of pathogens. CO6.To elaborate the characteristics, mode of infection, diagnosis, prophylaxis and treatment of bacterial, fungal and viral infectiousagents.
2.2P	Pharmaceutical Microbiology (Practical)	CO1.To recall different techniques of sterilization and equipment used in microbiology laboratory. CO2.To interpret characteristics of microbes using staining techniques, isolation methods and quantitative estimation. CO3.To construct standard graphs for estimating antibiotics and vitamins using microbes. CO4. To test for possible microbial contamination in a given sample. CO5.To estimate qualitatively and quantitatively the amount of microbes in a sample. CO6.To choose the correct method for evaluating the microbes by serological and bacteriological methods.
2.3T	Pharmacognosy&Phytopharmaceuticals (Theory)	CO1.Develop and design agricultural & storage requirement of crude drugs & explain detailed pharmacognostic account of medicinal plants CO2.Develop and design the technique for extraction, isolation, purification of phytoconstituents for medicinal, agricultural, food & healthcare industry CO3.Design & explain various methods for determination of authenticity of crude drugs, extracts,phytoconstituents, formulations & detect their adulteration CO4.Develop to design a method for analysis, detection, purification of various extracts, phytoconstituents& herbal raw materials. CO5.Correlate various techniques involved in extraction, isolation, estimation & application of phytoconstituents
2.3P	Pharmacognosy&Phytopharmaceuticals (Practical)	CO1.Illustrate the anatomical architecture of various crude drugs & its significance for the plants & for its analysis CO2.Correlate the various staining reagents required for the authentication of crude drugs during microscopy CO3.Design various analytical parameters required for the authentication of crude drugs, extracts,Oils etc. CO4.Judge various crude drugs on the basis of their morphological &microscopical Studies. CO5.Evaluate the purity &/Or stability of various unorganized crude drugs & oils.

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2.4T	Pharmacology-I (Theory)	CO1.Relate pharmacokinetics and pharmacodynamics of a drug with drug action CO2.Identify the factors modifying drug action CO3.Assess drug interactions and detect adverse drug reactions CO4.Classify and explain the pharmacology of drugs acting on various systems CO5.Apply the basics of pre-clinical and clinical evaluations in the development of new drugs
2.4P	Pharmacology-I (Practical)	CO1. Utilize and handle the Experimental animals CO2.Assess and handle the computerized simulated software programme such as COLPHARM CO3. Compare the effects of various drugs on animals CO4.Test and Utilize the instruments used in experimental Pharmacology CO5.Recommend physiological salt solutions for different isolated tissues CO6.Apply different routes of drug administration and the techniques of Euthanasia and analgesia in laboratory animals
2.5T	Community Pharmacy (Theory)	CO1.Identify drug discuss the roles andresponsibilities of community pharmacist CO2.Outline the layout and infrastructurerequirements for community pharmacy. CO3.Recognize the need of inventory control anddiscuss the various methods CO4.Discuss the factors affecting medicationadherence CO5. Perform general patient counselling CO6. Apply health screening services incommunity pharmacy
2.6T	Pharmacotherapeutics-I (Theory)	CO1. To recall the pathophysiology of cardiovascular disorders and relate their etiology withthe therapeutic approach including treatment controversies. CO2. To outline the concept of essential drugs, use and rational drug therapy and summarizethe choice of drugs with justification in various disease conditions. CO3. To identify various types of respiratory and endocrine disorders with respect to clinicalfeatures and laboratory investigations, list their complications along with replacement in their management. CO4. To distinguish between various disease conditions and analyze the results with druginduced disorders. CO5. To select the patient-specific parameters relevant in initiating drug therapy, andmonitoring therapy among pediatric, geriatric, pregnant and lactating women. CO6. To develop competency to design individual care plan for cardiovascular, respiratory,ocular and hormonal disorders.
2.6P	Pharmacotherapeutics-I (Practical)	CO1.To list the sign and symptoms, laboratory parameters of the cardiovascular diseases. CO2.To identify the drug interactions and find a solution to overcome drug interactions in thegiven prescriptions. CO3.To plan an individual care plan in the cases with endocrine and thyroid disorders.

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		CO4.To analyze the prescription for rational drug use. CO5.To explain the safety of oral contraceptives, hormone replacement therapy and the drugsused on occular disorder CO6.To minimize the drug related problems in the prescriptions and to choose a choice ofdrugs in various diseases.
	THIRD YEAR PHARM D.	
3.1T	Pharmacology-II (Theory)	CO1.Understand the pharmacological actions of different categories of drugs CO2. Study in detailed about mechanism of drug action at organ system/ sub cellular/ macromolecular level CO3.Understand the application of basic pharmacological knowledge in the prevention and treatment of various diseases CO4.Observe the effect of drugs on animal by simulated experiments CO5.Correlate of pharmacology with other bio medical science CO6.Understand the signal transduction mechanism of various mechanism
3.1P	Pharmacology-II (Practical)	CO1 Understand the pharmacological aspects of drugs used to treat ailment of different organ systems of the body. CO2 Appreciate the importance of drug discovery by preclinical and clinical trials. CO3 Apply the knowledge of drugs practically using simulated pharmacological experiments CO4.Demonstrate in-vitro techniques of Bio-Assay and various pharmacological models in different animals to assess drug activity. CO5.Differentiate various physiological salt solution
3.2T	Pharmaceutical Analysis (Theory)	CO1.Assess quality Assurance and validation methods concept with guidelines and their regulations and Understand the concepts of calibration and validation of various pharmaceutical analytical instruments CO2.Explain Introduction, theory, instrumentation and application in the different types of chromatography and spectroscopic technique. CO3.Categorize the electrometric methods, theoretical aspects, Instrumentation, Interpretation of data and analytical applications CO4.Understand the principles of analytical techniques and its application in analysis of drugs
3.2P	Pharmaceutical Analysis (Practical)	CO1.Develop mobile phase for separation and identification of drugs by Chromatography. CO2.Operate various instruments to develop practical skill. CO3.Interpret the data obtained through UV, IR, NMR, spectra and report the result CO4.Summarize theoretical knowledge on various instrumental technique
3.3T	Pharmacotherapeutics-II (Theory)	CO1.Describe the pathophysiology and management of diseases. CO2.Develop Patient case-based Assessment Skills CO3.Describe the quality use of medicines issues surrounding the therapeutic agents in the treatment of these diseases CO4.Develop clinical skills in the therapeutic management of

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		these conditions CO5.Provide patient centric care to diverse patients using the evidence-based medicine
3.3P	Pharmacotherapeutics-II (Practical)	CO1.Integrate the knowledge of therapeutic approach to management of diseases. CO2.Analyze needs to identify the patient specific parameters relevant in initiating drug therapy. CO3.Describe pathophysiology of selected diseases. CO4.Understand individualized therapeutic plans based on diagnosis. CO5.Describe the diagnosis of various diseases and able to report ADR. CO6.Outline the therapeutic approach to management of diseases including reference to the latest available evidence.
3.4T	Pharmaceutical Jurisprudence(T) (Theory)	CO1.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 CO2.Illustrate pharmaceutical legislation in India concepts, principle and significance of pharmaceutical ethics drafted by PCI CO3.Practice legal provisions for import, manufacture, sale of drugs and cosmetics and schedules thereunder and similarly, provisions under Pharmacy Act CO4.Organize and describeprovisions under medicinal and toilet preparation act and narcotic drug and psychotropic substances act CO5.Examine provisions made under drugs price control order, prevention of cruelty to animal act, patent and design act and prescription and non-prescription product CO6.Analyse and describe salient features of drugs and magic remedies act and essential commodities act relevant to drugs price control order
3.5T	Medicinal Chemistry (Theory)	CO1.Understand Modern concepts of rational drug design CO2.Derive and understand the Structural influences on mechanism of pharmacologic action (structure-activity relationship). CO3.Evaluate the chemistry of drugs with respect to their pharmacological activity. CO4.Summarize the mechanism pathways of different class of medicinal compounds. CO5.Illustrate chemical nomenclature, brand names of important marketed products and their side effects. CO6.Analyze and apply Diagnostic agents
3.5P	Medicinal Chemistry (Practical)	CO1.Perform synthesis of medicinal compounds and integrate knowledge related to mechanism behind synthesis. CO2.Perform purification of medicinal compounds by recrystallization CO3.Analyze pharmaceutical drugs using appropriate assay method. CO4.Analyze monographs of important drugs. CO5.Determine physical properties of organic compounds with respect to QSAR analysis.

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3.6T	Pharmaceutical Formulations (Theory)	CO1. Integrate the knowledge related to different pharmaceutical dosage forms. CO2. Develop and prepare of various pharmaceutical dosage forms CO3.Analyze different pharmaceutical dosage forms according to their evaluation parameters. CO4. Integrate knowledge regarding different terms like bioavailability and bioequivalence. CO5. Study role of various pharmaceutical dosage forms.
3.6P	Pharmaceutical Formulations (Practical)	CO1.Develop different types of dosage from according to route of administration. CO2.Develop and prepare various pharmaceutical dosage forms. CO3.Analyze different dosage forms according to their evaluation parameters. CO4.Design labels according to different types of pharmaceutical dosage forms. CO5.Integrate knowledge regarding principle involved in formulation and role of various pharmaceutical dosage forms
		FOURTH YEAR PHARM D.
4.1T	Pharmacotherapeutics-III (Theory)	CO1.Explain the etiopathogenesis of selected gastrointestinal, hematological, neurological and psychiatric diseases. CO2.Discuss the principles of evidence-based therapy and pain management CO3.Identify the patient-specific parameters relevant in initiating and monitoring drug therapy and adverse effects CO4.Discuss the therapeutic approach in the management of selected diseases and controversies in drug therapy CO5.Prepare individualized therapeutic plans based on diagnosis CO6.Recognize the role of pharmacist in essential and rational drug use.
4.1P	Pharmacotherapeutics-III (Practical)	CO1.Identify drug interactions and rationalize the prescription CO2.Discuss the therapeutic approach to management of selected diseases CO3.Prepare individualized therapeutic plans based on diagnosis CO4.Conduct patient counseling CO5.Conduct planned experiments and prepare laboratory report in a standard format
4.2T	Hospital Pharmacy (Theory)	CO1.Understand organisation and function CO2.Use knowledge of drug distribution methods in hospital, apply principles of drug store management and inventory control to medication use. CO3.Provide patient-centered care to diverse patients using the best available evidence, Provide Unbiased Drug Information to The Doctors; Provide and design guidelines for the diseases. CO4.Know the formulation aspects of different dosage forms do different pharmaceutical calculation involved in formulation and appreciate the importance of good formulation for effectiveness. CO5.Know the professional practice skills
4.2P	Hospital Pharmacy (Practical)	CO1.Use knowledge of drug distribution methods in hospital, apply principles of drug store management and inventory control

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		to medication use. CO2.Provide patient-centered care to diverse patients using the best available evidence, Provide Unbiased Drug Information to The Doctors; Provide and design guidelines for the diseases. CO3.Know the formulation aspects of different dosage forms do different pharmaceutical calculation involved in formulation and appreciate the importance of good formulation for effectiveness. CO4.Know the professional practice skills
4.3T	Clinical Pharmacy (Theory)	CO1.To understand and explain the daily activities of clinical pharmacist and to monitor the patient rug therapy through medication chart review and clinical review. CO2.To obtain medication history interview and counsel the patients on various diseases and lifestyle modifications and by applying communication skills. CO3.To provide response to a drug and poison information queries using modified systemic approach and to gain ability to establish a drug and poison information center. CO4.To interpret selected laboratory results of specific disease states mentioned and to report ADRs and understand the process of pharmacovigilance. CO5.To identify and resolve drug related problems and medication errors. CO6.To critically evaluate biomedical literature in order to get an unbiased clinical evidence to develop individualized pharmaceutical care plan.
4.3P	Clinical Pharmacy (Practical)	CO1.Interview Medication history and Drug utilization Review CO2.Identify and resolve drug related problems CO3.Interpret selected lab results (as monitoring parameters in therapeutics)and design the Drug therapy CO4.Assess prescriptions for drug interactions and solve Drug and Poison information Queries CO5.Justify the disease conditions perform patient counseling on medication
4.4T	Biostatistics & Research Methodology (Theory)	CO1.To define the concepts of research methodology and sample size determination with report writing. CO2.To discuss different types of clinical study designs involved in medical research like case studies, observational studies and interventionalStudies. CO3.To apply the concepts of biostatistics and data graphics along with clinical soft wares like SPSS, SAS to support the research design. CO4.To learn to utilize the computer applications and their advantages in both hospital, community pharmacy. CO5.To simplify the understanding of statistical methods in epidemiology and be conscious about its relative, attributable risks CO6.To critically evaluate biomedical literature in order to get an unbiased clinical evidence to develop individualized pharmaceutical care plan.
4.5T	Biopharmaceutics&Phar	CO1.To recall basic concepts of absorption, distribution,

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	macokinetics (Theory)	metabolism and excretion of drugs. CO2.To understand the mechanisms, interpret various factors affecting drug absorption, distribution, metabolism and excretion of drugs. CO3.To apply the pharmacokinetic models for the determination of Pharmacokinetic parameters. CO4.Toexamine multiple dosage regimens based on pharmacokinetic Parameters for maximizing therapeutic effectiveness and patient compliance. CO5.To evaluate various pharmacokinetic parameters for the drugs exhibiting saturation kinetics. CO6.To design the bioavailability testing protocol of a drug and compare the bioequivalence between marketed products.
4.5P	Biopharmaceutics& Pharmacokinetics (Practical)	CO1.To recall the concepts in biopharmaceutics, basic pharmacokinetic parameters and their significance. CO2.To interpret the effect of surfactant, diluents, lubricant and polymorphism on rate of drug dissolution. CO3.To solve bioavailability parameters of drugs by using plasma data and methods to improve bioavailability. CO4.To analyze absorption rate constant, KE, biological half-life, mean residence time and mean absorption time for the given data. CO5.To estimate the extent of protein biding by equilibrium dialysis or dynamic dialysis methods. CO6.To predict the pharmacokinetic parameters for the given data as per one compartment and two compartment models.
4.6T	Clinical Toxicology (T) (Theory)	CO1.Develop general working knowledge of the principles and practice of clinical toxicology CO2.Demonstrate an understanding of the health implications of toxic exposures and commonly involved chemicals for toxicity CO3.Demonstrate and applying an understanding of general toxicology principles and clinical management practice CO4.Demonstrate and applying an understanding of the history, assessment, and therapy considerations associated with the management of a toxic exposure CO5.Demonstrate and apply an understanding of the characteristics of and treatment guidelines for specific toxic substances CO6.Propose several preventive approaches to reduce unintentional poisonings CO7.Enable the pharmacist to function as contributing health care team member when faced with a toxic exposure experience, including emergencies
	FIFTH YEAR PHARM D.	
5.1	Clinical Research	CO1.Determine basic concepts of drug development process and Demonstrate the competencies of clinical research designs and the regulatory approval process. CO2.Familiarize with the various regulatory documents and the guidelines and to evaluate critical domestic and global regulatory and health care implications on the product development.

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		CO3.Identifying, implementing and manage ethical aspects of conduct of clinical trial. CO4.Familiarize with the roles and responsibilities of the personnel involved in conduct of clinical research to ensure the quality research is undertaken CO5.Estimating the regulatory and ethical requirements. CO6.Identifying and implementing the clinical trials activities
5.2	Pharmacoepidemiology& Pharmacoeconomics	CO1.Understand the applications of pharmacoepidemiology and pharmacoeconomics in clinical settings CO2.Analyze and evaluate the concept of risk in pharmacoepidemiology and different methods of measuring risk CO3.Understand the various pharmacoepidemiological methods and analyzing the sources of data for pharmacoepidemiological studies. CO4.Evaluate the methods to measure outcomes in pharmacoeconomic studies CO5.Implement competency in the design, conduct and evaluation of pharmacoepidemiology studies. CO6.Executing and estimating. The software's in pharmacoepidemiology and pharmacoeconomics
5.3	Clinical Pharmacokinetics and Pharmacotherapeutic Drug Monitoring	CO1.Discuss the pharmacokinetic principles to individualize drug therapy in patient care situations CO2.Determine dose,dosing intervals and dosage adjustments of a drug for a given patient CO3.Apply the principles of pharmacokinetics to analyze and predict drug interactions CO4.Plan protocol for TDM of drugs for selected diseases CO5.Discuss the concept of genetic polymorphism in metabolism, transport and target of a drug

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Course Outcomes

Academic Year 2021-22

Course Outcomes (COs) for B. Pharmacy

A.Y. 2021-2022

Sem	Subject Name	COs
First Year Sem I 2019 pattern		
BP101 T	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 ofhuman 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.
BP102 T	Pharmaceutical analysis I – T Div.(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 Div. (B)	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. Select various titration methods for end point detection and oxidation and reduction mechanism reaction.
BP103 T	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

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		influencing powders, monophasic-biphasic liquid dosage form, 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. 4. Summarize the Advantage, Disadvantage & factors influencing powders, 5. monophasic-biphasic liquid dosage form, semisolid dosage form and suppositories.
BP104 T	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 4. Derive acids, bases, buffers, water and different GIT agents and recall the fundamental principles of them 5. Develop the medicinal use of topical agents, gases and vapors', dental 6. Integrate about the major intra and extra cellular electrolytes, essential and trace
	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 Derive acids, bases, buffers, water and different GIT agents and recall the fundamental principles of them 4.Develop the medicinal use of topical agents, gases and vapors', dental 5.Integrate about the major intra and extra cellular electrolytes, essential and trace
BP105 T	Communication skills – t *	1. Develop communication skills effectively with range of people in variety of setting, using different of modes and media 2. Integrate behavioral needs of pharmacists 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-cocurricular and extracurricular activities 6. To develop graduates with ethics, morals and social sense & decision making
BP106 RBT	Remedial biology/	1. To identify a given plant part based on its macroscopic and microscopic characteristics. 2. To illustrate the classification of plants, plant cell and its

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		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.
BP107 P	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
BP107 P	Human anatomy and physiology –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. 5. Evaluate body temperature and body mass index. 6. To assess the knowledge on positive and negative feedback mechanism, family planning devices, pregnancy diagnostic tests, tissues of vital organs and gonads.
BP108 P	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. Understand and apply the fundamentals of analytical chemistry and the theory of electrochemical analysis of drugs 2. Recall, apply and evaluate various molar and normal solution in Pharmaceutical solution 3. Evaluate various volumetric and electrochemical titrations 4. Apply and measure end point detection in volumetric and electrochemical titrations 5. understand, apply and evaluate refractive index of some sample.
BP109 P	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.

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		4. Classify various dosage forms by using different criteria 5. Create labels in prescribed manner for various dosage forms.
	Pharmaceutics I – P (B)	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.
BP110 P	Pharmaceutical inorganic chemistry –P (A)	1. Determine the level of specific impurities in the given inorganic compounds by performing different limit tests. 2. Use different chemical methods to prepare inorganic pharmaceuticals. 3. Integrate and Analyze the anions, cations in different inorganic pharmaceuticals by Perform identification tests as per Indian 4. Determine the impurities qualitatively be performing tests for purity 5. Compose and Familiar with different classes of inorganic pharmaceuticals and their analysis 6. Evaluate important properties of inorganic drugs, pharmaceuticals and Test for their purity
	Pharmaceutical inorganic chemistry –P (B)	1. Determine the level of specific impurities in the given inorganic compounds by performing different limit tests. 2. Use different chemical methods to prepare inorganic pharmaceuticals. 3. Integrate and Analyze the anions, cations in different inorganic pharmaceuticals by Performing identification tests as per Indian Pharmacopoeia. 4. Determine the impurities qualitatively be performing tests for purity 5. Compose and Familiar with different classes of inorganic pharmaceuticals and their analysis 6. Evaluate important properties of inorganic drugs, pharmaceuticals and test for their purity
BP111 P	Communication skills – p*	1. Develop etiquettes, mannerism, soft skills and & communication skills 2. Develop presentation skills, listening skills & sophisticated non-verbal communication 3. Generate leadership quality, emotional intelligence & cognitive skills 4. Develop good interview skills with complete professional etiquettes
BP112 RBP	Remedial biology – p*	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 of different bone in human skeleton system, their location and significance.

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First year semester II		
BP201 T	Human anatomy and physiology II– T (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/micturition.\ 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.
	Human anatomy and physiology II – T (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/micturition. 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.
BP202 T	Pharmaceutical organic chemistry I-T(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. 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
	Pharmaceutical organic chemistry I-T (B)	1. Derive and understandthe structure, name andthe type of isomerism of the organic compound 2. Integrate the fundamentals of Chemical Reactions, stereochemistry and rearrangement of carbocations 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 for preparation of derivatives
BP203	Biochemistry –	1. To summarize biomolecules and to conclude, evaluate and

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T	T(A)	discuss chemical nature and biological role of it with concepts in bioenergetics. 2. To Summarize & compose; Compose Synthesis and Metabolism of important biomolecules like carbohydrates, lipids, proteins and nucleic acids. 3. To 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 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, therapeutics and diagnostics applications of enzymes.
	Biochemistry – T (B)	1. To introduce, describe, discuss and classify biomolecules, carbohydrates, biological oxidation, bioenergetics, lipids, amino acids, nucleic acids and enzymes. 2. To describe, study and discuss metabolism pathways of carbohydrates, lipids, amino acids, nucleic acids and enzymes. 3. To describe, study and discuss the energetics and regulation of metabolism of carbohydrates, lipids, amino acids, nucleic acids and enzymes. 4. To compare and discriminate metabolism, energetics, regulation and functions of carbohydrates, lipids, amino acids, nucleic acids and enzymes.
BP204 T	Pathophysiology – T(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 (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
BP205 T	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

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		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.
BP206 T	Environmental sciences – T*	1. Create awareness about environmental problems among learners & society at large 2. Develop the knowledge about environmental issues & 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 & conservation 5. Integrate skills to help the society in identifying & solving environmental problems
BP207 P	Human anatomy and physiology II –P (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 II –P (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. 5. Evaluate body temperature and body mass index. 6. To assess the knowledge on positive and negative feedback mechanism, family planning devices, pregnancy diagnostic tests, tissues of vital organs and gonads.
BP208 P	Pharmaceutical organic chemistry I– P (A)	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
	Pharmaceutical	1. Integrate the reaction, possess knowledge and synthesis of

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	organic chemistry I– P (B)	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 5. Create model of organic compounds 6. Evaluate and analysis of element,solubility test, functional group test, mp, bp, derivatives
BP209 P	Biochemistry – P (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 (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.
BP210 P	Computer applications in pharmacy – P (A&B)	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.
Second year 2019 pattern SEMESTER-III		
BP301 T	Pharmaceutical Organic Chemistry II – Theory (A)	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 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 –	1. Draw the structure, name and the type of isomerism of the organic compounds 2. Derive the method of preparation of reactions and their

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	Theory (B)	orientation 3. able to illustrate reasons for acidity/ basicity, reactivity/stability of compounds 4. Distinguish, Relate, discriminate and rewrite about fats and oils 5. Summarize isomerism with types and choose proper conformation & configuration for assigning them by building various projection formulas & generating their interconversions
BP302 T	Physical Pharmaceutics I – Theory (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 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.
BP303 T	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, sources of microbial contamination and preventive measures to avoid the same. 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,

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		clean area classification 4 Discuss the concept of cell technology and its application in pharmaceutical industry. 5 Describe the spoilage, sources of microbial contamination and preventive measures to avoid the same. Describe microbiological assay along with methods for standardization of antibiotics, vitamins and amino acids
BP304 T	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, mixing, flow of fluid, evaporation, heat transfer, distillation, corrosion, centrifugation, filtration, size reduction, size separation 2. Illustrate objective, mechanism & theories of drying, mixing, 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, mixing, 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, mixing, 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.
BP305 P	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 binary mixture 4. Examine and evaluate the saponification value of given oil

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		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.
BP306 P	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 skill fully 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. Compile procedure and calculate various physicochemical parameters and report its significance. 2. Relate various physicochemical properties of drug/excipients to design various pharmaceutical dosage forms and delivery systems 3. Select and operate apparatus/equipment to determine of various physicochemical parameters. 4. Calculate and interpret particle size, size distribution, densities, viscosity, angle of repose, sedimentation volume, reaction rate constants, stability study, Cloud point and Kraft point. 5. Evaluate and analyse effect of some variables on physicochemical parameters and report it 6. Distinguish the principles of chemical kinetics and to apply them for stability testing; report effect of salt on hydrophobic sols
BP307 P	Pharmaceutical Microbiology – Practical (Div A)	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.

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		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.
	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 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
Semester IV		
BP401 T	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.

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		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 and recall the methods of preparation and properties of organic compounds. 2. Understand, describe and interpret the stereochemical aspects of organic compounds and stereo chemical reactions. 3. Memorize, summarize, distinguish and justify the nomenclature and classification, chemistry, synthesis, reactions and medicinal uses of heterocyclic compounds. 4. Understand, analyze and evaluate the chemistry like reactivity, stability, acidity and basicity, synthesis and reactions of heterocyclic compounds 5. Understand, analyze and evaluate the chemistry like reactivity, stability, acidity and basicity, synthesis and reactions of heterocyclic compounds.
BP402 T	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. Understand, discuss and determine the history and development of medicinal chemistry, physicochemical properties drug metabolism 2. Explain, discuss, and demonstrate the drugs acting on autonomic nervous system 3. Determine, apply and develop the drugs acting on central nervous system 4. Understand, discuss and determine drugs acting as centrally acting analgesics
BP403 T	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.

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	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.
BP404 T	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 drugaddiction/abuse/tolerance/ dependence.
BP405 T	Pharmacognosy and Phytochemistry I– Theory (Div- A)	1. Summerize the basic knowledge of importance and scope of Pharmacognosy andphytochemistry I in pharmacy field and its role in various systems of medicines 2. Apply knowledge of pharmacognostic study and quality conrol of crude drugs 3. Describe biological source, chemical nature, properties, 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 medicine 2. Apply knowledge of pharmacognostic study and quality control of crude drugs.

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		3. Describe biological source, chemical nature, properties, identification test and uses of crude drugs as well as plant products of natural origin (Primary and 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
BP406 P	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 poceducrefor 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 procedure 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
BP407 P	Physical Pharmaceutics II – Practical (Div A)	1. Exercise different pharmaceutical laboratory procedures used in determining various physical properties such as micromeritic 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 a proper documentation system to record observations and analyze information gathered through experimentation
	Physical Pharmaceutics II – Practical (Div B)	1. Compile procedure and calculate various physicochemical parameters and report its significance 2. Relate various physicochemical properties of drug/excipients to design various pharmaceutical dosage forms and delivery systems 3. Select and operate apparatus/equipment to determine of various physicochemical parameters. 4. Calculate and interpret particle size, size distribution, densities, viscosity, angle of repose, 5. sedimentation volume, reaction rate constants, stability study, Cloud point and Kraft point. 6. Evaluate and analyse effect of some variables on physicochemical parameters and report it 7. Distinguish the principles of chemical kinetics and to apply them

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		for stability testing; report effect of salt on hydrophobic sols
BP408 P	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 andeuthanasia 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 interpret the effects of various drugs on rabbit eye and ciliary motility of frog oesophagus in correlation with humans 5. To evaluate the stereotype and anticatatonic activity of drugs in rats/mice. 6. To predict various screening models for anticonvulsant, anxiolytic and local anesthetics activity.
	Pharmacology I – Practical (Div B)	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 interpret the effects of various drugs on rabbit eye and ciliary motility of frog oesophagus in correlation with humans 5. To evaluate the stereotype and anticatatonic activity of drugs in rats/mice. 6. To predict various screening models for anticonvulsant, anxiolytic and local anesthetics activity.
BP409 P	Pharmacognosy and Phytochemistry I – P(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 drugs 5. Develops hands on skills in micrometry
	Pharmacognosy and Phytochemistry I – P (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		
BP501 T	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.

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		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. 5. Compare and summarize the chemistry of drugs with respective to their pharmacological activity.
BP502 T	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.
BP503 T	Pharmacology II – Theory (Div-A)	1. Understand mechanism of drug action and its relevance in treatment of different diseases 2. Explain essential pharmacotherapy of drugs acting on cardiovascular system

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		3. Clarify the pharmacological features of common and important drugs used in urinary system 4. Study and understand different autacoids and their functions in body 5. Correlate exact role of hormones and their mechanism in different types of disease and disorders 6. Explain various types of bioassay and their importance in new drug development
	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.
BP504 T	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

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BP505 T	Pharmaceutical Jurisprudence – Theory (Div A)	1. Acquire knowledge in practice the Professional ethics and understand the various concepts of the pharmaceutical legislation in India. 2. Learn the knowledge on schedules and functioning of various committees in the Drug and Cosmetic Act and rules 3. Understand the labeling requirements and packaging guidelines for drugs and cosmetics Drug policy, DPCO, Patent and design act. 4. Know about narcotic and psychotropic drugs, its productions and drug abuse, its controlling. 5. Understand the concepts of Dangerous Drugs Act, Pharmacy Act and Excise duties Act. 6. Explain other laws as prescribed by the Pharmacy Council of India from time to time including International Laws.
	Pharmaceutical Jurisprudence – Theory (Div B)	1. Acquire knowledge in practice the Professional ethics and understand the various concepts of the pharmaceutical legislation in India. 2. Learn the knowledge on schedules and functioning of various committees in the Drug and Cosmetic Act and rules 3. Understand the labeling requirements and packaging guidelines for drugs and cosmetics Drug policy, DPCO, Patent and design act. 4. Know about narcotic and psychotropic drugs, its productions and drug abuse, its controlling. 5. Understand the concepts of Dangerous Drugs Act, Pharmacy Act and Excise duties Act. 6. Explain other laws as prescribed by the Pharmacy Council of India from time to time including International Laws.
BP506 P	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,

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		prepare and evaluate them 6. Prepare labels to suit regulatory requirements and select proper packaging (container and closure) and labeling materials for preparations.
BP507 P	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 for experimentation. 5. Calculate and compare experimental observations and results statistically.
	Pharmacology II – P (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 for experimentation. 5. Calculate and compare experimental observations and results statistically.
BP508 P	Pharmacognosy and Phytochemistry II – P (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 – P (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		
BP601 T	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

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		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, antimycobacterial, antiviral, antifungal, antiprotozoal, 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, antimycobacterial, antiviral, antifungal, anttiprotozoal, anthelmintic and antineoplastic agents.
BP602 T	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. 6. Correlate toxicology and its pharmacology with different types of disease and poisoning.
BP603 T	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,

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		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. 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. 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 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
BP604 T	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 Collaborate the concept of dissolution and application of in vitro in vivo correlation in drug product development.
BP605 T	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 biotechnological tasks.

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		3. To apply knowledge of immunology in healthcare and diagnostic purposes 4. To clarify equipment's 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 4. To clarify equipment's and the steps involved in production of biotechnologically derived product as well as methods to develop modern techniques in biotechnology field helpful to society
BP606 T	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
BP607 P	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 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

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		software.
	Medicinal chemistry III – Practical (Div B)	1. Make correct use of various equipment and take safety measures while working in medicinal chemistry laboratory 2. Explain, apply and justify the principle and theory behind synthesis of compound of our interest. 3. Develop skill to synthesize compounds 4. Develop skill to purify synthesized compounds 5. Predict and derive structure of synthesized compound with the help of spectroscopic analysis and physicochemical properties.
BP608 P	Pharmacology III – Practical (Div A)	1. Understand the principle behind evaluation of potency/effect of test drugs in various in-vitro as well as simulated experiments. 2. Analyse various biochemical parameters with the help of instrumental methods. 3. Design the in-vitro bioassay set up for the screening of various category of drugs. 4. Evaluate the toxicity profile of various drugs using various toxicity guidelines. 5. Create a basic understanding of bio-statistics methods in experimental pharmacology. 6. Calculate various pharmacokinetic parameters from the given data set.
	Pharmacology III – Practical (Div B)	1. Understand the principle behind evaluation of potency/effect of test drugs in various in-vitro as well as simulated experiments. 2. Analyse various biochemical parameters with the help of instrumental methods. 3. Design the in-vitro bioassay set up for the screening of various category of drugs. 4. Evaluate the toxicity profile of various drugs using various toxicity guidelines. 5. Create a basic understanding of bio-statistics methods in experimental pharmacology. 6. Calculate various pharmacokinetic parameters from the given data set.
BP609 P	Herbal Drug Technology – Practical (Div A)	1. Classify and analyze various herbal raw materials required for the 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. Design, optimize various analysis methods for determination of aldehydes, phenols, alkaloids in medicinal herbs and herbal products. Discuss Monograph of herbal drugs from recent Pharmacopoeias.
	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

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		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.
Final year SEMESTER-VII 2018 Pattern		
BP701 T	Instrumental Methods of Analysis – Theory	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 chromatography, High performance liquid chromatography (HPLC), Ion exchange chromatography, Gel chromatography, Affinity chromatography 2. To explain, demonstrate and discuss instrumentation 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 chromatography, High performance liquid chromatography (HPLC), Ion exchange chromatography, Gel chromatography, Affinity chromatography 3. To discuss, categorize and understand applications 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 chromatography, High performance liquid chromatography (HPLC), Ion exchange chromatography, Gel chromatography, Affinity chromatography 4. To distinguish, discriminate and compare various 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 chromatography, High performance liquid chromatography (HPLC), Ion exchange chromatography, Gel chromatography, Affinity chromatography
BP702 T	Industrial PharmacyII – Theory	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

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		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	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.
BP704 T	Novel Drug Delivery System – Theory	1. Illustrate the basic knowledge of novel drug delivery system with respect to Classification and definition of various novel drug delivery systems. 2. Illustrate the basic knowledge of types of polymers for controlled release drug delivery system, their classification, properties, evaluation and applications. 3. Explain the criteria for selection of drugs and polymers for the development of novel drug delivery system. 4. List out the various approaches for development of NDDS.
BP705 P	Instrumental Methods of Analysis – Practical	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 summerize the data obtained from instruments 4. Calculate and estimate the results from summarized data.
BP706 PS	Practice School*	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 autoanalyzer and hematology analyzer. 4. Develop basic skills, demonstrate use of modern equipments in formulation development and documentation practices.
Final year SEMESTER-VIII 2018 Pattern		
BP801 T	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 and tools 3. Describe the appropriate statistical methods required for a particular research design 4. Demonstrate the use of softwares like M.S. Excel, SPSS, R and MINITAB®, DoE (Design of Experiment) in industrial and clinical research

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		5. Demonstrate use of tools for design, analysis and optimization of experiments like factorial designs, RSM methodology
BP802 T	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.
BP806 ET	Quality Control and Standardization of Herbals	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 standardization 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
BP808 ET	Cell and Molecular Biology	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 and role in disease process.
BP809 ET	Cosmetic Science	1. Classify and define Cosmetics and Cosmeceuticals as per Indian and EU regulations 2. Describe the role of cosmetic excipients and building blocks in the formulation of cosmetics for skin care, hair care and oral care. 3. Explain the structure and function of the skin, hair, teeth and gums 4. Describe the fundamentals of sun protection and the formulation of Sunscreens, antiperspirants and deodorants 5. Discuss the principles of cosmetic evaluation. 6. Explain the role of herbs in cosmetics for skin care, hair care and oral care
BP811 ET	Advanced Instrumentation Techniques	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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Course Outcomes (COs) for M. Pharmacy
2021-22

Semester	Subject Name	COs
First Year M. Pham Sem I 2019 pattern		
MPC 102T	Advanced Organic Chemistry –I (T)	1. To recall, apply and interpret basic aspects of organic intermediates and different types of reactions. 2. To understand and appraise mechanism and applications of various named reactions. 3. To recognize and apply different synthetic reagent and protecting groups used in organic synthesis. 4. To explain and understand name reactions including heterocyclic compounds. 5. To understand and apply the concept of disconnection to develop synthetic routs for small target molecule. 6. To recall and apply retrosynthetic pathways in organic synthesis.
MPC 201T	Advanced Spectral Analysis	1. 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 2. 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. 3. To understand, explain and interpret UV, IR, NMR, and Mass spectra of various organic compounds 4. To understand, distinguish and apply theoretical and practical skills of hyphenated techniques like GC–MS, GC-AAS, LC-MS, LC-FTIR, LC-NMR, CE- MS, and LC-MS/MS
MPAT101T	Modern Pharmaceutical Analytical Techniques (T)	1. To integrate and apply theoretical knowledge of various spectroscopic techniques available for analysis of drugs. 2. To understand and apply basic Knowledge of chromatographic and electrophoretic separation techniques. 3. To Summarize the instrumentation of modern analytical techniques 4. To elucidate a structure based on UV, IR, NMR and Mass data. 5. To explain, Compare and appraise X-ray crystallographic and Thermal Teachniques
MPC 104T	Pharmaceutical Chemistry (T)	1. Recall, describe and summarize different types of natural compounds and their chemistry and medicinal importance 2. Apply and illustrate general methods of structural elucidation of compounds of natural origin. 3. Describe, summarize and apply information regarding active constituent of certain crude drugs used in Indigenous system 4. Develop the understanding regarding classification, isolation, purification, molecular modification and biological activity, general methods of structural determination, structural elucidation and stereochemistry of Alkaloids, Flavonoids and Terpenoids. 5. Integrate and summarize the brief knowledge on recombinant

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		DNA technology and drug discovery 6. Develop the understanding regarding Chemistry and Physiological significance of Vitamin
MPC 105P	Pharmaceutical Chemistry Practical – I	1. Students will be able to synthesize compounds of medicinal importance and characterize the synthesized compounds using physicochemical and spectroscopic methods. 2. Students will be able to purify organic solvents using column chromatographic techniques. 3. Students will be able to isolate and characterize the islolated compounds using physicochemical and spectroscopic techniques and carry out degradation reactions on selected plant constituents. 4. To operate, demonstrate, apply and record UV Vis spectrophotometer, column chromatography, HPLC, GC, fluorimetry and flame photometry 5. To perform degradation reactions on selected plant constituents 6. To 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
MPL 102T	Advanced pharmacology I	1. Discuss the pathophysiology and pharmacotherapy of certain diseases 2. Explain the mechanism of drug actions at cellular and molecular level 3. Understand the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases 4. Summarize, classify and apply epidemiology, etiology, pathophysiology sign and symptoms, diagnosis, complications, treatment and management of disease affecting CVS, CNS. 5. Understand and summarize different autocoids and their role in physiological functioning
MPL103 T	Pharmacological and Toxicological screening methods I	1. 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. 2. Describe the various laboratory animals used in experimental pharmacology and be able to outline the limitations of animal experimentations justifying the use of alternative methods for animal studies. 3. Classify the various preclinical screening methods involved in experimental pharmacology 4. Describe the various preclinical screening methods involved in experimental pharmacology 5. Summarize the general principles and methods of immunoassay

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MPL 104T	Cellular and molecular pharmacology	1. Understand the basic concepts of cell biology and genome organization 2. Compare the cellular intracellular signaling pathways. 3. Apply the basic knowledge of various genomic and proteomic tools in research. 4. Apply the basic principles of proteomic science in research work. 5. Develop the in-vitro cell culture media. 6. Understand the basic principles and applications of cell viability assays.
MPL 105 P	Pharmacology Practical I	1. Handle the experimental animals 2. Perform different techniques in experimental animals 3. Perform experiments related to biological standardization of drugs using isolated tissues. 4. Illustrate the effect of drugs on animals by simulated experiments. 5. Demonstrate the estimation of various components in biological samples.
MQA104 T	Product development technology transfer	1. Describe the regulatory principles and requirements of drug discovery and product development 2. Relate and execute the concept of pre-formulation studies for various formulations 3. Explain the detail knowledge about pilot plant scale 4. Categorize and use various pharmaceutical packaging systems 5. Implement the concept of technology transfer from R&D to production plant
MQA103T	Quality Control and Quality Assurance	1. Explain significance of quality in pharmaceutical manufacturing and understand the responsibilities of QA & QC departments. 2. Explain role of national and international regulatory agencies in deciding quality standards 3. Follow cGMP while working in Pharmaceutical industry. 4. Describe various aspects of documentation 5. Perform analysis of raw materials, IPQC and FPQC of drug products and other manufacturing operations and controls 6. Explain different guidelines related to Pharmaceutical industry
MPH102T	Drug Delivery Systems	1. Formulate and evaluate novel drug delivery systems 2. Justify selection criteria of drug and polymers for the development of novel drug delivery system 3. Understand and construct rate-controlled drug delivery systems 4. Construct, justify and evaluate gastroretentive drug delivery 5. Systems 6. Construct, justify and evaluate ocular drug delivery systems and transdermal drug delivery systems 7. Construct, justify and evaluate protein and peptide delivery systems and vaccine delivery systems.

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MQA 102T	Quality Management Systems	1. Explain the basic concepts, terminology and factors affecting the framework of quality, quality control and quality management system. 2. Implement the fundamental concepts of Total Quality Management. 3. Explain the scope of quality certifications applicable to Pharmaceutical industries. 4. Demonstrate the effective utilization of different QMS tools for monitoring and improving product quality and process performance within the regulatory framework. 5. Suggest suitable guidelines for quality management which can be applied to pharmaceutical industry.
MPH 103T	Modern Pharmaceutics	1. Understand and analyze the concept of preformulation studies in oral solid dosage form development. 2. Compile and integrate preformulation data and apply this knowledge in development of disperse systems and parenterals. 3. Analyze and apply optimization and scale up techniques in formulation development and manufacturing. 4. Demonstrate and understand the concept of validation of pharmaceutical processes, equipment's and methods. 5. Outline and analyze the industrial management techniques and GMP considerations. 6. Evaluate and understand stability, compression, diffusion and dissolution processes in drug product development.
MPH 105 P	Pharmaceutics Practicals - I	1. Understand and apply the analytical methods for pharmaceutical compounds 2. Compile and integrate various analytical techniques for estimation of drug alone or in combination. 3. Analyze and evaluate formulation aspects of different drug delivery systems 4. Demonstrate and understand in vitro dissolution studies and effect of various parameters on dissolution of drug. 5. Outline and perform preformulation studies as a significant step in drug product development. 6. Demonstrate and apply the concept of preformulation studies in product life cycle.
MQA 105P	Quality Assurance Practical - I	1. Perform qualitative and quantitative analysis of pharmacopoeial compounds in bulk and in their formulations 2. Perform experiments on various analytical instruments such as UV Vis spectrophotometer, HPLC, GC etc. 3. Demonstrate use of tools for quality management 4. Perform quality control tests for drugs, raw materials, dosage forms and primary and secondary packaging materials. 5. Perform experiments on pre-formulation studies
MPH104T	Regulatory Affairs	1. Discuss the basic regulatory Documentation in pharmaceutical industry 2. Discuss the preparation and submission of CTD, e-CTD

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		3. Explain the chemistry, manufacturing controls and their regulatory importance in ANDA, NDA Submission & Approval process by different regulatory agencies 4. Describe the process of Preparation of Dossiers and their submission to regulatory agencies in different countries 5. What are Clinical trials requirements & different approval procedures for conducting clinical trials
First Year M. Pham Sem II 2019 pattern		
MPH 202T	Advanced Bio-Pharmaceutics & Pharmacokinetics	1. Understand and analyze the concept of biopharmaceutics and pharmacokinetic. 2. Compile and integrate pharmacokinetic data and derive the pharmacokinetic models and parameters that best describe the process of drug absorption, distribution and metabolism. 3. Analyze and apply critical evaluation of biopharmaceutic studies involving drug product equivalency. 4. Demonstrate and understand the design and evaluation of dosage regimens of the drugs using pharmacokinetic and biopharmaceutic parameters. 5. Outline and analyze the potential clinical pharmacokinetic problems and application of basics of pharmacokinetic. 6. Demonstrate and apply the applications of biopharmaceutics and pharmacokinetic in drug delivery development.
MPH 204T	Cosmetics and Cosmeceuticals (T)	1. Explain, illustrate and understand scientific knowledge required to develop cosmetic & cosmeceuticals to evaluate its safety, efficacy and stability 2. Illustrate key ingredients and basic science used to developed all cosmetic & herbal cosmetics products like skin care, dental, hair, facial, eye etc 3. Understand the various aspects of cosmetics like regulatory, biological, formulation, design and production of herbal cosmetics. 4. Explain current technologies used to developed different cosmetics & herbal cosmetics product like skin care, dental, hair, facial, eye etc 5. Understand & study classification and application of cosmetics and cosmeceuticals like perfume, dental, skin care, hair care, oral, facial & eye with its regulatory aspects
MPH 201T	Molecular Pharmaceutics (nano tech and targeted DDs)	1. To develop the drug delivery systems and apply gene therapy for targeting drugs to tumors and inherited diseases 2. To explain the preparation and evaluation of nanoparticles, liposomes, aquasomes, niosomes, phytosomes and electrosomes as carriers for drug targeting 3. To discuss the selection ofdrugs and polymers in the design of microspheres and microcapsules and to integrate the knowledge of antisense molecules and aptamers in the designing of novel drug delivery system. 4. To elaborate the strategies for improving nasal absorption in the

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		design of nasal drug delivery system and optimize pulmonary delivery by designing suitable aerosols, nebulizers and dry powder inhalers
MPH 205 P	Pharmaceutics Practicals - II	1. Understand and evaluate the effect of various factors on development of formulation of drug. 2. Compile and apply different types of in vitro dissolution studies of drug formulation and its comparison with marketed product. 3. Analyze and understand the techniques in ex vivo and in situ evaluation of the formulation for its performance. 4. Demonstrate and understand various software's in optimization of the formulation 5. Outline and learn various in silico methods used in formulation development and optimization. 6. Demonstrate and apply the formulation knowledge and skills in development of herbal formulations.
MPA 203T	Audits and Regulatory Compliance (T)	1. Explain methodology of auditing in different department of pharmaceutical industry like production, vendor, microbiological laboratory, quality assurance 2. 2.Illustrate CGM's practices and regulation of production department, microbiological department, quality assurance & engineering department 3. 3.Understand the process of carry out audit in department like production, quality assurance and different laboratory of pharmaceutical industry. 4. 4.Understand preparation of audit report and check list of auditing which is required by various department of pharmaceutical industry like vendor, production, packaging, laboratory, quality assurance etc. 5. Understand the role and importance of Quality systems and audits in pharmaceutical manufacturing environment, auditing of vendors & production department, auditing of microbiological laboratory and auditing of quality assurance & engineering department.
MQA 201T	Hazard and Safety Management	1. Understand the environment related problem and find remedies to combat them. 2. Develop and ensure safety standards in pharmaceutical industry. 3. Impart basic knowledge and comprehensive study on safety management. 4. Execution of different innovative methods for different types of hazard management system. 5. Design method of hazard assessment, procedure and methodology for safe industrial atmosphere.

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MPC 205P	Pharmaceutical Chemistry Practical - II	1. Students will be able to compare synthesis of API's / intermediates by different synthetic routes and use various approaches for synthesis of organic compounds. 2. Students will be able to synthesize organic compounds using microwave technique 3. Students will be able to design drug molecules using computer aided drug design. 4. To understand, explain and interpret identification of organic compounds using FT–IR, NMR, CNMR and Mass spectra 5. To describe, discuss and compare study of synthesis of APIs/intermediates by different synthetic routes and assignments on regulatory requirements in API. 6. To 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
MPC202T	Advanced Organic Chemistry – II	1. Students will be able to understand the aspects and techniques of Green chemistry and synthesize compounds using these techniques. 2. Students will be able to understand stereochemistry and use the methods of asymmetric synthesis for chiral compounds 3. Students will be able to understand the techniques of peptide synthesis 4. Students will be able to understand and apply the principles of phytotchemical and pericyclic reactions 5. Students will be able to use different methods of catalysis and catalysts in synthesis of organic compounds.
MPL202T	Pharmacological and toxicological screening methods II	1. Explain the various types of toxicity studies. 2. Appreciate the importance of ethical and regulatory requirements for toxicity studies. 3. Demonstrate the practical skills require conducting the preclinical toxicity studies. 4. To study Importance and applications of toxicokinetic studies. 5. To study and apply good laboratory practices and its importance in drug development
MPL 201 T	Advanced Pharmacology II	1. Recall the pathophysiological aspects of different endocrine disorders, be able to classify different drugs used in endocrine disorders and be able to describe their pharmacological aspects. 2. 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. 3. 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. 4. Illustrate the current scenario of tuberculosis, HIV, cancer and respiratory disorders in society, be able to classify the drugs used

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		in management of these diseases and be able justify the use of these drugs for management of these diseases. 5. 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 203T	Principles of Drug Discovery	1.Explain the various stages of drug discovery 2.Understand the importance of the role of genomics, proteomics and bioinformatics in drug discovery 3.Apply the basic knowledge of various targets in drug discovery process. 4.Apply the various lead seeking methods and lead optimization in the drug discovery process. 5.Understand the concept of computer aided drug design in drug discovery. 6.Apply the basic knowledge of QSAR statistical methods in drug discovery process.
MPL204T	Clinical Research And Pharmacovigilance	1. Explain various aspects of adverse drug reactions and understand various terminologies involved in pharmacovigilance. 2. Illustrate detection of new adverse drug reactions and their assessment. 3. Be able to execute methods and tools used in pharmacovigilance. 4. Explain the regulatory requirements for conducting clinical trial and demonstrate the types of clinical trial designs. 5. Explain the responsibilities of key players involved in clinical trials. 6. Execute safety monitoring, reporting and close-out activities.
MPL 205P	Pharmacological Practical II	1. To demonstrate the biological evaluation of drugs by in vitro and in vivo methods 2. To 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 as well as by simulated experiments which give an idea on the recent methods of bioassay. 4. To develop skills in handling animals and perform and evaluate experiments on them. 5. To calculate and compare experimental observations and results statistically. Student can differentiate between actual experimental results or if these results are due to chance.
MQA205P	Pharmaceutical Quality Assurance Practical-II	1. Perform qualitative and quantitative analysis of certain pharmaceutical contaminants and drugs 2. Analyze and validate pharmaceutical facilities, processes, methods and equipment 3. Study qualification of pharmaceutical equipment 4. Create checklist for pharmaceutical facilities 5. Design plant layout for sterile and nonsterile products 6. Perform case study on certain quality management tools.

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MQA204T	Pharmaceutical Manufacturing Technology	1. Understand and discuss common practices in manufacturing of sterile and non-sterile dosage forms in pharmaceutical industry. 2. 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. 3. Elaborate legal requirements for pharmaceutical industry development, plant layout and compile steps of production planning. 4. Construct sterile product manufacturing and non-sterile product manufacturing technology and differentiate them. 5. Compile, classify and compare different containers and closures for pharmaceuticals and to correlate stability aspects of packaging materials. 6. Understand and elaborate principles of Quality by Design (QbD) and Process Analytical Technology (PAT) in pharmaceutical manufacturing.
MQA 202T	Pharmaceutical Validation	1. Explain the concepts, importance, scope types, methodology and application of calibration, qualification and validation activities in pharma industry 2. Prepare protocols for qualification and validation of instruments, facilities and processes as per guidelines. 3. Explain the importance of patent and intellectual property rights 4. Suggest methodology for qualification of laboratory, analytical and manufacturing equipments. 5. Suggest methodology for validation of utilities, analytical methods, cleaning methods, computerized systems and manufacturing processes of various dosage forms.
Second Year M. Pham Sem III 2019 pattern		
MRM 301T	Research Methodology & Biostatistics	1. Demonstrate knowledge about basic concepts about research and the methodology to conduct research 2. Describe the appropriate statistical methods required for a particular research design 3. Explain the rationale, importance and processes for abiding to research ethics in medical research conducted using humans and animals. 4. Develop an appropriate framework for research studies including study design, method of data collection, sampling techniques, data analysis, report writing and publication.

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Course Outcomes (COs) for Pharmacy Practice

A.Y. 2021-22

FIRST YEAR PHARM D.		
	Subject	CO
1.1 T	Human Anatomy and Physiology (Theory)	CO1.Understand Basic terminologies used, prefixes & suffixes used to identify body parts and directional terms as well as relevance and significance to Health Sciences. CO2.Understand various homeostatic mechanisms and their imbalances of various systems. CO3.Understand the coordinated working pattern of different organs of each system. CO4.Understand interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body. CO5.Understand the importance of health education and health promotion.
1.1 P	Human Anatomy and Physiology (Practical)	CO1.Understand the construction, working, care and handling of instruments, glassware's and equipment's required for practical. CO2.Understand the significance of Bleeding time, Clotting time, Blood group detection, Haemoglobin detection and measurement of blood pressure. CO3.Knowledge of mechanism of White Blood Cell Count, Red Blood Cell Count and Erythrocytes Sedimentation rate of blood sample. CO4.Demonstration of various systems with the help of charts and models. CO5.Understand the mechanism of experimental physiology
1.2 T	Pharmaceutics (Theory)	CO1 Integrate the knowledge related to introduction and classification of dosage form, prescription and posology. CO2 Build knowledge about the historical background and development of Pharmacy profession including different pharmacopoeias. CO3 Develop and demonstrate solid dosage form like powders and granules and pharmaceutical calculations related to weights and measures. CO4 Build knowledge of liquid dosage form including both monophasic and biphasic dosage form. CO5 Investigate information related to suppositories and surgical aids. CO6 Develop knowledge related to different galenical products and its extraction processes along with incompatibilities associated with dosage form
1.2 P	Pharmaceutics (Practical)	CO1 Demonstrate the skill of preparation and evaluation of various solid and liquid dosage forms. CO2 Explain principles of formulation and evaluation of dosage forms. CO3 Calculate evaluation parameters like density, specific gravity, angle of repose, carr's index and hausner's ratio of

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		pharmaceutical preparation. CO4 Classify various dosage forms by using different criteria. CO5 Create labels in prescribed manner for various dosage forms. CO6 Build knowledge regarding different types of incompatibilities for safety, efficacy and therapeutic effect of dosage forms.
1.3T	Medicinal Biochemistry (Theory)	CO1.Summarize, justify and conclude catalytic activity of enzymes, importance of isoenzymes in diagnosis of diseases. CO2. Summarize metabolic process of biomolecules in health and illness including metabolic disorders. CO3. Integrate, discuss and summarize nucleic acid metabolism, the genetic organization of mammalian genome, DNA replication, mutation and repair mechanism along with proteins synthesis CO4. Understand biochemical principles of organ function tests of kidney, liver and endocrine gland. CO5.Summarize qualitative analysis and determine biomolecules in body fluids.
1.3P	Medicinal Biochemistry (Practical)	CO1.Evaluate and analyze presence of various biomolecules/ normal and abnormal constituents in body fluids using qualitative and quantitative tests. CO2.Understand and analyze the catalytic activity of enzymes and importance of isoenzymes in diagnosis of diseases. CO3.Apply the biochemical principles of organ function tests of kidney, liver and endocrine gland. CO4.Understand importance of levels of various biomolecules in body fluids.
1.4T	Pharmaceutical Organic Chemistry (Theory)	CO1.Explain the physical properties of organic compounds CO2.Identify the structures of a given organic compound and give the nomenclature CO3.Explain the mechanisms involved in various organic reactions CO4.Discuss the reactivity, orientation and stability of organic reactions CO5.Identify the products obtained through simple organic reactions CO6.Summarize the studies on some important official organic compounds
1.4 P	Pharmaceutical Organic Chemistry(Practical)	CO1.Synthesize simple organic compounds by different organic reactions CO2.Apply stereo models and explain the structural aspects of organic compounds CO3.Detect the extra elements (N.S and X) present in the compounds CO4.Identify various classes of organic compounds by systematic qualitative analysis CO5.Prepare suitable solid derivatives from organic compounds CO6.Conduct planned experiments and prepare laboratory report in a standard format

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1.5 T	Pharmaceutical Inorganic Chemistry (Theory)	CO1.Discuss and explain the principles and procedures of analysis of drugs. CO2.Apply and determine the applications of inorganic pharmaceuticals in analysis of drug. CO3.Discuss the fundamentals of analytical chemistry and examine inorganic pharmaceuticals regarding their monograph. CO4.Justify the importance of inorganic pharmaceuticals in preventing and curing disease. CO5.Knowledge about the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals CO6.To have been introduced to a variety of inorganic drug classes
1.5P	Pharmaceutical Inorganic Chemistry (Practical)	CO1.Perform the limit test for certain impurities like chloride, sulphate, iron, arsenic, lead and heavy metals as per the Indian Pharmacopoeia CO2.Determine percentage purity of given pharmaceutical drugs by titrimetric analysis CO3.Perform qualitative analysis of given inorganic mixtures. CO4.Identify the Inorganic compounds through various chemical tests. CO5.Know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals CO6.Use different methods for preparation of Inorganic substances
	SECOND YEAR PHARM D.	
2.1T	Pathophysiology (Theory)	CO1.Study of investigation and pathogenesis of the various disease conditions. CO2.Describe signs and symptoms of the diseases. CO3.Elucidate the complications of various diseases. CO4.Illustrate connection of immune system and various disorders.
2.2T	Pharmaceutical Microbiology (Theory)	CO1. Integrate the knowledge related to Bacteria morphology, growth, Culture media, staining technique, counting techniques. CO2. Design and demonstrate sterilization methods, validation of sterilization method, sterility testing and also acquire the knowledge about preservation and disinfection. CO3. Develop and demonstrate immunology and serology CO4.Build knowledge for diagnostic and serological testing CO5.Investigate microbial culture sensitivity testing with interpretation of result. CO6.Design microbiological assay protocol for antibiotics and vitamins; standardization of vaccines and sera.
2.2P	Pharmaceutical Microbiology (Practical)	CO1.Design sterility testing and minimum inhibitory concentration protocol. CO2.Create and sterilize different culture media, glassware. CO3.Develop the process for determination of total and viable count and microbial assay of antibiotic and vitamins CO4.Design culture sensitivity testing, biochemical testing, diagnostic serological testing and disinfectant testing. CO5.Develop inoculation technique, isolation technique of pure

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		culture. CO6.Investigate different staining technique for identification of bacteria, hanging drop technique for study of motility of bacteria.
2.3T	Pharmacognosy & Phytopharmaceuticals (Theory)	CO1.Develop and design agricultural & storage requirement of crude drugs & explain detailed pharmacognostic account of medicinal plants CO2.Develop and design the technique for extraction, isolation, purification of phytoconstituents for medicinal, agricultural, food & healthcare industry CO3.Design & explain various methods for determination of authenticity of crude drugs, extracts,phytoconstituents, formulations & detect their adulteration CO4.Develop to design a method for analysis, detection, purification of various extracts, phytoconstituents & herbal raw materials. CO5.Correlate various techniques involved in extraction, isolation, estimation & application of phytoconstituents
2.3P	Pharmacognosy & Phytopharmaceuticals (Practical)	CO1.Illustrate the anatomical architecture of various crude drugs & its significance for the plants & for its analysis CO2.Correlate the various staining reagents required for the authentication of crude drugs during microscopy CO3.Design various analytical parameters required for the authentication of crude drugs, Extracts, Oils etc. CO4.Judge various crude drugs on the basis of their morphological & microscopical Studies. CO5.Evaluate the purity &/Or stability of various unorganized crude drugs & oils.
2.4T	Pharmacology-I (Theory)	CO1.Discuss pharmacokinetics and pharmacodynamics of a drug CO2.Recognize the factors modifying drug action CO3.Identify drug interactions and detect adverse drug reactions CO4.Classify and explain the pharmacology of drugs acting on various systems CO5 Apply the basics of pre-clinical and clinical evaluations in the development of new drugs
2.4P	Pharmacology-I (Practical)	CO1 Utilize and handle the Experimental animals CO2 Explain and handle the computerized simulated software programme such as COLPHARM CO3 Compare the effects of various drugs on animals Students will be able Test and Utilize the instruments used in experimental Pharmacology CO4.Recommend physiological salt solutions for different isolated tissues CO5.Tell different routes of drug administration and the techniques of Euthanasia and analgesia in laboratory animals
2.5T	Community Pharmacy (Theory)	CO1.Identify drug discuss the roles and responsibilities of community pharmacist

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		CO2.Outline the layout and infrastructurerequirements for community pharmacy CO3.Recognize the need of inventory control anddiscuss the various methods CO4.Discuss the factors affecting medication +9adherence CO5.Perform general patient counselling CO6.Apply health screening services in community pharmacy
2.6T	Pharmacotherapeutics-I (Theory)	CO1.Describe the pathophysiology and management of diseases. CO2.Develope Patient case-based Assessment Skills CO3.Describe the quality use of medicines issues surrounding the therapeutic agents in the treatment of these diseases CO4.Develop clinical skills in the therapeutic management of these conditions CO5.Provide patient centric care to diverse patients using the evidence-based medicine
2.6P	Pharmacotherapeutics-I (Practical)	CO1.Integrate the knowledge of therapeutic approach to management of diseases. CO2.Analyse needs to identify the patient specific parameters relevant in initiating drug therapy. CO3.Describe pathophysiology of selected diseases. CO4.Understand individualized therapeutic plans based on diagnosis. CO5.Describe the diagnosis of various diseases and able to report ADR. CO6.Outline the therapeutic approach to management of diseases including reference to the latest available evidence.
		THIRD YEAR PHARM D.
3.1T	Pharmacology-II (Theory)	CO1.Understand the pharmacological actions of different categories of drugs CO2. Study in detailed about mechanism of drug action at organ system/ sub cellular/ macromolecular level CO3.Understand the application of basic pharmacological knowledge in the prevention and treatment of various diseases CO4.Observe the effect of drugs on animal by simulated experiments CO5.Correlate of pharmacology with other bio medical science CO6.Understand the signal transduction mechanism of various mechanism
3.1P	Pharmacology-II (Practical)	CO1.Understand the pharmacological aspects of drugs used to treat ailment of different organ systems of the body. CO2.Appreciate the importance of drug discovery by preclinical and clinical trials. CO3.Apply the knowledge of drugs practically using simulated pharmacological experiments CO4.Demonstrate in-vitro techniques of Bio-Assay and various pharmacological models in different animals to assess drug activity. CO5.Differentiate various physiological salt solution
3.2T	Pharmaceutical Analysis	CO1.Assess quality Assurance and validation methods concept

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	(Theory)	with guidelines and their regulations CO2.Explain Introduction,theory, instrumentation and application in the different types of chromatography and spectroscopic technique. CO3.Categorize the electrometric methods , theoretical aspects, Instrumentation , Interpretation of data and analytical applications CO4.Summarize theoretical aspects of Polarimeter, X-Ray diffraction CO5.Outline Introduction,Instrumentation and application of thermal analysis.
3.2P	Pharmaceutical Analysis (Practical)	CO1.Develop mobile phase for separation and identification of drugs by Chromatography. CO2.Operate various instruments to develop practical skill. CO3.Interpret the data obtained through UV, IR, NMR,spectra and report the result CO4.Summarize theoretical knowledge on various instrumental technique
3.3T	Pharmacotherapeutics-II (Theory)	CO1.Describe the pathophysiology and management of diseases. CO2.Develop Patient case-based Assessment Skills CO3.Describe the quality use of medicines issues surrounding the therapeutic agents in the treatment of these diseases CO4.Develop clinical skills in the therapeutic management of these conditions CO5.Provide patient centric care to diverse patients using the evidence-based medicine
3.3P	Pharmacotherapeutics-II (Practical)	CO1.Integrate the knowledge of therapeutic approach to management of diseases. CO2.Analyse needs to identify the patient specific parameters relevant in initiating drug therapy. CO3.Describe pathophysiology of selected diseases. CO4.Understand individualized therapeutic plans based on diagnosis. CO5.Describe the diagnosis of various diseases and able to report ADR. CO6.Outline the therapeutic approach to management of diseases including reference to the latest available evidence.
3.4T	Pharmaceutical Jurisprudence(T) (Theory)	CO1.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 CO2.Illustrate pharmaceutical legislation in India concepts, principle and significance of pharmaceutical ethics drafted by PCI CO3.Practice legal provisions for import, manufacture, sale of drugs and cosmetics and schedules thereunder and similarly, provisions under Pharmacy Act CO4.Organize and describeprovisions under medicinal and toilet preparation act and narcotic drug and psychotropic substances act

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		CO5.Examine provisions made under drugs price control order, prevention of cruelty to animal act, patent and design act and prescription and non-prescription product CO6.Analyse and describe salient features of drugs and magic remedies act and essential commodities act relevant to drugs price control order
3.5T	Medicinal Chemistry (Theory)	CO1.Understand Modern concepts of rational drug design CO2.Derive and understand the Structural influences on mechanism of pharmacologic action (structure-activity relationship) . CO3.Evaluate the chemistry of drugs with respect to their pharmacological activity. CO4.Summarize the mechanism pathways of different class of medicinal compounds. CO5.Illustrate chemical nomenclature, brand names of important marketed products and their side effects. CO6.Analyse and apply Diagnostic agents
3.5P	Medicinal Chemistry (Practical)	CO1.Perform synthesis of medicinal compounds. CO2.Perform purification of medicinal compounds by recrystallization CO3.Analyse pharmaceutical drugs using appropriate assay method. CO4. Analyse monographs of important drugs. CO5. Determine physical properties of organic compounds with respect to QSAR analysis.
3.6T	Pharmaceutical Formulations (Theory)	CO1.Integrate the knowledge related to different pharmaceutical dosage forms. CO2.Develop and prepare of various pharmaceutical dosage forms CO3.Analyse different pharmaceutical dosage forms according to their evaluation parameters. CO4.Integrate knowledge regarding different terms like bioavailability and bioequivalence. CO5.Study role of various pharmaceutical dosage forms.
3.6P	Pharmaceutical Formulations (Practical)	CO1.Develop different types of dosage from according to route of administration. CO2.Develop and prepare various pharmaceutical dosage forms. CO3.Analyse different dosage forms according to their evaluation parameters. CO4.Design labels according to different types of pharmaceutical dosage forms. CO5.Integrate knowledge regarding principle involved in formulation and role of various pharmaceutical dosage forms
		FOURTH YEAR PHARM D.
4.1T	Pharmacotherapeutics-III (Theory)	CO1.Explain the etiopathogenesis of selected gastrointestinal, hematological, neurological and psychiatric diseases. CO2.Discuss the principles of evidence based therapy and pain management CO3.Identify the patient-specific parameters relevant in

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		initiating and monitoring drug therapy and adverse effects CO4.Discuss the therapeutic approach in the management of selected diseases and controversies in drug therapy CO5.Prepare individualized therapeutic plans based on diagnosis CO6.Recognize the role of pharmacist in essential and rational drug use.
4.1P	Pharmacotherapeutics-III (Practical)	CO1.Identify drug interactions and rationalize the prescription CO2.Discuss the therapeutic approach to management of selected diseases CO3.Prepare individualized therapeutic plans based on diagnosis CO4.Conduct patient counseling CO5.Conduct planned experiments and prepare laboratory report in a standard format
4.2T	Hospital Pharmacy (Theory)	CO1.Understand organisation and function CO2.Use knowledge of drug distribution methods in hospital, apply principles of drug store management and inventory control to medication use. CO3.Provide patient-centered care to diverse patients using the best available evidence, Provide Unbiased Drug Information To The Doctors; Provide and design guidelines for the diseases. CO4.Know the formulation aspects of different dosage forms do different pharmaceutical calculation involved in formulation and appreciate the importance of good formulation for effectiveness. CO5.Know the professional practice skills
4.2P	Hospital Pharmacy (Practical)	CO1.Use knowledge of drug distribution methods in hospital, apply principles of drug store management and inventory control to medication use. CO2.Provide patient-centered care to diverse patients using the best available evidence, Provide Unbiased Drug Information To The Doctors; Provide and design guidelines for the diseases. CO3.Know the formulation aspects of different dosage forms do different pharmaceutical calculation involved in formulation and appreciate the importance of good formulation for effectiveness. CO4.Know the professional practice skills
4.3T	Clinical Pharmacy (Theory)	CO1.Detect, Assess and monitor ADRs CO2.Design,analyze, interpret and formulate the drug or medicine information CO3.Report Medication history interview and Drug utilization review CO4.Solve Drug and Poison information Queries and provide disease related counseling to patient CO5.Relate common medical abbreviations, terminologies and lab results used in clinical practice CO6.Recognize the potential sources of Medication error and act for its prevention
4.3P	Clinical Pharmacy	CO1.Detect, Assess and monitor ADRs

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	(Practical)	CO2.Design,analyze, interpret and formulate the drug or medicine information CO3.Report Medication history interview and Drug utilization review CO4.Solve Drug and Poison information Queries and provide disease related counseling to patient CO5.Relate common medical abbreviations, terminologies and lab results used in clinical practice CO6.Recognize the potential sources of Medication error and act for its prevention
4.4T	Biostatistics & Research Methodology (Theory)	CO1.Understand Research Methodology. CO2.Know the various statistical methods to solve different types of problems. CO3.Operate various statistical software packages CO4.Appreciate the importance of computer in hospital and Community Pharmacy CO5.Evaluate the statistical technique in solving the pharmaceutical problems
4.5T	Biopharmaceutics & Pharmacokinetics (Theory)	CO1.Discuss biopharmaceutics, pharmacokinetics, pharmacodynamics processes with their applications. CO2.Explain the mechanisms and factors affecting Absorption, Distribution, Metabolism &excretion processes. CO3.Discuss the significance of modelling approach for evaluation of various pharmacokinetic parameters of dosage forms with different route of administration. CO4.Differentiate between bioavailability and bioequivalence along with Measurement of various parameters CO5.Identify and select the right pharmacokinetic model for administered drugs.
4.5P	Biopharmaceutics & Pharmacokinetics (Practical)	CO1.Compare the in-vitro drug release profile of different marketed products. CO2.Calculate the protein binding and drug absorption study. CO3.Estimate the bioavailability (absolute and relative) and bioequivalence from the given clinical data. CO4.Calculate the drug content in blood sample using Area Under Curve approach. CO5.Calculate and interpret various pharmacokinetic parameters from the given Clinical data.
4.6T	Clinical Toxicology (T) (Theory)	CO1.Develop general working knowledge of the principles and practice of clinical toxicology CO2.Demonstrate an understanding of the health implications of toxic exposures and commonly involved chemicals for toxicity CO3.Demonstrate and applying an understanding of general toxicology principles and clinical management practice CO4.Demonstrate and applying an understanding of the history, assessment, and therapy considerations associated with the management of a toxic exposure CO5.Demonstrate and apply an understanding of the characteristics of and treatment guidelines for specific toxic

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		substances CO6.Propose several preventive approaches to reduce unintentional poisonings CO7.Enable the pharmacist to function as contributing health care team member when faced with a toxic exposure experience, including emergencies

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Course Outcomes

Academic Year 2020-21

Course Outcomes (COs)B. Pharmacy

A.Y.2020-21

Semester	Subject Name	COs
First Year Sem I		
BP101T	HUMAN ANATOMY AND PHYSIOLOGY I–T	1. To summarize the basic knowledge of importance of Human Anatomy and Physiology in pharmacy field. 2. To outline the Introduction to human body, Cellular level of organization, Tissue level of organization 3. To summarize Integumentary system, Skeletal system, Joints, Body fluids and blood, Lymphatic system and Cardiovascular system 4. To summarize Peripheral nervous system: Special senses
BP102T	PHARMACEUTICAL ANALYSIS I – T	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
BP103T	PHARMACEUTICS I – T	1. Demonstrate skill of preparation and evaluation of various solid,liquid and semisolid dosage forms. 2. Explain principles of formulation and evaluation of powder preparations 3. Calculate evaluation parameters like density, specific gravity, angle of repose, Carr's index and Hausner ratio of pharmaceutical preparations. 4. Classify the various dosage forms by using different criteria 5. Create labels in prescribed manner for various dosage form.
BP104T	PHARMACEUTICAL INORGANIC CHEMISTRY T	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 4. inorganic drugs and pharmaceuticals. 5. Derive acids, bases, buffers, water and different GIT agents and recall the fundamental principles of them 6. Develop the medicinal used of topical agents, gases and vapors', dental products, pharmaceuticals aid and radio pharmaceuticals. 7. Integrate about the major intra and extra cellular electrolytes, essential and trace elements, cationic and anionic components of inorganic drugs.
BP105T	COMMUNICATION SKILLS – T *	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

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		5. To focus on curricular, co curricular and extra curricular activities 6. To develop graduates with ethics, morals and social sense and decision making
BP106RBT	REMEDIALBIOLOGY/	1. To study and understand the fundamental concepts of the structural and functional systems of plants and animals. 2. To understand the principle of classification and salient features of plant and animal kingdom. 3. To understand macro and micromorphology and phytochemistry of medicinal plants. 4. To study and understand the basic concept of human anatomy and physiology 5. To understand the interdisciplinary significance of biological concepts for pharmaceutical studies.
BP107P	HUMAN ANATOMY AND PHYSIOLOGY –P	1. To summarize the basic knowledge of importance of Human Anatomy and Physiology in pharmacy field. 2. To be able to apply knowledge of microscope (types, uses, care and handling of microscopes) to study epithelial, connective tissue, muscular and nervous tissue, human skeleton (axial), human skeleton (appendicular). 3. To develop practical skill in Students convergent with the techniques for identification, counting, estimation of various integral components of the body such as RBC count, WBC count and haematological studies 4. To develop practical skill in Student to determine blood group, clotting time, bleeding time. hemoglobin content, erythrocyte sedimentation rate,heart rate and pulse rate, blood pressure.
BP108P	PHARMACEUTICAL ANALYSIS I – P	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
BP109P	PHARMACEUTICS I – P	1. Illustrate history of pharmacy, development of pharmacy profession and industry in India. 2. Explain and evaluate different preparation like powders, monophasic-biphasic liquid dosage form, semisolid dosage form and suppositories 3. Define & classify physical, chemical and therapeutic incompatibilities with examples. 4. Summarize the factors influencing formulation of various dosage forms like solution, to predict the choice of route of administration based on dosage form and to define preformulation, describe various preformulation parameters and define additives with its examples
BP110P	PHARMACEUTICAL INORGANIC CHEMISTRY –P	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.

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		4. Invent the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals
BP111P	COMMUNICATION SKILLS – P*	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.
BP112RBP	REMEDIAL BIOLOGY – P*	1. To Discuss various experiments in biology. 2. To summarized cell and its inclusions. 3. To discuss various parts of plant and explain modification of it. 4. To discuss bones of human system. 5. To summarize the significance of blood group, blood pressure & tidal volume.
First YearSemester II		
BP201T	HUMAN ANATOMY AND PHYSIOLOGY II – T	1. Students will be able to organize the gross morphology, structure and function of various organs of the human body. 2. Student will be able to differentiate the various homeostatic mechanism and their imbalances 3. Student will be able to identify the various tissue and organs of different systems of the human body 4. Students will be able to design the hematological tests like blood cell counts, hemoglobin estimation, bleeding/ clotting time etc and also record blood pressure, heart rate, pulse and respiratory volume. 5. Student will be able to construct the model based on coordinated working pattern of different organs of each system 6. Student will be comparing the interlinked mechanism in the maintenance of normal functioning (homeostasis) of human body.
BP202T	PHARMACEUTICAL ORGANIC CHEMISTRY I-T	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	1. To summarize biomolecules and to conclude, evaluate and discuss chemical nature and biological role of it with concepts in bioenergetics. 2. To summarize and compose carbohydrate metabolism and biological oxidation 3. To integrate, compose, explain and discuss lipid metabolism 4. To compose, assess, explain and discuss amino acid metabolism 5. To integrate, discuss and summarize nucleic acid metabolism and

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		the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins 6. To summarize, justify and conclude catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes
BP204T	PATHOPHYSIOLOGY – T	1. Define medical terminology with respect to pathophysiology aspects. 2. Discuss the etiology and pathogenesis of various diseases on different organ systems. 3. Relate and analyze the clinical manifestations to pathophysiology of various diseases 4. Describe the diagnosis of various diseases
BP205T	COMPUTER APPLICATIONS IN PHARMACY – T *	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 SCIENCES – T *	1. Create awareness about environmental problems among 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	1. To be able to demonstrate integumentary and special senses, nervous and endocrine using specimen model 2. To be able to analyze neurological examination, function of olfactory nerves, visual and reflex activity and total blood count 3. To be able to distinguish the techniques for recording body temperature, basal mass index 4. Students will be able to interpret knowledge of various human system like digestive, respiratory, cardiovascular, urinary and reproductive system 5. Students will be able to examine various devices like pregnancy diagnostic test and family planning 6. Students will be able to compare the detailed information about the human body.
BP208P	PHARMACEUTICAL ORGANIC	1. Integrate the reaction, Possess knowledge and synthesis of organic compounds

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	CHEMISTRY I– P	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
BP209P	BIOCHEMISTRY – P	1. Assess the fundamentals of Separate, Identify and Characterize Proteins, amino acid Carbohydrates 2. Compare metabolism Pathway of Proteins, Lipids, Carbohydrates and vitamins 3. Measure various method of bio analytical sample identification 4. Test of glucose, fructose, galactose, ribose, lactose, maltose, sucrose, starch, glycogen in the given sample
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 2018 pattern SEMESTER-III		
BP301T	PHARMACEUTICAL ORGANIC CHEMISTRY - II(THEORY)	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 compounds. 4. Recommend particular chemical entity in predict the product problems. 5. Summarize isomerism with types and choose proper conformation & configuration 6. for assigning them by building various projection formulas &by generating their interconversions.
BP305P	PHARMACEUTICAL ORGANIC CHEMISTRY – II (PRACTICAL)	1. Synthesize the organic compounds based on syllabus, decide reaction & build mechanism behind it. 2. Summarize principle and design procedure involved in column chromatographic separation techniques and TLC, support it in purification of organic compounds. 3. Summarize principle behind various qualitative tests and integrate them in the identification of given unknown binary organic compounds having different functional groups. 4. Summarize principles and mechanism in each confirmatory test for identification of various organic compounds 5. Separate and evaluate unknown organic compound by qualitative Analysis.
BP 302 T	PHYSICAL PHARMACEUTIC	1. Describe the various physicochemical properties involved in selecting raw materials, including drug and inactive ingredients of

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	S-I (THEORY)	appropriate quality leading to stable formulations. 2. Use the principles of solubility and partition coefficient in designing of various formulations. 3. Explain physical principles of states of matter and phase rule. 4. Predict the properties of particles, pharmaceutical powders and their significance in formulating and characterizing pharmaceutical dosage form. 5. Discuss classification and applications of complexation, protein binding and drug action. 6. Solve the problems related to states of matter, buffers and isotonic solutions in manufacturing of pharmaceutical dosage forms and maintaining stability.
BP306P	PHYSICAL PHARMACEUTIC S-I (PRACTICAL)	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
BP303T	PHARMACEUTICAL MICROBIOLOGY (THEORY)	1. Students will be able to develop and demonstrate the method of identification, characterization, isolation, cultivation and preservation of various micro-organisms. 2. Students will be able to design and demonstrate the importance of sterilization and its application to pharmaceutical industry; also acquire the knowledge related preservation and disinfection. 3. Students will be able to build the protocol for sterility testing of pharmaceutical products, validation of Sterilization process; calibration and OQ of sterilization equipment. 4. Students will be able to develop the microbiological standardization procedure for pharmaceuticals like antibiotics, vitamins and amino acids; principles and methods for microbiological assays 5. Students will be able to integrate the knowledge about cell culture technology and its application in pharmaceutical industry. 6. Students will be able to construct models based on basic principles of microbiology includes classification of micro-organism, nutritional requirement
BP307P	PHARMACEUTICAL MICROBIOLOGY (PRACTICAL)	1. The learner will be able to design sterility testing and minimum inhibitory concentration protocols. 2. The learner will be able to derive Staphylococcus aureus, E. Coli and Salmonella. 3. The learner will be able to develop the process for determination of total viable count and microbial assay. 4. The learner will be able to construct laboratory equipments like

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		compound light microscope, autoclave, incubator and laminar air flow. 5. The learner will be able to create and sterilize nutrient broth and nutrient agar and also develop aseptic techniques of inoculation with identification of motility of pseudomonas aeruginosa. 6. The learner will be able to modify different staining techniques to demonstrate morphology of bacteria.
BP304T	PHARMACEUTICAL ENGINEERING (THEORY)	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, de humidifier, 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
BP308P	PHARMACEUTICAL ENGINEERING (PRACTICAL)	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, de humidifier, 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
Second year SEMESTER-IV		
BP401T	Pharmaceutical Organic Chemistry III– Theory	1. Understand the methods of preparation and properties of organic compounds and apply them 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 mechanism in formation of particular compound.
BP402T	Medicinal Chemistry I – Theory	1. Define and classify different classes of drugs comes under ANS and CNS etc 2. Describe & summarize the chemistry of drugs with respect to their pharmacological activity 3. Discuss the MOA of Different classes of drugs

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		4. Explain an outline of drug metabolic pathways, adverse effect and therapeutic value of Drugs. 5. Outline the chemical synthesis of some drugs. 6. Derive and summarize the Structural Activity Relationship (SAR) of different classes of drugs.
BP403T	Physical Pharmaceutics II – Theory	1. Integrate and apply knowledge and principles of 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	1. Understand the pharmacological actions of different categories of drugs 2. Explain the mechanism of drug action at organ system/sub cellular/ macromolecular levels 3. Apply the basic pharmacological knowledge in prevention and treatment of various diseases. 4. Understand adverse drug reactions and drug interactions of various classes of drugs. 5. Apply the knowledge of serious side effects and contraindications of various classes of drugs.
BP405T	Pharmacognosy and Phytochemistry I– Theory	1. Summarize the basic knowledge of importance and scope of pharmacognosy and phytochemistry-I in pharmacy field and its role in various systems of medicine 2. Apply knowledge of pharmacognostic study and quality control of crude drugs. 3. Describe biological source, chemical nature, properties, identification test and uses of crude drugs as well as plant products of natural origin (Primary and 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	1. Use of various equipments and take safety measures while working in medicinal chemistry laboratory. 2. Explain, apply and justify the principle and theory behind preparation of drugs/ intermediates. 3. Develop skill to prepare and synthesize drugs/ intermediates. 4. Choose techniques and develop skill to purify synthesized compounds. 5. Determine the partition coefficients of drugs and Ionization constants.
BP407P	Physical Pharmaceutics II – Practical	1. Exercise different pharmaceutical laboratory procedures used in determining various physical properties such as micromeritic properties, viscosity, order of reaction etc.

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		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.
BP408P	Pharmacology I – Practical	1. Create an understanding of protocols for various animal experiments. 2. Understand the use and importance of various simulation as well as intact animal experiments. 3. Apply the knowledge of various CPCSEA guidelines during the course of various animal experiments. 4. Observe the effect of drugs on animals by simulated experiments 5. Appreciate correlation of pharmacology with other bio medical sciences
BP409P	Pharmacognosy and Phytochemistry I – Practical	1. Understand, analyze & 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 & differentiate between authentic and adulterated drugs 5. Develop hands on skills in micrometry
Third year 2015 SEMESTER - V		
BP502T	INDUSTRIAL PHARMACY –I (THEORY)	1. Illustrate goal and objectives of pre-formulation studies and describe physicochemical properties of drug substance 2. Formulate tablets and coated tablets as a solid dosage forms and describe manufacturing and evaluation 3. Formulate suspension, emulsion, syrups and elixirs as a liquid dosage forms, and describe manufacturing and evaluation 4. Formulate hard and soft capsule as a solid dosage forms, differentiate them and describe manufacturing and evaluation 5. Formulate parenteral products as a dosage forms and describe manufacturing and evaluation and container-closure selection 6. Design cosmetics, pharmaceutical aerosols and describe manufacturing, evaluation of them and discuss packaging materials
BP506P	INDUSTRIAL PHARMACY –I (PRACTICAL)	1. Design preformulation study for a drug and further to design oral solid dosage forms, parenteral products, sterile ophthalmic products and cosmetic products 2. Formulate and evaluate tablets and build tablet coating process for tablets/granules 3. Formulate and evaluate capsules 4. Formulate and evaluate injections 5. Evaluate marketed oral solid dosage forms and packaging materials 6. Design and evaluate ophthalmic products and cosmetic products
BP501T	MEDICINAL CHEMISTRY II –	1. To classify antihistaminic agents and autacoids, drugs acting on cardiovascular system, drugs acting on endocrine system, antidiabetic agents and local anesthetics.

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	THEORY	2. To discuss and study drug metabolic pathways, adverse effect and therapeutic value of antihistaminic agents and autacoids, drugs acting on cardiovascular system, drugs acting on endocrine system, antidiabetic agents and local anesthetics. 3. To describe and explain Structural Activity Relationship of antihistaminic agents and autacoids, drugs acting on cardiovascular system, drugs acting on endocrine system, antidiabetic agents and local anesthetics. 4. To know and describe chemical synthesis of selected drugs.
BP503T	PHARMACOLOGY II – THEORY	1. Describe, explain and summarize the specific knowledge related to the different classes of drugs, and important distinctions among members of each class, in relation to the organ systems they affect, and the diseases for which they are used therapeutically. 2. Summarize, classify and apply epidemiology, etiology, pathophysiology sign and symptoms, diagnosis, complications, treatment and management of disease like Hypertension, Coronary Heart disease Congestive heart failure, Cardiac arrhythmias. 3. Describe Pharmacology of drugs acting on urinary system 4. Students can able to describe the agent thatacting on endocrine system. 5. To study Principles and applications of bioassay. 6. Explain and outline correlation of pharmacology with related medical sciences
BP507P	PHARMACOLOGY II – PRACTICAL	1. To demonstrate the biological evaluation of drugs by in vitro and in vivo methodsand to study different physiological salt solutions 2. To analyze knowledge how to deal with experimental animals to test the potency of drugs. 3. Compare, select, locate andisolate 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. 4. To develop skills in handling animals and perform and evaluate experiments on them. 5. To calculate and compare experimental observations and results statistically.The students can differentiate between actual experimental results or if these results are due to chance. 6. Manage her / his time effectively by performing pharmacological activity on experimental animals.
BP504T	PHARMACOGNOSY AND PHYTOCHEMISTRY II– THEORY	1. Describe and explain various metabolic pathways in the formation of secondary metabolites and application of biogenetic studies. 2. Discuss and understand modern extraction techniques, characterization, identification of the herbal drugs. 3. Describe and explain the production of herbal formulation. 4. Understand and explain isolation, identification and production of phytoconstituents 5. Describe and explain chromatography and non-chromatographic separation procedures for herbal drug material.
BP508P	PHARMACOGNOS	1. Develop skill for isolation and identification of phytoconstituents.

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	Y AND PHYTOCHEMISTRY II –	2. Analyze and understand morphology, histology and powder characteristics, extraction & detection of crude drug material. 3. Design and analyze various chromatographic methods for herbal drug materials. 4. Develop and optimize isolation and detection of volatile oils. 5. Analyze and evaluate organized & Unorganized crude drugs by chemical tests
BP505T	PHARMACEUTICAL JURISPRUDENCE – THEORY	1. Describe and explain Basic principles, purpose and dimensions of the laws to understand the significance and relevance of Pharmaceutical laws in India 2. Describe the qualifications for membership and the constitution of the board of all official committees of state & central government 3. Illustrate the various laws governing the manufacturing, sale, research & usage of drug,To understand significance of Schedule M and Schedule Y related Manufacturing & clinical trials, drug & price control, drug & cosmetic act 4. Illustrate potential fraud and abuse legal issues of narcotic & psychotropic substance & all related laws penalty & offences 5. Summarized Patents, procedure for patent application and IPR, US patent & standard regulatory authorities
Third year SEMESTER -VI		
BP601T	MEDICINAL CHEMISTRY III – THEORY	1. Evaluate the chemistry of drugs with respect to their pharmacological activity. 2. Derive and understand the structural activity relationship of different class of drugs. 3. Summarize the mechanism pathways of different class of medicinal compounds. 4. Remember the metabolism, adverse effects and therapeutic value of drugs. 5. Understand the importance of drug design and different techniques of drug designing.
BP602T	PHARMACOLOGY III – THEORY	1. Describe, explain and summarize the specific knowledge related to the different classes of drugs, and important distinctions among members of each class, in relation to the organ systems they affect, and the diseases for which they are used therapeutically. 2. Describe, explain and summarize the concepts of, detail study & management of various diseases on respiratory system like-asthma, COPD, peptic ulcer Laxative, antidiarrhoeal drugs, Emetics 3. To understand the mechanism of drug action and its relevance in the treatment of different infectious diseases 4. Describe, understand and comprehend the principles of toxicology and treatment of various poisonings 5. Describe, explain and summarize the specific knowledge related toimmuno-pharmacology and emphasis on the principles of toxicology and Chronopharmacology. 6. Students would able to explain and outline the correlation of pharmacology with related medical sciences
BP603T	HERBAL DRUG	1. Describe and explain herbs as raw materials source from

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	TECHNOLOGY – THEORY	cultivation to herbal drug product. 2. Discuss and apply various guidelines issued by WHO in relation with cultivation, collection, storage etc. in order to ethically develop pharmaceutical dosage forms. 3. Describe and explain concept of health and pathogenesis, philosophical basis, diagnosis & treatment aspects of Ayurveda, Unani, siddha & Homeopathic system of medicine; understand & explain method of preparation of ayurvedic dosage forms; importance of novel drug delivery of natural products; herbs used in cosmetic preparation & method of their formulations. 4. Explain the approaches and potentials of herbal new drug delivery system like liposomes, phytosomes, nanoparticles & vesicles. 5. Describe and explain Good Manufacturing Practices (GMP), patenting and regulatory issues of herbal drugs
BP604T	BIOPHARMACEUTICS AND PHARMACOKINETICS – THEORY	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	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 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
BP606T	QUALITY ASSURANCE – THEORY	1. Students will be able to understand the concept of Quality assurance and Quality Management, Regulatory agencies, QbD, ISO. 2. Students will able to understand and implement GMP guidelines. 3. Students will be able to analyse and apply the concept of Quality Control of Packaging material, Good Laboratory Practices and Role of CPCSEA. 4. Students will be able to evaluate the complaints and create the maintenance document in pharmaceutical industry and warehousing. 5. Students will be able to design calibration and validation protocol.
BP607P	MEDICINAL CHEMISTRY III – PRACTICAL	1. Perform synthesis and purification by recrystalization of medicinal compounds and their reaction intermediates. 2. Analyse drugs using modern analytical techniques. 3. Apply Modern techniques of drug synthesis like microwave assisted synthesis 4. Design drugs using softwares Lipinskies.

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		5. Draw drug structures and reactions using softwares like CHEMDRAW
BP608P	PHARMACOLOGY III – PRACTICAL	1. Understand the principle behindevaluation of potency/ effect of test drugs in various simulated experiments. 2. Analyze various biochemical parameters with the helpof instrumenta methods. 3.Design the in-vitro bioassay set up for the screening of various catego drugs. 4.Evaluate the toxicity profile of various drugs using various toxicity guidelines 5.Create a basic understanding of biostatistics methods in experimental pharmacology. 6.Calculate various pharmacokinetic parameters from the given data set.
BP609P	HERBAL DRUG TECHNOLOGY – PRACTICAL	1. Classify and analyze various herbal raw materials required for formulation of herbal products. 2. Develop skills of formulation, labelling and evaluation of various Ayurvedic or herbal formulations such as Asava, Arista, Churna, vati, gutika etc. 3. Design various parameters required for evaluation of formulation & their role in optimization & product development. 4. Design, evaluate, optimize & develop cosmetic formulations like creams, lotions and shampoos. 5. Design, evaluate, optimize & develop standardized extract in formulations like syrups, mixtures and tablets.
Final year 2015 SEMESTER-VII		
4.7.1 T	STERILE PRODUCTS (THEORY)	1. Illustrate the basic knowledge of sterile products with respect to: Preformulation. Formulation parameters with respect to parenteral route of administration. Packaging material as well as packaging technologies. Basic types, formulation and evaluation. 2. Illustrate design of aseptic area, HVAC system. 3. Demonstrate the basic knowledge of lyophilization and its application in sterile product formulation and stabilization. 4. Compare SVPS and LVPs. 5. Compare and classify various types of packaging material. 6. Demonstrate the basic knowledge of blood products, surgical products and parenteral devices.
4.7.1 P	STERILE PRODUCTS (PRACTICAL)	1. Demonstrate the basic knowledge of validation of aseptic area as well as gowning and de-gowning procedure for entry and exit from aseptic area. 2. Analyze packaging components of sterile products. 3. Formulate and evaluate SVPs and LVPs as per IP. 4. Formulate and evaluate ophthalmic products as per official compendia. 5. Assess accelerated stability studies and prediction of shelf life. 6. Demonstrate labeling requirements of parenterals, parenterals devices, blood products and surgical.
4.7.2 T	PHARMACEUTICAL ANALYSIS-V	1. To summarize, explain and discuss principle and theory of analytical techniques like Gas chromatography, IR spectroscopy,

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	(THEORY)	FTIR, Near IR spectroscopy, Raman spectroscopy, HPLC, UPLC, SEM and TEM. 2. To explain, discuss, integrate and demonstrate instrumentation in Gas chromatography, IR spectroscopy, FTIR, Near IR spectroscopy, Raman spectroscopy, HPLC, UPLC, SEM and TEM. 3. To assess, conclude and summarize use and applications of Gas chromatography, IR spectroscopy, FTIR, Near IR spectroscopy, Raman spectroscopy, HPLC, UPLC, SEM and TEM for separation and identification analysis. 4. To outline, critique, defend and rank Gas chromatography, IR spectroscopy, FTIR, Near IR spectroscopy, Raman spectroscopy, HPLC, UPLC, SEM and TEM. 5. To conclude, analyze, discuss and compare IR with FTIR, Near IR spectroscopy, Raman spectroscopy, HPLC with UPLC and SEM with TEM. 6. To integrate, compile, select and interpret IR ranges of simple organic compounds for structure elucidation
4.7.2 P	PHARMACEUTICAL ANALYSIS-V (PRACTICAL)	1. To design and develop UV spectrophotometric estimation of two-component formulations by simultaneous equation method 2. To design and develop UV spectrophotometric analysis of two component formulations by Q-Method 3. To measure and generate IR spectra of compounds with different functional groups (-COOH, -COOR, - CONHR, -NH2,-NHR, -OH, -CHO, -CO etc.) 4. To integrate, interpret and justify IR-Spectra of aliphatic and aromatic compounds 5. To demonstrate and summarize working of Gas Chromatography /Atomic Absorption Spectrophotometry/ SEM
4.7.3 T	MEDICINAL CHEMISTRY-III (THEORY)	1. Students will be able to make correct use of various equipments and take safety measures while working in Medicinal Chemistry Laboratory. 2. Students will be able to explain, apply, and justify the principle and theory behind synthesis of compound of our interest. 3. Students will be able to develop skill to synthesize compounds. 4. Students will be able to choose and develop skill to purify synthesized compounds. 5. Students will be able to predict andderive structure of synthesized compoundwith the help of spectroscopic analysis and physicochemical properties.
4.7.3 P	MEDICINAL CHEMISTRY-III (PRACTICAL)	1. Students will be able to recall, apply and illustrate SAR of drugs 2. Students will be able to tell, describe, apply, categorize and justify of Physiochemical properties of drug molecules in relation to drug ADME. 3. Students will be able to identify, discuss, examine and conclude recent developments in the drug development and discovery. 4. Students will be able to explain, determine, justify and formulate some routes for the chemical synthesis of some drugs. 5. Students will be able to describe, explain the importance of drug design and illustrate different techniques of drug design, for

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		development of new drugs. 6. Students will be able to explain and apply knowledge to guide society and professionals regarding application to making drug therapy decisions.
4.7.4 T	PHARMACOLOGY-IV (THEORY)	1. Describe and apply the fundamental principles of pharmacology and toxicology. 2. Analyze the usage of different chemotherapeutic agent with respect to disease and their side effects. 3. Discuss pharmacology of drugs on different systems of the body. 4. Describe pharmacology of various steroidal hormones and oral contraceptives
4.7.4 P	PHARMACOLOGY-IV (PRACTICAL)	1. Demonstrate the multiple point bioassays to find out unknown concentration of drugs 2. Discuss various marketed fixed dose drug combinations with respect to complete specification 3. Discuss various case study reports 4. Justify standard treatment protocols
4.7.5 T	NATURAL DRUG TECNOLOGY (THEORY)	1. Describe and explain various difficulties in the standardization of herbal material and steps in the development of plant monograph 2. Discuss and apply various guidelines issued by WHO in relation with cultivation, collection, storage etc. in order to ethically develop pharmaceutical dosage forms. 3. Describe & explain concept of health & pathogenesis, philosophical basis, diagnosis & treatment aspects of Ayurveda, Unani, Siddha & Homoepatic system of medicine; Understand & explain method of preparation of Ayurvedic dosage forms; importance of novel drug delivery of natural products; herbs used in cosmetic preparation & methods of their formulations. 4. Apply and explain the applications of plant tissue culture for Secondary metabolite production. 5. Explain the approaches and potentials of herbal new drug delivery systems like liposomes, phytosomes, nanoparticles and vesicles
4.7.5 P	NATURAL DRUG TECNOLOGY (PRACTICAL)	1. Classify and analyze various herbal raw materials required for formulation of herbal products 2. Develop skills of formulation, labeling & evaluation of various Ayurvedic or herbal formulations such as Churna, vati, gutika, vaporub etc 3. Design various parameters required for evaluation of formulation & their role in optimization & product development 4. Design, evaluate, optimize & develop natural skin & hair cosmetic products such as Lipsticks, face powders, shampoos etc 5. Analyze & evaluate the marketed herbal pharmaceutical as well as cosmetic products
4.7.6 T	BIO-PHARMACEUTICS & PHARMACOKINETICS (THEORY)	1. Apply the concept of biopharmaceuticals and pharmacokinetic knowledge in formulation development 2. Analyze and integrate pharmacokinetic processes and their relevance in efficacy of dosage form 3. Compile and apply various compartmental models and noncompartmental analysis methods. 4. Outline and demonstrate the non linear pharmacokinetics and

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		methods to determine their rate parameters. 5. Analyze and evaluate the concept of BCS and mechanisms of dissolution and in vitro in vivo correlation 6. Demonstrate and integrate the concept of bioavailability and bioequivalence studies
4.7.7 T	PHARMACEUTICAL JURISPRUDENCE (THEORY)	1. Describe and explain Basic principles, purpose and dimensions of the laws to understand the significance andrelevance of Pharmaceutical laws in India 2. Describe the qualifications for membership and the constitution of theBoard 3. Illustrate the various laws governing the manufacturing, sale, research & usage of drug. 4. To understand significanceof Schedule M and Schedule Y related Manufacturing & clinical trials 5. Illustrate potential fraud and abuse legal issues of narcotic & psychotropic substance. 6. Illustrate the act ofprevention of cruelty to the animalsSummarized Patents, procedure for patent application and IPR. 7. describe standard institution & regulatoryauthorities
Final year SEMESTER-VIII		
4.8.1 T	ADVANCED DRUG DELIVERY SYSTEM (THEORY)	1. Illustrate the basic knowledge of modified release dosage forms with respect to:Classification and definition of various modified release dosage forms. Properties of candidate drug for modified release dosage forms. Dose calculation for sustained release dosage forms.Formulation approaches and classification. 2. Illustrate the basic knowledge of types of polymers for modified release dosage forms, their evaluation and applications. 3. Illustrate the basic knowledge of various novel drug delivery systems. 4. Retrieve information from various sources and select, develop and evaluate most feasible drug delivery system with respect to certain constraints. 5. Demonstrate the basic knowledge of optimization techniques. 6. Asses and communicate the proposed idea or work effectively.
4.8.1 P	ADVANCED DRUG DELIVERY SYSTEM (PRACTICAL)	1. Demonstrate the basic knowledge of spectroscopic evaluations, swelling index and viscosity analysis of polymers. 2. Analyze as well as present rational and feasibility of novel drug delivery systems. 3. Demonstrate formulation and evaluation of various modified release and novel drug delivery systems. 4. Analyze drug release pattern of advanced drug delivery dosage forms. 5. Apply knowledge of optimization. 6. Formulate industrially feasible, cost effective strategy for development of new dosage forms.
4.8.2 T	COSMATIC SCIENCE (THEORY)	1. Discuss the concepts and summarize general additives used in cosmetics 2. Explain theoretical aspects in formulation and evaluation of creams & powders for skin cosmetics

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		3. Develop and evaluate shaving and bath preparations 4. Design and develop cosmetics formulation for hair, eyes, nail, dental and baby care products 5. Illustrate the concept of cosmetics, cosmeceuticals & cosmeceutical agents
4.8.2 P	COSMATIC SCIENCE (PRACTICAL)	1. Use various equipments in Pharmaceutics laboratory relevant to cosmetics and show their handling as per SOP 2. Formulate and evaluate various cosmetics preparations 3. Demonstrate skill of good manufacturing practices in laboratory 4. Predict correct use of various ingredients used in cosmetics formulation 5. Design labels as per regulatory requirements
4.8.3 T	PHARMACEUTICAL ANALYSIS-VI (THEORY)	1. To explain, discuss and integrate theory and principle of various analytical techniques like ^{1}HNMR, ^{13}CNMR, ESR, Ion exchange chromatography, Flash chromatography, Super critical fluid chromatography, Mass spectrometry. 2. To explain, discuss, compose, demonstrate and evaluate instrumentation in NMR, ESR, Ion exchange chromatography, Flash chromatography, Super critical fluid chromatography, Mass spectrometry. 3. To apply, compare, rank and justify the analytical tools ^{1}HNMR, ^{13}CNMR, ESR, Ion exchange chromatography, Flash chromatography, Super critical fluid chromatography and Mass spectrometry for separation and identification analysis. 4. To summarize, integrate, analyze, critique, compare and discuss ^{1}HNMR with ^{13}CNMR, Ion exchange chromatography, Flash chromatography, Super critical fluid chromatography with GC and HPLC 5. To discuss, explain, integrate and apply automated methods of analysis 6. To compose and explain advantages and applications of hyphenated techniques like LC-MS, GC-MS and MS-MS.
4.8.3 P	PHARMACEUTICAL ANALYSIS-VI (PRACTICAL)	1. To discuss, explain and compare the UV, IR, NMR and Mass spectrometry ranges in problem solving and structural elucidation of organic compounds. 2. To utilize, apply and interpret UV, IR, NMR, MS spectra of simple organic compounds for structure elucidation 3. To explain, discuss, compose and justify validation of analytical methods (UV & HPLC) as per ICH & USP guidelines. 4. To explain, discuss compose and justify system suitability parameters as per IP/BP/USP protocol for HPLC methods and quantitation techniques in HPLC (% Area/Area Normalization, Internal Standard addition)
4.8.4 T	MEDICINAL CHEMISTRY-IV (THEORY)	1. Students will be able to recall, apply and illustrate SAR and physiochemical properties of drug molecules in relation to drug target interactions. 2. Students will be able to describe, predict, outline and design chemical basis of pharmacology and therapeutics. 3. Students will be able to predict and design fundamental of

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		pharmacophores for drug used to treat disease. 4. Students will be able to recall, summarize, apply and design chemical pathway of drug metabolism. 5. Students will be able to explain, determine, justify and formulate some routes for the chemical synthesis of some drugs. 6. Students will be able to describe, summarize,apply and illustrate the importance of resistance to drug and its significance use and abuse of drug.
4.8.4 P	MEDICINAL CHEMISTRY-IV (PRACTICAL)	1. Students will be able to use of various equipments and take safety measures while working in medicinal chemistry laboratory. 2. Students will be able to explain, apply, and justify the principle and theory behind synthesis of compound of our interest. 3. Students will be able to develop skillto synthesize compounds. 4. Students will be able to develop skilltopurify the solvents using fractional and vacuum distillation. 5. Students will be able to choose techniques and develop skill to purify synthesized compounds. 6. Students will be able to predict andderive structure of synthesized compoundwith the help of spectroscopic analysis and physicochemical properties.
4.8.5 T	PHARMACOLOGY-V (INCLUDING BIOSTATICS) (THEORY)	1. Justify various drug-drug and drug-food interactions 2. Describe various terminologies related to pharmacovigilance 3. Summarize various objectives of safety pharmacology 4. Discuss various departments and units in hospital pharmacy 5. Describe good clinical practices and ethical issues in clinical trial.
4.8.5 P	PHARMACOLOGY-V (INCLUDING BIOSTATICS) (PRACTICAL)	1. Develop skill to isolate different tissues from experimental animals. 2. Design the experimental set up for experiments related to biological standardization of drugs using isolated tissues. 3. Demonstrate the agonistic and antagonistic effect of a drug through experiments on isolated tissues. 4. Illustrate the effect of drugs on animals by simulated experiments. 5. Discuss the basic aspects of neurobehavioural characterization.
4.8.6 T	NATURAL PRODUCTS: COMMERCE, INDUSTRYY& REGULATIONS	1. Classify different segments in market, demand & supply position; export & import potential of herbal drugs & formulations; position of Indian herbal drug industry in global contest. Also, comprehend the market potential of natural products & explore entrepreneurship skills 2. Assessgovernment organizations & policies for promotion of herbal drugs; their regulation in India & other countries and their ethical issues. 3. Classify and explain plant allergens, their method of preparation & applications 4. Classify, analyze & explain safe use of natural products, possible toxicities & interactions with synthetic drugs or food. 5. Explain theneed & significance and challenges of Pharmacovigilance systems for herbal drugs, different players involved in the PV system as per WHO guidelines.
4.8.7 T	QUALITY	1. Integrate the concepts and significance of quality, QC and QA in

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Course Outcome (COs) for M. Pharmacy A.Y. 2020-21

Semester	Subject Name	COs
First Year M. Pham Sem I 2019 pattern		
MPC 102T	Advanced Organic Chemistry –I (T)	1. To recall, apply and interpret basic aspects of organic intermediates and different types of reactions. 2. To understand and appraise mechanism and applications of various named reactions. 3. To recognize and apply different synthetic reagent and protecting groups used in organic synthesis. 4. To explain and understand name reactions including heterocyclic compounds. 5. To understand and apply the concept of disconnection to develop synthetic routs for small target molecule. 6. To recall and apply retrosynthetic pathways in organic synthesis.
MPC 201T	Advanced Spectral Analysis	1. 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 2. 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. 3. To understand, explain and interpret UV, IR, NMR, and Mass spectra of various organic compounds 4. To understand, distinguish and apply theoretical and practical skills of hyphenated techniques like GC–MS, GC-AAS, LC-MS, LC-FTIR, LC-NMR, CE- MS, and LC-MS/MS
MPAT101T	Modern Pharmaceutical Analytical Techniques (T)	1. To integrate and apply theoretical knowledge of various spectroscopic techniques available for analysis of drugs. 2. To understand and apply basic Knowledge of chromatographic and electrophoretic separation techniques. 3. To Summarize the instrumentation of modern analytical techniques 4. To elucidate a structure based on UV, IR, NMR and Mass data. 5. To explain, Compare and appraise X-ray crystallographic and Thermal Teachniques
MPC 104T	Pharmaceutical Chemistry (T)	1. Recall, describe and summarize different types of natural compounds and their chemistry and medicinal importance 2. Apply and illustrate general methods of structural elucidation of compounds of natural origin. 3. Describe, summarize and apply information regarding active constituent of certain crude drugs used in Indigenous system 4. Develop the understanding regarding classification, isolation, purification, molecular modification and biological activity, general methods of structural determination, structural elucidation and stereochemistry of Alkaloids, Flavonoids and Terpenoids. 5. Integrate and summarize the brief knowledge on recombinant

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		DNA technology and drug discovery 6. Develop the understanding regarding Chemistry and Physiological significance of Vitamin
MPC 105P	Pharmaceutical Chemistry Practical – I	1. Students will be able to synthesize compounds of medicinal importance and characterize the synthesized compounds using physicochemical and spectroscopic methods. 2. Students will be able to purify organic solvents using column chromatographic techniques. 3. Students will be able to isolate and characterize the isolated compounds using physicochemical and spectroscopic techniques and carry out degradation reactions on selected plant constituents. 4. To operate, demonstrate, apply and record UV Vis spectrophotometer, column chromatography, HPLC, GC, fluorimetry and flame photometry 5. To perform degradation reactions on selected plant constituents 6. To 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
MPL 102T	Advanced pharmacology I	1. Discuss the pathophysiology and pharmacotherapy of certain diseases 2. Explain the mechanism of drug actions at cellular and molecular level 3. Understand the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases 4. Summarize, classify and apply epidemiology, etiology, pathophysiology sign and symptoms, diagnosis, complications, treatment and management of disease affecting CVS, CNS. 5. Understand and summarize different autocoids and their role in physiological functioning
MPL103 T	Pharmacological and Toxicological screening methods I	1. 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. 2. Describe the various laboratory animals used in experimental pharmacology and be able to outline the limitations of animal experimentations justifying the use of alternative methods for animal studies. 3. Classify the various preclinical screening methods involved in experimental pharmacology 4. Describe the various preclinical screening methods involved in experimental pharmacology 5. Summarize the general principles and methods of immunoassay

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MPL 104T	Cellular and molecular pharmacology	1. Understand the basic concepts of cell biology and genome organization 2. Compare the cellular intracellular signaling pathways. 3. Apply the basic knowledge of various genomic and proteomic tools in research. 4. Apply the basic principles of proteomic science in research work. 5. Develop the in-vitro cell culture media. 6. Understand the basic principles and applications of cell viability assays.
MPL 105 P	Pharmacology Practical I	1. Handle the experimental animals 2. Perform different techniques in experimental animals 3. Perform experiments related to biological standardization of drugs using isolated tissues. 4. Illustrate the effect of drugs on animals by simulated experiments. 5. Demonstrate the estimation of various components in biological samples.
MQA104 T	Product development technology transfer	1. Describe the regulatory principles and requirements of drug discovery and product development 2. Relate and execute the concept of pre-formulation studies for various formulations 3. Explain the detail knowledge about pilot plant scale 4. Categorize and use various pharmaceutical packaging systems 5. Implement the concept of technology transfer from R&D to production plant
MQA103T	Quality Control and Quality Assurance	1. Explain significance of quality in pharmaceutical manufacturing and understand the responsibilities of QA & QC departments. 2. Explain role of national and international regulatory agencies in deciding quality standards 3. Follow cGMP while working in Pharmaceutical industry. 4. Describe various aspects of documentation 5. Perform analysis of raw materials, IPQC and FPQC of drug products and other manufacturing operations and controls 6. Explain different guidelines related to Pharmaceutical industry
MPH102T	Drug Delivery Systems	1. Formulate and evaluate novel drug delivery systems 2. Justify selection criteria of drug and polymers for the development of novel drug delivery system 3. Understand and construct rate-controlled drug delivery systems 4. Construct, justify and evaluate gastroretentive drug delivery 5. Systems 6. Construct, justify and evaluate ocular drug delivery systems and transdermal drug delivery systems 7. Construct, justify and evaluate protein and peptide delivery systems and vaccine delivery systems.
MQA 102T	Quality Management Systems	1. Explain the basic concepts, terminology and factors affecting the framework of quality, quality control and quality management system. 2. Implement the fundamental concepts of Total Quality Management.

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		3. Explain the scope of quality certifications applicable to Pharmaceutical industries. 4. Demonstrate the effective utilization of different QMS tools for monitoring and improving product quality and process performance within the regulatory framework. 5. Suggest suitable guidelines for quality management which can be applied to pharmaceutical industry.
MPH 103T	Modern Pharmaceutics	1. Understand and analyze the concept of preformulation studies in oral solid dosage form development. 2. Compile and integrate preformulation data and apply this knowledge in development of disperse systems and parenterals. 3. Analyze and apply optimization and scale up techniques in formulation development and manufacturing. 4. Demonstrate and understand the concept of validation of pharmaceutical processes, equipment's and methods. 5. Outline and analyze the industrial management techniques and GMP considerations. 6. Evaluate and understand stability, compression, diffusion and dissolution processes in drug product development.
MPH 105 P	Pharmaceutics Practicals - I	1. Understand and apply the analytical methods for pharmaceutical compounds 2. Compile and integrate various analytical techniques for estimation of drug alone or in combination. 3. Analyze and evaluate formulation aspects of different drug delivery systems 4. Demonstrate and understand in vitro dissolution studies and effect of various parameters on dissolution of drug. 5. Outline and perform preformulation studies as a significant step in drug product development. 6. Demonstrate and apply the concept of preformulation studies in product life cycle.
MQA 105P	Quality Assurance Practical - I	1. Perform qualitative and quantitative analysis of pharmacopoeial compounds in bulk and in their formulations 2. Perform experiments on various analytical instruments such as UV Vis spectrophotometer, HPLC, GC etc. 3. Demonstrate use of tools for quality management 4. Perform quality control tests for drugs, raw materials, dosage forms and primary and secondary packaging materials. 5. Perform experiments on pre-formulation studies
MPH104T	Regulatory Affairs	1. Discuss the basic regulatory Documentation in pharmaceutical industry 2. Discuss the preparation and submission of CTD, e-CTD 3. Explain the chemistry, manufacturing controls and their regulatory importance in ANDA, NDA Submission & Approval process by different regulatory agencies 4. Describe the process of Preparation of Dossiers and their submission to regulatory agencies in different countries 5. What are Clinical trials requirements & different approval

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		procedures for conducting clinical trials
First Year M. Pham Sem II 2019 pattern		
MPH 202T	Advanced Bio-Pharmaceutics & Pharmacokinetics	1. Understand and analyze the concept of biopharmaceutics and pharmacokinetic. 2. Compile and integrate pharmacokinetic data and derive the pharmacokinetic models and parameters that best describe the process of drug absorption, distribution and metabolism. 3. Analyze and apply critical evaluation of biopharmaceutic studies involving drug product equivalency. 4. Demonstrate and understand the design and evaluation of dosage regimens of the drugs using pharmacokinetic and biopharmaceutic parameters. 5. Outline and analyze the potential clinical pharmacokinetic problems and application of basics of pharmacokinetic. 6. Demonstrate and apply the applications of biopharmaceutics and pharmacokinetic in drug delivery development.
MPH 204T	Cosmetics and Cosmeceuticals (T)	1. Explain, illustrate and understand scientific knowledge required to develop cosmetic & cosmeceuticals to evaluate its safety, efficacy and stability 2. Illustrate key ingredients and basic science used to developed all cosmetic & herbal cosmetics products like skin care, dental, hair, facial, eye etc 3. Understand the various aspects of cosmetics like regulatory, biological, formulation, design and production of herbal cosmetics. 4. Explain current technologies used to developed different cosmetics & herbal cosmetics product like skin care, dental, hair, facial, eye etc 5. Understand & study classification and application of cosmetics and cosmeceuticals like perfume, dental, skin care, hair care, oral, facial & eye with its regulatory aspects
MPH 201T	Molecular Pharmaceutics (nano tech and targeted DDs)	1. To develop the drug delivery systems and apply gene therapy for targeting drugs to tumors and inherited diseases 2. To explain the preparation and evaluation of nanoparticles, liposomes, aquasomes, niosomes, phytosomes and electrosomes as carriers for drug targeting 3. To discuss the selection ofdrugs and polymers in the design of microspheres and microcapsules and to integrate the knowledge of antisense molecules and aptamers in the designing of novel drug delivery system. 4. To elaborate the strategies for improving nasal absorption in the design of nasal drug delivery system and optimize pulmonary delivery by designing suitable aerosols, nebulizers and dry powder inhalers
MPH 205 P	Pharmaceutics Practicals - II	1. Understand and evaluate the effect of various factors on development of formulation of drug.

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		2. Compile and apply different types of in vitro dissolution studies of drug formulation and its comparison with marketed product. 3. Analyze and understand the techniques in ex vivo and in situ evaluation of the formulation for its performance. 4. Demonstrate and understand various software's in optimization of the formulation 5. Outline and learn various in silico methods used in formulation development and optimization. 6. Demonstrate and apply the formulation knowledge and skills in development of herbal formulations.
MPA 203T	Audits and Regulatory Compliance (T)	1. Explain methodology of auditing in different department of pharmaceutical industry like production, vendor, microbiological laboratory, quality assurance 2. Illustrate CGM's practices and regulation of production department, microbiological department, quality assurance & engineering department 3. Understand the process of carry out audit in department like production, quality assurance and different laboratory of pharmaceutical industry. 4. Understand preparation of audit report and check list of auditing which is required by various department of pharmaceutical industry like vendor, production, packaging, laboratory, quality assurance etc. 5. Understand the role and importance of Quality systems and audits in pharmaceutical manufacturing environment, auditing of vendors & production department, auditing of microbiological laboratory and auditing of quality assurance & engineering department.
MQA 201T	Hazard and Safety Management	1. Understand the environment related problem and find remedies to combat them. 2. Develop and ensure safety standards in pharmaceutical industry. 3. Impart basic knowledge and comprehensive study on safety management. 4. Execution of different innovative methods for different types of hazard management system. 5. Design method of hazard assessment, procedure and methodology for safe industrial atmosphere.
MPC 205P	Pharmaceutical Chemistry Practical - II	1. Students will be able to compare synthesis of API's / intermediates by different synthetic routes and use various approaches for synthesis of organic compounds. 2. Students will be able to synthesize organic compounds using microwave technique 3. Students will be able to design drug molecules using computer aided drug design. 4. To understand, explain and interpret identification of organic compounds using FT–IR, NMR, CNMR and Mass spectra 5. To describe, discuss and compare study of synthesis of APIs/intermediates by different synthetic routes and assignments

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		on regulatory requirements in API. 6. To 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 studybased experiment, virtual screeningbased experiment
MPC202T	Advanced Organic Chemistry – II	1. Students will be able to understand the aspects and techniques of Green chemistry and synthesize compounds using these techniques. 2. Students will be able to understand stereochemistry and use the methods of asymmetric synthesis for chiral compounds 3. Students will be able to understand the techniques of peptide synthesis 4. Students will be able to understand and apply the principles of phytotchemical and pericyclic reactions 5. Students will be able to use different methods of catalysis and catalysts in synthesis of organic compounds.
MPL202T	Pharmacological and toxicological screening methods II	1. Explain the various types of toxicity studies. 2. Appreciate the importance of ethical and regulatory requirements for toxicity studies. 3. Demonstrate the practical skills require conducting the preclinical toxicity studies. 4. To study Importance and applications of toxicokinetic studies. 5. To study and apply good laboratory practices and its importance in drug development
MPL 201 T	Advanced Pharmacology II	1. Recall the pathophysiological aspects of different endocrine disorders, be able to classify different drugs used in endocrine disorders and be able to describe their pharmacological aspects. 2. 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. 3. 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. 4. 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. 5. 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 203T	Principles of Drug Discovery	1. Explain the various stages of drug discovery 2. Understand the importance of the role of genomics, proteomics and bioinformatics in drug discovery 3. Apply the basic knowledge of various targets in drug discovery process.

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		4.Apply the various lead seeking methods and lead optimization in the drug discovery process. 5.Understand the concept of computer aided drug design in drug discovery. Apply the basic knowledge of QSAR statistical methods in drug discovery process.
MPL204T	Clinical Research And Pharmacovigilance	1. Explain various aspects of adverse drug reactions and understand various terminologies involved in pharmacovigilance. 2. Illustrate detection of new adverse drug reactions and their assessment. 3. Be able to execute methods and tools used in pharmacovigilance. 4. Explain the regulatory requirements for conducting clinical trial and demonstrate the types of clinical trial designs. 5. Explain the responsibilities of key players involved in clinical trials. 6. Execute safety monitoring, reporting and close-out activities.
MPL 205P	Pharmacological Practical II	1. To demonstrate the biological evaluation of drugs by in vitro and in vivo methods 2. To 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 as well as by simulated experiments which give an idea on the recent methods of bioassay. 4. To develop skills in handling animals and perform and evaluate experiments on them. 5. To calculate and compare experimental observations and results statistically. Student can differentiate between actual experimental results or if these results are due to chance.
MQA205P	Pharmaceutical Quality Assurance Practical-II	1. Perform qualitative and quantitative analysis of certain pharmaceutical contaminants and drugs 2. Analyze and validate pharmaceutical facilities, processes, methods and equipment 3. Study qualification of pharmaceutical equipment 4. Create checklist for pharmaceutical facilities 5. Design plant layout for sterile and nonsterile products 6. Perform case study on certain quality management tools.
MQA204T	Pharmaceutical Manufacturing Technology	1. Understand and discuss common practices in manufacturing of sterile and non-sterile dosage forms in pharmaceutical industry. 2. 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. 3. Elaborate legal requirements for pharmaceutical industry development, plant layout and compile steps of production planning. 4. Construct sterile product manufacturing and non-sterile product manufacturing technology and differentiate them. 5. Compile, classify and compare different containers and closures

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		for pharmaceuticals and to correlate stability aspects of packaging materials. 6. Understand and elaborate principles of Quality by Design (QbD) and Process Analytical Technology (PAT) in pharmaceutical manufacturing.
MQA 202T	Pharmaceutical Validation	1. Explain the concepts, importance, scope types, methodology and application of calibration, qualification and validation activities in pharma industry 2. Prepare protocols for qualification and validation of instruments, facilities and processes as per guidelines. 3. Explain the importance of patent and intellectual property rights 4. Suggest methodology for qualification of laboratory, analytical and manufacturing equipments. 5. Suggest methodology for validation of utilities, analytical methods, cleaning methods, computerized systems and manufacturing processes of various dosage forms.
Second Year M. Pham Sem III 2019 pattern		
MRM 301T	Research Methodology & Biostatistics	1. Demonstrate knowledge about basic concepts about research and the methodology to conduct research 2. Describe the appropriate statistical methods required for a particular research design 3. Explain the rationale, importance and processes for abiding to research ethics in medical research conducted using humans and animals. 4. Develop an appropriate framework for research studies including study design, method of data collection, sampling techniques, data analysis, report writing and publication.

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Course Outcomes (COs) for Pharmacy Practice

A.Y. 2020-21

FIRST YEAR PHARM D.		
	Subject	COs
1.1 T	HUMAN ANATOMY AND PHYSIOLOGY (THEORY)	CO1.Understand Basic terminologies used, prefixes & suffixes used to identify body parts and directional terms as well as relevance and significance to Health Sciences. CO2.Understand various homeostatic mechanisms and their imbalances of various systems. CO3.Understand the coordinated working pattern of different organs of each system. CO4.Understand interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body. CO5.Understand the importance of health education and health promotion.
1.1 P	HUMAN ANATOMY AND PHYSIOLOGY (PRACTICAL)	CO1.Understand the construction, working, care and handling of instruments, glassware's and equipment's required for practical. CO2.Understand the significance of Bleeding time, Clotting time, Blood group detection, Haemoglobin detection and measurement of blood pressure. CO3.Knowledge of mechanism of White Blood Cell Count, Red Blood Cell Count and Erythrocytes Sedimentation rate of blood sample. CO4.Demonstration of various systems with the help of charts and models. CO5.Understand the mechanism of experimental physiology
1.2 T	PHARMACEUTICS (THEORY)	CO1. Integrate the knowledge related to introduction and classification of dosage form, prescription and posology. CO2. Build knowledge about the historical background and development of Pharmacy profession including different pharmacopoeias. CO3. Develop and demonstrate solid dosage form like powders and granules and pharmaceutical calculations related to weights and measures. CO4. Build knowledge of liquid dosage form including both monophasic and biphasic dosage form. CO5.Investigate information related to suppositories and surgical aids. CO6. Develop knowledge related to different galenical products and its extraction processes along with incompatibilities associated with dosage form
1.2 P	PHARMACEUTICS (PRACTICAL)	CO1.Demonstrate the skill of preparation and evaluation of various solid and liquid dosage forms. CO2 Explain principles of formulation and evaluation of dosage forms. CO3.Calculate evaluation parameters like density, specific gravity, angle of repose, carr's index and hausner'sratio of

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		pharmaceutical preparation. CO4. Classify various dosage forms by using different criteria. CO5. Create labels in prescribed manner for various dosage forms. CO6.Build knowledge regarding different types of incompatibilities for safety, efficacy and therapeutic effect of dosage forms.
1.3T	MEDICINAL BIOCHEMISTRY (THEORY)	CO1. Summarize, justify and conclude catalytic activity of enzymes, importance of isoenzymes in diagnosis of diseases. CO2. Summarize metabolic process of biomolecules in health and illness including metabolic disorders. CO3. Integrate, discuss and summarize nucleic acid metabolism, the genetic organization of mammalian genome, DNA replication, mutation and repair mechanism along with proteins synthesis CO4. Understand biochemical principles of organ function tests of kidney, liver and endocrine gland. CO5.Summarize qualitative analysis and determine biomolecules in body fluids.
1.3P	MEDICINAL BIOCHEMISTRY (PRACTICAL)	CO1.Evaluate and analyze presence of various biomolecules/ normal and abnormal constituents in body fluids using qualitative and quantitative tests. CO2.Understand and analyze the catalytic activity of enzymes and importance of isoenzymes in diagnosis of diseases. CO3.Apply the biochemical principles of organ function tests of kidney, liver and endocrine gland. CO4.Understand importance of levels of various biomolecules in body fluids.
1.4T	PHARMACEUTICAL ORGANIC CHEMISTRY (THEORY)	CO1.Explain the physical properties of organic compounds CO2.Identify the structures of a given organic compound and give the nomenclature CO3.Explain the mechanisms involved in various organic reactions CO4.Discuss the reactivity, orientation and stability of organic reactions CO5.Identify the products obtained through simple organic reactions CO6.Summarize the studies on some important official organic compounds
1.4 P	PHARMACEUTICAL ORGANIC CHEMISTRY (PRACTICAL)	CO1.Synthesize simple organic compounds by different organic reactions CO2.Apply stereo models and explain the structural aspects of organic compounds CO3.Detect the extra elements (N.S and X) present in the compounds CO4.Identify various classes of organic compounds by systematic qualitative analysis CO5.Prepare suitable solid derivatives from organic compounds CO6.Conduct planned experiments and prepare laboratory report in a standard format

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1.5 T	PHARMACEUTICAL INORGANIC CHEMISTRY (THEORY)	CO1 Discuss and explain the principles and procedures of analysis of drugs. CO2 Apply and determine the applications of inorganic pharmaceuticals in analysis of drug. CO3 Discuss the fundamentals of analytical chemistry and examine inorganic pharmaceuticals regarding their monograph. CO4 Justify the importance of inorganic pharmaceuticals in preventing and curing disease. CO5 Knowledge about the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals CO6 To have been introduced to a variety of inorganic drug classes
1.5P	Pharmaceutical inorganic chemistry (practical)	CO1 Perform the limit test for certain impurities like chloride, sulphate, iron, arsenic, lead and heavy metals as per the Indian Pharmacopoeia CO2 Determine percentage purity of given pharmaceutical drugs by titrimetric analysis CO3 Perform qualitative analysis of given inorganic mixtures. CO4 Identify the Inorganic compounds through various chemical tests. CO5 Know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals CO6 Use different methods for preparation of Inorganic substances
	Second year Pharm D.	
2.1T	Pathophysiology (Theory)	CO1 Study of investigation and pathogenesis of the various disease conditions. CO2 Describe signs and symptoms of the diseases. CO3 Elucidate the complications of various diseases. CO4 Illustrate connection of immune system and various disorders.
2.2T	Pharmaceutical microbiology (theory)	CO1: Integrate the knowledge related to Bacteria morphology, growth, Culture media, staining technique, counting techniques. CO2: Design and demonstrate sterilization methods, validation of sterilization method, sterility testing and also acquire the knowledge about preservation and disinfection. CO3: Develop and demonstrate immunology and serology CO4: Build knowledge for diagnostic and serological testing CO5: Investigate microbial culture sensitivity testing with interpretation of result. CO6: Design microbiological assay protocol for antibiotics and vitamins; standardisation of vaccines and sera.
2.2P	Pharmaceutical microbiology (practical)	CO1: Design sterility testing and minimum inhibitory concentration protocol. CO2: Create and sterilize different culture media, glassware. CO3: Develop the process for determination of total and viable count and microbial assay of antibiotic and vitamins CO4: Design culture sensitivity testing, biochemical testing, diagnostic serological testing and disinfectant testing.

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		CO5: Develop inoculation technique, isolation technique of pure culture. CO6: Investigate different staining technique for identification of bacteria, hanging drop technique for study of motility of bacteria.
2.3T	Pharmacognosy & phytopharmaceuticals (theory)	CO1 Develop and design agricultural & storage requirement of crude drugs & explain detailed pharmacognostic account of medicinal plants CO2 Develop and design the technique for extraction, isolation, purification of phytoconstituents for medicinal, agricultural, food & healthcare industry CO3 Design & explain various methods for determination of authenticity of crude drugs, extracts ,phytoconstituents, formulations & detect their adulteration CO4 Develop to design a method for analysis, detection, purification of various extracts, phytoconstituents & herbal raw materials. CO5 Correlate various techniques involved in extraction, isolation, estimation & application of phytoconstituents
2.3P	Pharmacognosy & phytopharmaceuticals (practical)	CO1 Illustrate the anatomical architecture of various crude drugs & its significance for the plants & for its analysis CO2 Correlate the various staining reagents required for the authentication of crude drugs during microscopy CO3 Design various analytical parameters required for the authentication of crude drugs, Extracts, Oils etc. CO4 Judge various crude drugs on the basis of their morphological & microscopical Studies. CO5 Evaluate the purity &/Or stability of various unorganized crude drugs & oils.
2.4T	Pharmacology-I (Theory)	CO1 Discuss pharmacokinetics and pharmacodynamics of a drug CO2 Recognize the factors modifying drug action CO3 Identify drug interactions and detect adverse drug reactions CO4 Classify and explain the pharmacology of drugs acting on various systems CO5 Apply the basics of pre-clinical and clinical evaluations in the development of new drugs
2.4P	Pharmacology-I (Practical)	CO1 Utilize and handle the Experimental animals CO2 Explain and handle the computerized simulated software programme such as COLPHARM CO3 Compare the effects of various drugs on animals Students will be able Test and Utilize the instruments used in experimental Pharmacology CO4 Recommend physiological salt solutions for different isolated tissues CO5 Tell different routes of drug administration and the techniques of Euthanasia and analgesia in laboratory animals

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2.5T	Community pharmacy (theory)	CO1 Identify drug discuss the roles and responsibilities of community pharmacist CO2 Outline the layout and infrastructure requirements for community pharmacy CO3 Recognize the need of inventory control and discuss the various methods CO4 Discuss the factors affecting medication adherence CO5 Perform general patient counselling CO6 Apply health screening services in community pharmacy
2.6T	Pharmacotherapeutics-I (Theory)	CO 1 Describe the pathophysiology and management of diseases. CO 2 Develope Patient case-based Assessment Skills CO 3 Describe the quality use of medicines issues surrounding the therapeutic agents in the treatment of these diseases CO 4 Develope clinical skills in the therapeutic management of these conditions CO 5 Provide patient centric care to diverse patients using the evidence-based medicine
2.6P	Pharmacotherapeutics-I (Practical)	CO 1 Integrate the knowledge of therapeutic approach to management of diseases. CO 2 Analyse needs to identify the patient specific parameters relevant in initiating drug therapy. CO 3 Describe pathophysiology of selected diseases. CO 4 Understand individualized therapeutic plans based on diagnosis. CO 5 Describe the diagnosis of various diseases and able to report ADR. CO 6 Outline the therapeutic approach to management of diseases including reference to the latest available evidence.
	Third year Pharm D.	
3.1T	Pharmacology-II (Theory)	CO1 Understand the pharmacological actions of different categories of drugs CO2 Study in detailed about mechanism of drug action at organ system/ sub cellular/ macromolecular level CO3 Understand the application of basic pharmacological knowledge in the prevention and treatment of various diseases CO4 Observe the effect of drugs on animal by simulated experiments CO5 Correlate of pharmacology with other bio medical science CO6 Understand the signal transduction mechanism of various mechanism
3.1P	Pharmacology-II (Practical)	CO1 Understand the pharmacological aspects of drugs used to treat ailment of different organ systems of the body. CO2 Appreciate the importance of drug discovery by preclinical and clinical trials. CO3 Apply the knowledge of drugs practically using simulated pharmacological experiments CO4 Demonstrate in-vitro techniques of Bio-Assay and

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		various pharmacological models in different animals to assess drug activity. CO 5 Differentiate various physiological salt solution
3.2T	Pharmaceutical analysis (theory)	CO1 Assess quality Assurance and validation methods concept with guidelines and their regulations CO2 Explain Introduction ,theory, instrumentation and application in the different types of chromatography and spectroscopic technique. CO3 Categorize the electrometric methods , theoretical aspects, Instrumentation , Interpretation of data and analytical applications CO4 Summarize theoretical aspects of Polarimeter , X-Ray diffraction CO5 Outline Introduction ,Instrumentation and application of thermal analysis.
3.2P	Pharmaceutical analysis (practical)	CO1 Develop mobile phase for separation and identification of drugs by Chromatography. CO2 Operate various instruments to develop practical skill. CO3 Interpret the data obtained through UV, IR, NMR,spectra and report the result CO4 Summarize theoretical knowledge on various instrumental technique
3.3T	Pharmacotherapeutics-II (Theory)	CO 1 Describe the pathophysiology and management of diseases. CO 2 Develop Patient case-based Assessment Skills CO 3 Describe the quality use of medicines issues surrounding the therapeutic agents in the treatment of these diseases CO 4 Develop clinical skills in the therapeutic management of these conditions CO 5 Provide patient centric care to diverse patients using the evidence-based medicine
3.3P	Pharmacotherapeutics-II (Practical)	CO 1 Integrate the knowledge of therapeutic approach to management of diseases. CO 2 Analyse needs to identify the patient specific parameters relevant in initiating drug therapy. CO 3 Describe pathophysiology of selected diseases. CO 4 Understand individualized therapeutic plans based on diagnosis. CO 5 Describe the diagnosis of various diseases and able to report ADR. CO 6 Outline the therapeutic approach to management of diseases including reference to the latest available evidence.
3.4T	Pharmaceutical jurisprudence(t) (theory)	CO1 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 CO2 Illustrate pharmaceutical legislation in India concepts, principle and significance of pharmaceutical ethics drafted by PCI CO3 Practice legal provisions for import, manufacture, sale of drugs and cosmetics and schedules thereunder and similarly,

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		provisions under Pharmacy Act CO4 Organize and describeprovisions under medicinal and toilet preparation act and narcotic drug and psychotropic substances act CO5 Examine provisions made under drugs price control order, prevention of cruelty to animal act, patent and design act and prescription and non-prescription product CO6 Analyse and describe salient features of drugs and magic remedies act and essential commodities act relevant to drugs price control order
3.5T	Medicinal chemistry (theory)	CO1 Understand Modern concepts of rational drug design CO2 Derive and understand the Structural influences on mechanism of pharmacologic action (structure-activity relationship) . CO3 Evaluate the chemistry of drugs with respect to their pharmacological activity. CO4 Summarize the mechanism pathways of different class of medicinal compounds. CO5 Illustrate chemical nomenclature, brand names of important marketed products and their side effects. CO6 Analyse and apply Diagnostic agents
3.5P	Medicinal chemistry (practical)	CO 1 Perform synthesis of medicinal compounds. CO 2 Perform purification of medicinal compounds by recrystallization CO 3 Analyse pharmaceutical drugs using appropriate assay method. CO 4 Analyse monographs of important drugs. CO 5 Determine physical properties of organic compounds with respect to QSAR analysis.
3.6T	Pharmaceutical formulations (theory)	CO1: Integrate the knowledge related to different pharmaceutical dosage forms. CO2: Develop and prepare of various pharmaceutical dosage forms CO3: Analyse different pharmaceutical dosage forms according to their evaluation parameters. CO4: Integrate knowledge regarding different terms like bioavailability and bioequivalence. CO5: Study role of various pharmaceutical dosage forms.
3.6P	Pharmaceutical formulations (practical)	CO1: Develop different types of dosage from according to route of administration. CO2: Develop and prepare various pharmaceutical dosage forms. CO3: Analyse different dosage forms according to their evaluation parameters. CO4: Design labels according to different types of pharmaceutical dosage forms. CO5: Integrate knowledge regarding principle involved in formulation and role of various pharmaceutical dosage forms

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Course Outcomes

Academic Year 2019-20

Course Outcomes (COs) for B. Pharmacy

A.Y. 2019-20

Semester	Subject Name	COs
First Year Sem I 2018 pattern		
BP101T	HUMAN ANATOMY AND PHYSIOLOGY I–T	1. To summarize the basic knowledge of importance of Human Anatomy and Physiology in pharmacy field. 2. To outline the Introduction to human body, Cellular level of organization, Tissue level of organization 3. To summarize Integumentary system, Skeletal system, Joints, Body fluids and blood, Lymphatic system and Cardiovascular system 4. To summarize Peripheral nervous system: Special senses
BP102T	PHARMACEUTICAL ANALYSIS I – T	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
BP103T	PHARMACEUTICS I – T	1. Demonstrate skill of preparation and evaluation of various solid,liquid and semisolid dosage forms. 2. Explain principles of formulation and evaluation of powder preparations 3. Calculate evaluation parameters like density, specific gravity, angle of repose, Carr's index and Hausner ratio of pharmaceutical preparations. 4. Classify the various dosage forms by using different criteria 5. Create labels in prescribed manner for various dosage form.
BP104T	PHARMACEUTICAL INORGANIC CHEMISTRY T	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 4. inorganic drugs and pharmaceuticals. 5. Derive acids, bases, buffers, water and different GIT agents and recall the fundamental principles of them 6. Develop the medicinal used of topical agents, gases and vapors', dental products, pharmaceuticals aid and radio pharmaceuticals. 7. Integrate about the major intra and extra cellular electrolytes, essential and trace elements, cationic and anionic components of inorganic drugs.
BP105T	COMMUNICATION SKILLS – T *	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

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		3. To develop understanding and interpret subjects 4. To develop ability to apply what is learned 5. To focus on curricular, cocurricular and extracurricular activities 6. To develop graduates with ethics, morals and social sense and decision making
BP106RBT	REMEDIALBIOLOGY/	1. To study and understand the fundamental concepts of the structural and functional systems of plants and animals. 2. To understand the principle of classification and salient features of plant and animal kingdom. 3. To understand macro and micromorphology and phytochemistry of medicinal plants. 4. To study and understand the basic concept of human anatomy and physiology 5. To understand the interdisciplinary significance of biological concepts for pharmaceutical studies.
BP107P	HUMAN ANATOMY AND PHYSIOLOGY –P	1. To summarize the basic knowledge of importance of Human Anatomy and Physiology in pharmacy field. 2. To be able to apply knowledge of microscope (types, uses, care and handling of microscopes) to study epithelial, connective tissue, muscular and nervous tissue, human skeleton (axial), human skeleton (appendicular). 3. To develop practical skill in Students convergent with the techniques for identification, counting, estimation of various integral components of the body such as RBC count, WBC count and haematological studies 4. To develop practical skill in Student to determine blood group, clotting time, bleeding time, hemoglobin content, erythrocyte sedimentation rate,heart rate and pulse rate, blood pressure.
BP108P	PHARMACEUTICAL ANALYSIS I – P	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
BP109P	PHARMACEUTICS I – P	1. Illustrate history of pharmacy, development of pharmacy profession and industry in India. 2. Explain and evaluate different preparation like powders, monophasic-biphasic liquid dosage form, semisolid dosage form and suppositories 3. Define & classify physical, chemical and therapeutic incompatibilities with examples. 4. Summarize the factors influencing formulation of various dosage forms like solution, to predict the choice of route of administration based on dosage form and to define preformulation, describe various preformulation parameters and define additives with its examples
BP110P	PHARMACEUTICAL INORGANIC CHEMISTRY –P	1. Derive acquainted with the principles of limit tests. 2. Compose and Familiar with different classes of inorganic pharmaceuticals and their analysis

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		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*	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.
BP112RBP	REMEDIAL BIOLOGY – P*	1. To Discuss various experiments in biology. 2. To summarized cell and its inclusions. 3. To discuss various parts of plant and explain modification of it. 4. To discuss bones of human system. 5. To summarize the significance of blood group, blood pressure & tidal volume.
First YearSemester II		
BP201T	HUMAN ANATOMY AND PHYSIOLOGY II – T	1. Students will be able to organize the gross morphology, structure and function of various organs of the human body. 2. Student will be able to differentiate the various homeostatic mechanism and their imbalances 3. Student will be able to identify the various tissue and organs of different systems of the human body 4. Students will be able to design the hematological tests like blood cell counts, hemoglobin estimation, bleeding/ clotting time etc and also record blood pressure, heart rate, pulse and respiratory volume. 5. Student will be able to construct the model based on coordinated working pattern of different organs of each system 6. Student will be comparing the interlinked mechanism in the maintenance of normal functioning (homeostasis) of human body.
BP202T	PHARMACEUTICAL ORGANIC CHEMISTRY I-T	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	1. To summarize biomolecules and to conclude, evaluate and discuss chemical nature and biological role of it with concepts in bioenergetics. 2. To summarize and compose carbohydrate metabolism and biological oxidation 3. To integrate, compose, explain and discuss lipid metabolism

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		4. To compose, assess, explain and discuss amino acid metabolism 5. To integrate, discuss and summarize nucleic acid metabolism and the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins 6. To summarize, justify and conclude catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes
BP204T	PATHOPHYSIOLOGY – T	1. Define medical terminology with respect to pathophysiology aspects. 2. Discuss the etiology and pathogenesis of various diseases on different organ systems. 3. Relate and analyze the clinical manifestations to pathophysiology of various diseases 4. Describe the diagnosis of various diseases
BP205T	COMPUTER APPLICATIONS IN PHARMACY – T *	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 SCIENCES – T *	1. Create awareness about environmental problems among 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 Yelmar	1. To be able to demonstrate integumentary and special senses, nervous and endocrine using specimen model 2. To be able to analyze neurological examination, function of olfactory nerves, visual and reflex activity and total blood count 3. To be able to distinguish the techniques for recording body temperature, basal mass index 4. Students will be able to interpret knowledge of various human system like digestive, respiratory, cardiovascular, urinary and reproductive system 5. Students will be able to examine various devices like pregnancy diagnostic test and family planning 6. Students will be able to compare the detailed information about the human body.
BP208P	PHARMACEUTIC	1. Integrate the reaction, Possess knowledge and synthesis of organic

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	AL ORGANIC CHEMISTRY I– P	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
BP209P	BIOCHEMISTRY – P	1. Assess the fundamentals of Separate, Identify and Characterize Proteins, amino acid Carbohydrates 2. Compare metabolism Pathway of Proteins, Lipids, Carbohydrates and vitamins 3. Measure various method of bio analytical sample identification 4. Test of glucose, fructose, galactose, ribose, lactose, maltose, sucrose, starch, glycogen in the given sample
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 2018 pattern SEMESTER-III		
BP301T	PHARMACEUTICAL ORGANIC CHEMISTRY - II(THEORY)	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 compounds. 4. Recommend particular chemical entity in predict the product problems. 5. Summarize isomerism with types and choose proper conformation & configuration 6. for assigning them by building various projection formulas &by generating their interconversions.
BP305P	PHARMACEUTICAL ORGANIC CHEMISTRY – II (PRACTICAL)	1. Synthesize the organic compounds based on syllabus, decide reaction & build mechanism behind it. 2. Summarize principle and design procedure involved in column chromatographic separation techniques and TLC, support it in purification of organic compounds. 3. Summarize principle behind various qualitative tests and integrate them in the identification of given unknown binary organic compounds having different functional groups. 4. Summarize principles and mechanism in each confirmatory test for identification of various organic compounds 5. Separate and evaluate unknown organic compound by qualitative Analysis.
BP 302 T	PHYSICAL	1. Describe the various physicochemical properties involved in

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	PHARMACEUTICS-I (THEORY)	selecting raw materials, including drug and inactive ingredients of appropriate quality leading to stable formulations. 2. Use the principles of solubility and partition coefficient in designing of various formulations. 3. Explain physical principles of states of matter and phase rule. 4. Predict the properties of particles, pharmaceutical powders and their significance in formulating and characterizing pharmaceutical dosage form. 5. Discuss classification and applications of complexation, protein binding and drug action. 6. Solve the problems related to states of matter, buffers and isotonic solutions in manufacturing of pharmaceutical dosage forms and maintaining stability.
BP306P	PHYSICAL PHARMACEUTICS-I (PRACTICAL)	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
BP303T	PHARMACEUTICAL MICROBIOLOGY (THEORY)	1. Students will be able to develop and demonstrate the method of identification, characterization, isolation, cultivation and preservation of various micro-organisms. 2. Students will be able to design and demonstrate the importance of sterilization and its application to pharmaceutical industry; also acquire the knowledge related preservation and disinfection. 3. Students will be able to build the protocol for sterility testing of pharmaceutical products, validation of Sterilization process; calibration and OQ of sterilization equipment. 4. Students will be able to develop the microbiological standardization procedure for pharmaceuticals like antibiotics, vitamins and amino acids; principles and methods for microbiological assays 5. Students will be able to integrate the knowledge about cell culture technology and its application in pharmaceutical industry. 6. Students will be able to construct models based on basic principles of microbiology includes classification of micro-organism, nutritional requirement
BP307P	PHARMACEUTICAL MICROBIOLOGY (PRACTICAL)	1. The learner will be able to design sterility testing and minimum inhibitory concentration protocols. 2. The learner will be able to derive Staphylococcus aureus, E. Coli and Salmonella. 3. The learner will be able to develop the process for determination of total viable count and microbial assay.

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		4. The learner will be able to construct laboratory equipments like compound light microscope, autoclave, incubator and laminar air flow. 5. The learner will be able to create and sterilize nutrient broth and nutrient agar and also develop aseptic techniques of inoculation with identification of motility of pseudomonas aeruginosa. 6. The learner will be able to modify different staining techniques to demonstrate morphology of bacteria.
BP304T	PHARMACEUTICAL ENGINEERING (THEORY)	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, de humidifier, 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
BP308P	PHARMACEUTICAL ENGINEERING (PRACTICAL)	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, de humidifier, 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
Second year SEMESTER-IV		
2.4.1 T	PHYSICAL PHARMACEUTICS-II (THEORY)	1. Integrate and apply basic knowledge and principles of physical pharmacy as they used for development and assessment of various types of drug delivery systems 2. Demonstrate basics involved in existence and coexistence of states and phases, solutions of electrolytes and nonelectrolytes, solubility and distribution phenomenon 3. Demonstrate ability to develop critical thinking and problem solving required to address problems related toaddress problems related to dosage form design 4. Recognize and Apply basic rules and equations regarding physical principles essential for pharmaceutical applications. 5. Apply rationally the principles in choosing adjuvants used for delivery and in formulation of biologically active molecules 6. Demonstrate a wide background in physical pharmaceutical principles essential for their pharmacy study in the next years

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2.4.1 P	PHYSICAL PHARMACEUTICS-II (PRACTICAL)	1. Exercise different pharmaceutical laboratory procedures used in determining various physical properties such as surface tension, viscosity, order of reaction 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
2.4.2 T	PATHOPHYSIOLOGY AND CLINICAL BIOCHEMISTRY (THEORY)	1. To summarize basic knowledge of importance of pathophysiology and clinical biochemistry in pharmacy field 2. Integrate the knowledge of etiology and pathogenesis of various diseases on different organ system. 3. Compare to conclude the clinical manifestations to pathophysiology of various diseases 4. Generate an understanding of the pathogenesis and diagnosis of various diseases using modern tools 5. Justify and summarize pathological change with physiological data.
2.4.2 P	PATHOPHYSIOLOGY AND CLINICAL BIOCHEMISTRY (PRACTICAL)	1. To summarize basic knowledge of importance of pathophysiology and clinical biochemistry in pharmacy field 2. To apply the basic knowledge of application, maintenance and uses of various instruments in clinical biochemistry and techniques of biological fluid collection and separation. 3. Able to measure various estimation of function tests for liver, kidney and heart diseases and erythrocyte sedimentation rate. 4. To summarize basic knowledge of basics of histology, determination of arterial blood gas, serum c reactive protein, blood glucose level. To outline basic knowledge of blood bank.
2.4.3 T	PHARMACEUTICAL ORGANIC CHEMISTRY-IV (THEORY)	1. Recall structures, numbering, and examples of drugs containing heterocyclic rings, methods of preparation, chemical reactions and mechanisms of name reactions of some heterocyclic polycyclic rings. 2. Recall and infer various reagents used in particular organic synthesis, their methods of preparation, reactions and application. 3. Explain various techniques of combinatorial chemistry and understand applications of combinatorial chemistry in the speedy synthesis of organic compounds and peptides 4. Recall general rules and guidelines involved in retro-synthesis, analyze, plan & construct retrosynthetic pathway of pharmaceutically important compounds. 5. Outline the basics in microwave assisted synthesis and discuss applications of microwave assisted synthesis in pharmaceutical research.
2.4.3 P	PHARMACEUTICAL ORGANIC	1. Synthesize various heterocyclic compounds and explain reaction, mechanism behind it.

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	CHEMISTRY-IV (PRACTICAL)	2. Explain the principle behind various qualitative tests and analyze the given unknown binary organic compounds having different functional groups. 3. Perform quantitative determination of different reactive groups. 4. Demonstrate microwave assisted reaction of organic compounds.
2.4.4 T	PHARMACEUTICAL ANALYSIS-II (THEORY)	1. Assess the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs 2. Select a quality control of chemicals, drug intermediates, APIs, excipients, pharmaceutical formulations and cosmetic products 3. Summarize various volumetric and electrochemical titrations 4. Outline end point of various electro chemicals analysis and oxidation and reduction reaction
2.4.4 P	PHARMACEUTICAL ANALYSIS-II (PRACTICAL)	1. Support the fundamental of analytical chemistry and principles of electrochemical analysis of drugs 2. Evaluate a purity of some pharmaceutical substances by conductometric titrations 3. Select pKa of some monobasic, dibasic or tribasic acids of pharmaceutical importance 4. Measure optical rotation and specific optical rotation of some sugars
2.4.5 T	PHARMACOGNOSY & PHYTOCHEMISTRY-II (THEORY)	1. To summarize the basic knowledge of importance of pharmacognosy and phytochemistry field 2. To assess the crude drugs in detail, chemical nature, chemical constituents, cultivation and collection and uses. 3. To apply and demonstrate the basic knowledge on alkaloids, explain sources, describe methods of their extraction, qualitative and quantitative analysis of alkaloids 4. To apply and demonstrate the basic knowledge on terpenoids, classify, explain source, qualitative and quantitative analysis of terpenoids and resins
2.4.5 P	PHARMACOGNOSY & PHYTOCHEMISTRY-II (PRACTICAL)	1. Explain and understand the principle, assembly, working and application of clavenger and soxhlet apparatus for extraction. 2. Classify and analyze various herbal volatile oils 3. Develop and explain the morphology and microscopy of intact crude drug and also characterize the crude drugs in their powder form 4. Design method for extraction, isolation and purification of caffeine and reserpine 5. Design and hands on skill of isolation and purification of eugenol from clove oil.
2.4.6 T	PHARMACEUTICAL ENGINEERING	1. Define drying, crystallization, evaporation, heat transfer, mass transfer distillation, corrosion and know the mechanism, theory and factors affecting it. 2. Illustrate types of drying crystallizer, evaporation, heat transfer, flow of fluids, distillation, corrosion, mass transfer 3. Study the principle, theory, mechanism, working and construction of equipment's of different unit operations. 4. Illustrate fundamental and facts about flow of fluids, mass

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		transfer, heat transfer and corrosion 5. Describe types of distillation and corrosion, their mechanism with appropriate diagrams.
Third year 2015 SEMESTER - V		
3.5.1 T	INDUSTRIAL PHARMACY –I (THEORY)	1. Summarise the concept of solid dosage form design and formulation strategies 2. Formulate tablets and capsules as a solid dosage forms, manufacture and evaluation 3. Integrate the concepts, pharmacopoeical specifications, techniques and equipments used in tablets, tablet coatings and capsules 4. Build the tablet coating process and evaluate parameters of coated tablets 5. Develop tablet manufacture, tablet coating and capsules manufacture by analysing critically the problems/defects involved and select possible remedies to them 6. Summarise the concept of scale up and technology transfer
3.5.1 P	INDUSTRIAL PHARMACY –I (PRACTICAL)	1. Formulate and evaluate uncoated tablets, coated tablets and capsules 2. Design formulations on the basis of necessary calculations and evaluate it 3. Justify the role of ingredients and their quantity in formulation and category of formulation 4. Decide the use of appropriate equipment and select the apparatus needed for the particular preparation 5. Design labels to suit regulatory requirements and select proper packaging (container and closure) and labelling materials for preparations 6. Summarise pharmaceutical plant layout and demonstrate product details
3.5.2 T	PHARMACEUTICAL ANALYSIS –III (THEORY)	1. Integrate and assess the different types of instrumental analytical techniques available for quality control of APIs & Pharmaceutical dosage forms. 2. Choose and evaluate the various sampling techniques employed in analysis of solid, semisolid and liquids dosage forms 3. Develop the understanding regarding principles, instrumentation and applications of absorption spectroscopy techniques such as UV-VIS, Fluorimetry, Atomic absorption spectroscopy 4. Integrate and summarize the various analytical techniques such as atomic emission spectroscopy, Flame photometry, Phosphorimetry and Nepheloturbidimetry.
3.5.2 P	PHARMACEUTICAL ANALYSIS –III (PRACTICAL)	1. Integrate and independently able to operate, calibrate various analytical instruments for the assay of various APIs and formulations as per Pharmacopoeial standards 2. Generate and judge the beer's law limit and calculate different absorptivity constants 3. Derive the value of λmax by calculating Woodward rule 4. Develop and perform assay of APIs and formulations by UV Spectrophotometry, fluorimetry and Nepheloturbidimetry 5. Derive and estimate the concentration of Na, K, Ca, Li from

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		Pharmaceutical formulations by flame photometry
3.5.3 T	MEDICINAL CHEMISTRY –I (THEORY)	1. Explain and relate physicochemical properties with action of drug. 2. Define; explain types and applications of bioisosterism 3. Understand receptor types and forces involved in drug receptor interactions 4. Evaluate the chemistry of drugs with respect to their pharmacological activity. 5. Summerize the mechanism pathways of different class of medicinal compounds. 6. Derive and understand the structural activity relationship of different class of drugs. 7. Understand biosynthesis of Adrenaline and Acetyl choline
3.5.3 P	MEDICINAL CHEMISTRY –I (PRACTICAL)	1. Understand techniques of purification of solvents by fractional distillation and vacuum distillation 2. Derive synthesis of hydrochloric acid and phosphoric acid salt of piperazine 3. Evaluate partition coefficient and dissociation constant of medicinal compounds 4. Understand technique of Thin Layer Chromatography and Column Chromatography 5. Perform synthesis and purification by recrystalization of medicinal compounds for ex sulfanilamide, 1, 2, 3, 4-tetrhydrocarbazole etc
3.5.4 T	PHARMACOLOGY –II (THEORY)	1. Describe, explain and summarize the specific knowledge related to the different classes of drugs, and important distinctions among members of each class, in relation to the organ systems they affect, and the diseases for which they are used therapeutically 2. Classify and summarize the drugs and diseases of autonomic nervous system and understand general pharmacology. 3. Describe various adrenoreceptor and cholinoreceptor, Classify their subtype and the clinical spectrum of their agonist and antagonist. 4. Students can able to describe the agent that stimulate or relax skeletal muscle, including the cholinergic neuromuscular agonist and antagonist. 5. Summarize, classify and apply epidemiology, etiology, pathophysiology sign and symptoms, diagnosis, complications, treatment and management of disease like Hypertension, Coronary Heart disease Congestive heart failure, Cardiac arrhythmias. 6. Explain and outline correlation of pharmacology with related medical sciences
3.5.4 P	PHARMACOLOGY –II (PRACTICAL)	1. Summarize different types of experimental animals and instruments used in experimental pharmacology. 2. Design the in-vitro bioassay technique. 3. Demonstrate different simulated pharmacological screening experiments 4. Analyze the results in evaluation of preclinical studies of drugs.
3.5.5 T	ANALYTICAL	1. Explain the source, active constituents and uses of crude drugs.

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	PHARMACOGNOSY & EXTRACTION TECHNOLOGY (THEORY)	2. Discuss the application and extraction methods of phytochemicals. 3. Summarized the principle & applications of chromatography & non chromatographic separation methods for natural products. 4. Summarize the various analytical techniques used for herbal drug analysis. As per WHO.
3.5.5 P	ANALYTICAL PHARMACOGNOSY & EXTRACTION TECHNOLOGY (PRACTICAL)	1. Evaluate crude drug based on pharmacognostic & physicochemical analysis. 2. Discuss the various extraction techniques used for herbal drug analysis 3. Summarize various chromatographic & non chromatographic separation methods for natural phytoconstituents analysis. 4. Discuss the meaning & the significance of 'Good Laboratory Practices' learn in theory& demonstrate through laboratory behavior.
3.5.6 T	PHARMACEUTICAL BUSINESS MANAGEMENT & DISASTER MANAGEMENT (THEORY)	1. Explain the basic knowledge of fundamentals of management. 2. Apply fundamentals of setting objective, plan, organize, make decision and control activities. 3. Illustrate the basic knowledge pharmaceutical marketing. 4. Illustrate the basic knowledge human resource development. 5. Define requirements and role of medical representative. 6. Illustrate preparedness and mitigation of disasters.
3.5.7 T	ACTIVE PHARMACEUTICAL INGREDIENTS TECHNOLOGY (THEORY)	1. Discuss overview of API and fine chemical industry & basics of chemical process kinetics, some classes of reactions with examples of API for each unit process. 2. Explain techniques and process of synthetic routes and optimization of reactions, raw material & reagent selection, scale up techniques for APIs, Quality control aspects, material safety data sheet (MSDS), Scale up techniques in API manufacturing, environmental aspects in manufacturing of APIs, green chemistry approaches, health hazards with chemical handling. 3. Summarize Chirality in API industry with some examples. 4. Summarize principle, industrial process, select scale up techniques, choose Industrial manufacturing process & design flow charts of some important APIs. 5. Summarize Quality assurance (QA) and quality control (QC) of APIs and GMP Guidelines in API manufacturing like ICH Q7, Q7A and Q11 & recommend them in determining quality of API.
Third year SEMESTER -VI		
3.6.1 T	INDUSTRIAL PHARMACY –II (THEORY)	1. Summarise concept of disperse system, its classification, types and judge its stability 2. Design formulation, manufacturing and evaluation of suspension and emulsion 3. Design formulation, manufacturing and evaluation of semisolids 4. Choose and recommend layout for manufacturing and select manufacturing equipment for suspension, emulsion and semisolids 5. Design labelling of suspension, emulsion and semisolids; select proper packaging and recommend proper storage 6. Summarise scale up and technology transfer for disperse system

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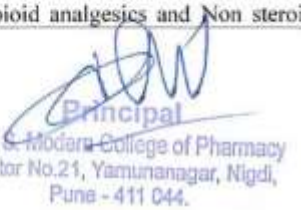
3.6.1 P	INDUSTRIAL PHARMACY -II (PRACTICAL)	1. Design formulation, manufacturing and evaluation of suspension, emulsion and semisolids 2. Design formulations on the basis of necessary calculations needed to conclude working formula and evaluation tests 3. Justify role of ingredients and its quantity in formulation and summarise respective formulations with its category. 4. Decide the use of appropriate equipment and select the apparatus needed for the particular preparation 5. Convince a logic/rational involved in the development of different semisolid dosage forms of the same drug
3.6.2 T	PHARMACEUTICAL ANALYSIS –IV (THEORY)	1. Develop the understanding of basics of various chromatography techniques such as Column Chromatography, paper chromatography, Thin layer chromatography and HPTLC. 2. Integrate and summerize the brief knowledge on various thermal methods of analysis such asDSC, DTA, TGA, ITC. 3. Develop the understanding regarding knowledge of principles, instrumentation and applications of various chromatographic, thermal, X ray Diffraction and radio chemical techniques employed for the analysis of APIs and formulations 4. Integrate and develop the process of validation of analytical instruments and methods as per ICH/USP guidelines
3.6.2 P	PHARMACEUTICAL ANALYSIS –IV (PRACTICAL)	1. Compose the mobile phase system to separate & determine Rf values of mixture of amino acids by Ascending, Radial and two dimensional Paper chromatography 2. Develop a mobile phase to separate & determine Rf values of mixture of carbohydrates/amino acids by TLC 3. Design Validation protocol for spectrophotometric assay methods as per ICH guidelines 4. Select and recommend the experiment for analysis of particular sample such as HPTLC/DSC/Electrophoresis
3.6.3 T	MEDICINAL CHEMISTRY –II (THEORY)	1. Classify local anesthetics 2. Discuss Structure activity Relationship (SAR) and Mechanism of Action (MOA) of Sulfonylurea's as oral hypoglycemic agents 3. Design and development of Benzodiazepines as CNS drugs 4. Describe Scheme of synthesis of certain CNS drugs 5. Analyse Diagnostic agents and anti-migraine 6. Understand metabolism of some medicinal compounds along with application of drug metabolism in drug discovery
3.6.3 P	MEDICINAL CHEMISTRY –II (PRACTICAL)	1. Determining molar refractivity of using refractometer by finding refractive index of medicinal compounds 2. Performing synthesis and purification of medicinal compounds by recrystallization 3. Organic synthesis of certain medicinal compounds using microwave 4. Interpret IR of synthesized compounds 5. Understand technique of steam distillation for separation of compounds
3.6.4 T	PHARMACOLOGY –III (THEORY)	1. Classify and summarize the disease and drug acting on Central nervous system 2. Explain the significance of opioid analgesics and Non steroidal



		anti-inflammatory Drugs, etc 3. Explain and apply the preferred therapies for the different types of epileptic seizures. 4. Assess the treatment for Anxiety, mania, depression and psychosis 5. Classify, analyze the concepts of, detail study & management of various diseases on respiratory system like-asthma, COPD 6. Classify, analyze the concepts of detail study & management of various diseases on gastrointestinal system like-peptic ulcer Laxative, antidiarrhoeal drugs, Emetics, etc
3.6.4 P	PHARMACOLOGY –III (PRACTICAL)	1. Explain the various alternatives to animal experimentation. 2. Compare various OECD guidelines for acute oral toxicity of drugs. 3. Design the various in-vitro bioassay methods to find out unknown drug concentration 4. Summarize various computerized simulation software programme.
3.6.5 T	NATURAL PRODUCT CHEMISTRY (THEORY)	1. Compose the contribution of natural product used in the drug discovery process. 2. Integrate the significance of nutraceuticals & functional foods. 3. Summarize natural products used as dietary supplements. 4. Conclude the source, extraction, processing, chemistry & applications of natural products used in pharmaceutical & allied industry.
3.6.5 P	NATURAL PRODUCT CHEMISTRY (PRACTICAL)	1. Developed isolation of pure natural material using column chromatography. 2. Design various extraction methods & physical constants required in characterization of natural products. 3. Demonstrate and compile records of the UV / IR spectrum of giving natural sample & interpret them. 4. Summarize the evaluation of isolated phytoconstituents by chemical, chromatographic and spectral means.
3.6.6 T	BIOORGANIC CHEMISTRY AND DRUG DESIGN (THEORY)	1. Classify Enzymes: Oxidoreductases: Monoamine Oxidase and Cyclooxygenase-1and 2, HMGCoA reductase, DHFR (Human), DHFR (Bacterial), Transferase: Tyrosine Lysases: DOPA Carboxylase. 2. Classify Isomerases: Thymidylate Synthase (Fungal and Human), Phosphofructokinase (Leishmanial). 3. Assess biochemical features, physiological role and their substrates/antagonists studies. 4. Outline the Topoisomerase-II, reverse transciptase (human and viral). mRNA, rRNA and antisense therapy
3.6.7 T	PHARMACEUTICAL BIOTECHNOLOGY (THEORY)	1. To Summarize the basic knowledge of Biotechnology and its scope in pharmacy integrate 2. To assess knowledge of principles genetic engineering techniques, Hybridoma technology, enzyme immobilization, Fermentation, downstream process in development of Biotechnology derived Products 3. To demonstrate the basic knowledge on cloning, r DNA technology, transformation, transduction, conjugation, plasmids,

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		Mutation, transgenic animals. 4. To assess the basic knowledge regarding use of Recombinant DNA technology, Gene cloning, Types of cloning vector.
Final year 2015 SEMESTER-VII		
4.7.1 T	STERILE PRODUCTS (THEORY)	1. Illustrate the basic knowledge of sterile products with respect to: Preformulation. Formulation parameters with respect to parenteral route of administration. Packaging material as well as packaging technologies. Basic types, formulation and evaluation. 2. Illustrate design of aseptic area, HVAC system. 3. Demonstrate the basic knowledge of lyophilization and its application in sterile product formulation and stabilization. 4. Compare SVPS and LVPs. 5. Compare and classify various types of packaging material. 6. Demonstrate the basic knowledge of blood products, surgical products and parenteral devices.
4.7.1 P	STERILE PRODUCTS (PRACTICAL)	1. Demonstrate the basic knowledge of validation of aseptic area as well as gowning and de-gowning procedure for entry and exit from aseptic area. 2. Analyze packaging components of sterile products. 3. Formulate and evaluate SVPs and LVPs as per IP. 4. Formulate and evaluate ophthalmic products as per official compendia. 5. Assess accelerated stability studies and prediction of shelf life. 6. Demonstrate labeling requirements of parenterals, parenterals devices, blood products and surgical.
4.7.2 T	PHARMACEUTICAL ANALYSIS-V (THEORY)	1. To summarize, explain and discuss principle and theory of analytical techniques like Gas chromatography, IR spectroscopy, FTIR, Near IR spectroscopy, Raman spectroscopy, HPLC, UPLC, SEM and TEM. 2. To explain, discuss, integrate and demonstrate instrumentation in Gas chromatography, IR spectroscopy, FTIR, Near IR spectroscopy, Raman spectroscopy, HPLC, UPLC, SEM and TEM. 3. To assess, conclude and summarize use and applications of Gas chromatography, IR spectroscopy, FTIR, Near IR spectroscopy, Raman spectroscopy, HPLC, UPLC, SEM and TEM for separation and identification analysis. 4. To outline, critique, defend and rank Gas chromatography, IR spectroscopy, FTIR, Near IR spectroscopy, Raman spectroscopy, HPLC, UPLC, SEM and TEM. 5. To conclude, analyze, discuss and compare IR with FTIR, Near IR spectroscopy, Raman spectroscopy, HPLC with UPLC and SEM with TEM. 6. To integrate, compile, select and interpret IR ranges of simple organic compounds for structure elucidation
4.7.2 P	PHARMACEUTICAL ANALYSIS-V (PRACTICAL)	1. To design and develop UV spectrophotometric estimation of two-component formulations by simultaneous equation method 2. To design and develop UV spectrophotometric analysis of two component formulations by Q-Method

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		3. To measure and generate IR spectra of compounds with different functional groups (-COOH, -COOR, - CONHR, -NH2,-NHR, -OH, -CHO, -CO etc.) 4. To integrate, interpret and justify IR-Spectra of aliphatic and aromatic compounds 5. To demonstrate and summarize working of Gas Chromatography /Atomic Absorption Spectrophotometry/ SEM
4.7.3 T	MEDICINAL CHEMISTRY-III (THEORY)	1. Students will be able to make correct use of various equipments and take safety measures while working in Medicinal Chemistry Laboratory. 2. Students will be able to explain, apply, and justify the principle and theory behind synthesis of compound of our interest. 3. Students will be able to develop skill to synthesize compounds. 4. Students will be able to choose and develop skill to purify synthesized compounds. 5. Students will be able to predict andderive structure of synthesized compoundwith the help of spectroscopic analysis and physicochemical properties.
4.7.3 P	MEDICINAL CHEMISTRY-III (PRACTICAL)	1. Students will be able to recall, apply and illustrate SAR of drugs 2. Students will be able to tell, describe, apply, categorize and justify of Physiochemical properties of drug molecules in relation to drug ADME. 3. Students will be able to identify, discuss, examine and conclude recent developments in the drug development and discovery. 4. Students will be able to explain, determine, justify and formulate some routes for the chemical synthesis of some drugs. 5. Students will be able to describe, explain the importance of drug design and illustrate different techniques of drug design, for development of new drugs. 6. Students will be able to explain and apply knowledge to guide society and professionals regarding application to making drug therapy decisions.
4.7.4 T	PHARMACOLOGY-IV (THEORY)	1. Describe and apply the fundamental principles of pharmacology and toxicology. 2. Analyze the usage of different chemotherapeutic agent with respect to disease and their side effects. 3. Discuss pharmacology of drugs on different systems of the body. 4. Describe pharmacology of various steroidal hormones and oral contraceptives
4.7.4 P	PHARMACOLOGY-IV (PRACTICAL)	1. Demonstrate the multiple point bioassays to find out unknown concentration of drugs 2. Discuss various marketed fixed dose drug combinations with respect to complete specification 3. Discuss various case study reports 4. Justify standard treatment protocols
4.7.5 T	NATURAL DRUG TECNOLOGY (THEORY)	1. Describe and explain various difficulties in the standardization of herbal material and steps in the development of plant monograph 2. Discuss and apply various guidelines issued by WHO in relation with cultivation, collection, storage etc. in order to ethically develop pharmaceutical dosage forms.

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		3. Describe & explain concept of health & pathogenesis, philosophical basis, diagnosis & treatment aspects of Ayurveda, Unani, Siddha & Homoepatic system of medicine; Understand & explain method of preparation of Ayurvedic dosage forms; importance of novel drug delivery of natural products; herbs used in cosmetic preparation & methods of their formulations. 4. Apply and explain the applications of plant tissue culture for Secondary metabolite production. 5. Explain the approaches and potentials of herbal new drug delivery systems like liposomes, phytosomes, nanoparticles and vesicles
4.7.5 P	NATURAL DRUG TECNOLOGY (PRACTICAL)	1. Classify and analyze various herbal raw materials required for formulation of herbal products 2. Develop skills of formulation, labeling & evaluation of various Ayurvedic or herbal formulations such as Churna, vati, gutika, vaporub etc 3. Design various parameters required for evaluation of formulation & their role in optimization & product development 4. Design, evaluate, optimize & develop natural skin & hair cosmetic products such as Lipsticks, face powders, shampoos etc 5. Analyze & evaluate the marketed herbal pharmaceutical as well as cosmetic products
4.7.6 T	BIO-PHARMACEUTICS & PHARMACOKINETICS (THEORY)	1. Apply the concept of biopharmaceuticals and pharmacokinetic knowledge in formulation development 2. Analyze and integrate pharmacokinetic processes and their relevance in efficacy of dosage form 3. Compile and apply various compartmental models and noncompartmental analysis methods. 4. Outline and demonstrate the non linear pharmacokinetics and methods to determine their rate parameters. 5. Analyze and evaluate the concept of BCS and mechanisms of dissolution and in vitro in vivo correlation 6. Demonstrate and integrate the concept of bioavailability and bioequivalence studies
4.7.7 T	PHARMACEUTICAL JURISPRUDENCE (THEORY)	1. Describe and explain Basic principles, purpose and dimensions o f the laws to understand the significance andrelevance of Pharm aceutical laws in India 2. Describe the qualifications for membership and the constitution of theBoard 3. Illustrate the various laws governing the manufacturing, sale, res earch & usage of drug. 4. To understand significanceof Schedule M and Schedule Y relate d Manufacturing & clinical trials 5. Illustrate potential fraud and abuse legal issues of narcotic & ps ychotropic substance. 6. Illustrate the act ofprevention of cruelty to the animalsSummariz ed Patents, procedure for patent application and IPR. 7. describe standard institution & regulatoryauthorities
Final year SEMESTER-VIII		

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4.8.1 T	ADVANCED DRUG DELIVERY SYSTEM (THEORY)	1. Illustrate the basic knowledge of modified release dosage forms with respect to:Classification and definition of various modified release dosage forms. Properties of candidate drug for modified release dosage forms. Dose calculation for sustained release dosage forms.Formulation approaches and classification. 2. Illustrate the basic knowledge of types of polymers for modified release dosage forms, their evaluation and applications. 3. Illustrate the basic knowledge of various novel drug delivery systems. 4. Retrieve information from various sources and select, develop and evaluate most feasible drug delivery system with respect to certain constraints. 5. Demonstrate the basic knowledge of optimization techniques. 6. Asses and communicate the proposed idea or work effectively.
4.8.1 P	ADVANCED DRUG DELIVERY SYSTEM (PRACTICAL)	1. Demonstrate the basic knowledge of spectroscopic evaluations, swelling index and viscosity analysis of polymers. 2. Analyze as well as present rational and feasibility of novel drug delivery systems. 3. Demonstrate formulation and evaluation of various modified release and novel drug delivery systems. 4. Analyze drug release pattern of advanced drug delivery dosage forms. 5. Apply knowledge of optimization. 6. Formulate industrially feasible, cost effective strategy for development of new dosage forms.
4.8.2 T	COSMATIC SCIENCE (THEORY)	1. Discuss the concepts and summarize general additives used in cosmetics 2. Explain theoretical aspects in formulation and evaluation of creams & powders for skin cosmetics 3. Develop and evaluate shaving and bath preparations 4. Design and develop cosmetics formulation for hair, eyes, nail, dental and baby care products 5. Illustrate the concept of cosmetics, cosmeceuticals & cosmeceutical agents
4.8.2 P	COSMATIC SCIENCE (PRACTICAL)	1. Use various equipments in Pharmaceutics laboratory relevant to cosmetics and show their handling as per SOP 2. Formulate and evaluate various cosmetics preparations 3. Demonstrate skill of good manufacturing practices in laboratory 4. Predict correct use of various ingredients used in cosmetics formulation 5. Design labels as per regulatory requirements
4.8.3 T	PHARMACEUTICAL ANALYSIS-VI (THEORY)	1. To explain, discuss and integrate theory and principle of various analytical techniques like ^{1}HNMR, ^{13}CNMR, ESR, Ion exchange chromatography, Flash chromatography, Super critical fluid chromatography, Mass spectrometry. 2. To explain, discuss, compose, demonstrate and evaluate instrumentation in NMR, ESR, Ion exchange chromatography, Flash chromatography, Super critical fluid chromatography, Mass spectrometry.

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		3. To apply, compare, rank and justify the analytical tools ^{1}HNMR, ^{13}CNMR, ESR, Ion exchange chromatography, Flash chromatography, Super critical fluid chromatography and Mass spectrometry for separation and identification analysis. 4. To summarize, integrate, analyze, critique, compare and discuss ^{1}HNMR with ^{13}CNMR, Ion exchange chromatography, Flash chromatography, Super critical fluid chromatography with GC and HPLC 5. To discuss, explain, integrate and apply automated methods of analysis 6. To compose and explain advantages and applications of hyphenated techniques like LC-MS, GC-MS and MS-MS.
4.8.3 P	PHARMACEUTICAL ANALYSIS-VI (PRACTICAL)	1. To discuss, explain and compare the UV, IR, NMR and Mass spectrometry ranges in problem solving and structural elucidation of organic compounds. 2. To utilize, apply and interpret UV, IR, NMR, MS spectra of simple organic compounds for structure elucidation 3. To explain, discuss, compose and justify validation of analytical methods (UV & HPLC) as per ICH & USP guidelines. 4. To explain, discuss compose and justify system suitability parameters as per IP/BP/USP protocol for HPLC methods and quantitation techniques in HPLC (% Area/Area Normalization, Internal Standard addition)
4.8.4 T	MEDICINAL CHEMISTRY-IV (THEORY)	1. Students will be able to recall, apply and illustrate SAR and physiochemical properties of drug molecules in relation to drug target interactions. 2. Students will be able to describe, predict, outline and design chemical basis of pharmacology and therapeutics. 3. Students will be able to predict and design fundamental of pharmacophores for drug used to treat disease. 4. Students will be able to recall, summarize, apply and design chemical pathway of drug metabolism. 5. Students will be able to explain, determine, justify and formulate some routes for the chemical synthesis of some drugs. 6. Students will be able to describe, summarize, apply and illustrate the importance of resistance to drug and its significance use and abuse of drug.
4.8.4 P	MEDICINAL CHEMISTRY-IV (PRACTICAL)	1. Students will be able to use of various equipment's and take safety measures while working in medicinal chemistry laboratory. 2. Students will be able to explain, apply, and justify the principle and theory behind synthesis of compound of our interest. 3. Students will be able to develop skill to synthesize compounds. 4. Students will be able to develop skill to purify the solvents using fractional and vacuum distillation. 5. Students will be able to choose techniques and develop skill to purify synthesized compounds. 6. Students will be able to predict and derive structure of synthesized compound with the help of spectroscopic analysis and physicochemical properties.
4.8.5 T	PHARMACOLOGY-V	1. Justify various drug-drug and drug-food interactions

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	(INCLUDING BIOSTATICS) (THEORY)	2. Describe various terminologies related to pharmacovigilance 3. Summarize various objectives of safety pharmacology 4. Discuss various departments and units in hospital pharmacy 5. Describe good clinical practices and ethical issues in clinical trial.
4.8.5 P	PHARMACOLOGY-V (INCLUDING BIOSTATICS) (PRACTICAL)	1. Develop skill to isolate different tissues from experimental animals. 2. Design the experimental set up for experiments related to biological standardization of drugs using isolated tissues. 3. Demonstrate the agonistic and antagonistic effect of a drug through experiments on isolated tissues. 4. Illustrate the effect of drugs on animals by simulated experiments. 5. Discuss the basic aspects of neurobehavioural characterization.
4.8.6 T	NATURAL PRODUCTS: COMMERCE, INDUSTRYY& REGULATIONS	1. Classify different segments in market, demand & supply position; export & import potential of herbal drugs & formulations; position of Indian herbal drug industry in global contest. Also, comprehend the market potential of natural products & explore entrepreneurship skills 2. Assessgovernment organizations & policies for promotion of herbal drugs; their regulation in India & other countries and their ethical issues. 3. Classify and explain plant allergens, their method of preparation & applications 4. Classify, analyze & explain safe use of natural products, possible toxicities & interactions with synthetic drugs or food. 5. Explain theneed & significance and challenges of Pharmacovigilance systems for herbal drugs, different players involved in the PV system as per WHO guidelines.
4.8.7 T	QUALITY ASSURANCE TECHNIQUES (THEORY)	1. Integrate the concepts and significance of quality, QC and QA in pharmaceutical 2. Elaborate the role of validation in pharmaceutical quality assurance and perform validation of equipments 3. Explain the concepts of QbD 4. Apply current Good Manufacturing Practices (cGMP) in pharmaceutical manufacturing 5. Follow good documentation practices and prepare documents for pharmaceutical Industry 6. Summarize ICH guidelines in stability testing and Quality Management Systems

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Course Outcomes (COs) for M. Pharm

A.Y.2019-2020

Subject Code	Subject Name	COs
SEMESTER I Department: Pharmaceutics		
MPAT 101T	Modern Pharmaceutical Analytical Techniques	1. Integrate and apply theoretical knowledge of various spectroscopic techniquesavailable for analysis of drugs. 2. Understand and apply basic Knowledge of chromatographic and electrophoreticseparation techniques. 3. Summarize the instrumentation of modern analytical techniques 4. Elucidate a structure based on UV, IR, NMR and Mass data. 5. Explain, Compare and appraise X-ray crystallographic and Thermal Techniques
MPH 102T	Drug Delivery System	1. To formulate and evaluate novel drug delivery systems 2. To justify selection criteria of drug and polymers for the development of novel drug delivery system 3. To understand and construct rate-controlled drug delivery systems 4. To construct, justify and evaluate gastro-retentive drug delivery systems 5. To construct, justify and evaluate ocular drug delivery systems and transdermal drug delivery systems 6. To construct, justify and evaluate protein and peptide delivery systems and vaccine delivery systems.
MPH 103T	Modern Pharmaceutics	1. Understand and analyze the concept of preformulation studies in oral soliddosage form development. 2. Compile and integrate preformulation data and apply this knowledge indevelopment of disperse systems and parenterals. 3. Analyze and apply optimization and scale up techniques in formulationdevelopment and manufacturing. 4. Demonstrate and understand the concept of validation of pharmaceuticalprocesses, equipment's and methods. 5. Outline and analyze the industrial management techniques and GMPconsiderations. 6. Evaluate and understand stability, compression, diffusion and dissolutionprocesses in drug product development.

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MPH 104T	Regulatory Affairs	1. Discuss the basic regulatory Documentation in pharmaceutical industry 2. Discuss the preparation and submission of CTD,e-CTD 3. Explain the chemistry, manufacturing controls and their regulatory importance in ANDA,NDA Submission & Approval process by different regulatory agencies 4. Describe the process of Preparation of Dossiers and their submission to regulatory agencies in different countries 5. What are Clinical trials requirements & different approval procedures for conducting clinical trials
MPH 105P	Pharmaceutics Practical I	1. Understand and apply the analytical methods for pharmaceuticalcompounds 2. Compile and integrate various analytical techniques for estimation of drugalone or in combination. 3. Analyze and evaluate formulation aspects of different drug deliverysystems 4. Demonstrate and understand in vitro dissolution studies and effect ofvarious parameters on dissolution of drug. 5. Outline and perform preformulation studies as a significant step in drugproduct development. 6. Demonstrate and apply the concept of preformulation studies in product life cycle.
Department: Pharmaceutical Quality Assurance		
MPAT 101T	Modern Pharmaceutical Analytical Techniques	1. Integrate and apply theoretical knowledge of various spectroscopic techniques available for analysis of drugs. 2. Understand and apply basic Knowledge of chromatographic and electrophoretic separation techniques. 3. Summarize the instrumentation of modern analytical techniques 4. Elucidate a structure based on UV, IR, NMR and Mass data. 5. Explain, Compare and appraise X-ray crystallographic and Thermal Techniques
MQA 102T	Quality Management Systems	1. Explain the basic concepts, terminology and factors affecting the framework of quality, quality control and quality management systems and implement the same. 2. Explain the scope of quality certifications applicable to pharmaceutical industries. 3. Demonstrate the effective utilization of different QMS tools for monitoring and improving product quality and process performance within the regulatory framework. 4. Suggest suitable guidelines for quality management which can be applied to pharmaceutical industry.

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MQA 103T	Quality control and Quality Assurance	1. Explain significance of quality in pharmaceutical manufacturing and understand the responsibilities of QA & QC departments. 2. Explain role of national and international regulatory agencies in deciding quality standards 3. Follow cGMP while working in Pharmaceutical industry. 4. Describe various aspects of documentation 5. Perform analysis of raw materials, IPQC and FPQC of drug products and other manufacturing operations and controls 6. Explain different guidelines related to Pharmaceutical industry.
MQA 104T	Product development Technology Transfer	1. Describe the regulatory principles and requirements of drug discovery and product development 2. Relate and execute the concept of pre-formulation studies for various formulations 3. Explain in detail the requirements for the pilot plant and scale up Categorize and use various pharmaceutical packaging systems 4. Implement the concept of technology transfer from R & D to production plant
MQA 105P	Pharmaceutical Quality Assurance Practical I	1. Perform qualitative and quantitative analysis of pharmacopoeial compounds in bulk and in their formulations 2. Perform experiments on various analytical instruments such as UV Vis spectrophotometer, HPLC, GC etc. 3. Demonstrate use of tools for quality management 4. Perform quality control tests for drugs, raw materials, dosage forms and primary and secondary packaging materials 5. Perform experiments on pre-formulation studies
Department: Pharmaceutical Chemistry		
MPAT 101T	Modern Pharmaceutical Analytical Techniques	1. Integrate and apply theoretical knowledge of various spectroscopic techniques available for analysis of drugs. 2. Understand and apply basic Knowledge of chromatographic and electrophoretic separation techniques. 3. Summarize the instrumentation of modern analytical techniques 4. Elucidate a structure based on UV, IR, NMR and Mass data. 5. Explain, Compare and appraise X-ray crystallographic and Thermal Techniques
MPC 102T	Advanced Organic Chemistry I	1. Explain, discuss and understand basic aspects of organic chemistry of organic intermediates and addition reactions as mentioned in the syllabus

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		2. Explain, discuss and understand mechanism and synthetic applications of important name reactions mentioned in the syllabus. 3. Explain, discuss and understand synthetic reagents & its applications as mentioned in the syllabus 4. Understand, discuss, and explain role of protecting groups in organic synthesis, includes protection for the hydroxyl group, carbonyl group and carboxyl group, amino group, and amino acids 5. Explain apply and justify organic name reactions with their respective mechanism and application involved in synthesis of drugs containing five, six membered and fused heterocyclic rigs and synthesis of few representative drugs containing heterocyclic nucleus. 6. Develop and apply skill of synthon approach and retrosynthesis applications
MPC 103T	Advanced Medicinal Chemistry	1. Plan strategies and prepare new chemical entities as potential drugs by following the process of drug discovery knowledge. 2. 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. 3. Understand the concept of, & design of peptidomimetics including the chemistry of prostaglandins, leukotrienes and thromboxanes. 4. Rationally design the enzyme inhibitors in medicine. 5. Understand the concept of, & design prodrugs, analogs and peptidomimetics and drug resistance.
MPC 104T	Chemistry of Natural Products	1. Develop the understanding and analyze the chemistry of drugs affecting the central nervous system, anticancer drugs, cardiovascular drugs, neuromuscular blocking drugs, anti-malarial drugs and analogues, macrolid antibiotics. 2. Understand and summarize the classification, isolation, purification, molecular modification and biological activity of alkaloids, flavonoids and steroids. 3. Understand, evaluate and summarize the classification, isolation, isoprene rule and general methods of structural elucidation of Terpenoids as well as chemistry and physiological significance of Vitamins. 4. Integrate, summarize and interpret the data for structural characterization of natural compounds.
MPC 105P	Pharmaceutical Chemistry Practical -I	1. Synthesize compounds of medicinal importance and characterize the synthesized compounds using physicochemical and spectroscopic methods. 2. Purify organic solvents using column chromatographic techniques.

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		3. Isolate and characterize the isolated compounds using physicochemical and spectroscopic techniques and carry out degradation reactions on selected plant constituents. 4. Operate, demonstrate, apply and record UV Vis spectrophotometer, column chromatography, HPLC, GC, fluorimetry and flame photometry 5. Perform degradation reactions on selected plant constituents 6. 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: Pharmacology		
MPAT 101T	Modern Pharmaceutical Analytical Techniques	1. Integrate and apply theoretical knowledge of various spectroscopic techniques available for analysis of drugs. 2. Understand and apply basic Knowledge of chromatographic and electrophoretic separation techniques. 3. Summarize the instrumentation of modern analytical techniques 4. Elucidate a structure based on UV, IR, NMR and Mass data. 5. Explain, Compare and appraise X-ray crystallographic and Thermal Techniques
MPL 102T	Advanced Pharmacology I	1. Discuss the pathophysiology and pharmacotherapy of certain diseases 2. Explain the mechanism of drug actions at cellular and molecular level 3. Understand the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases 4. Summarize, classify and apply epidemiology, etiology, pathophysiology sign and symptoms, diagnosis, complications, treatment and management of disease affecting CVS, CNS. 5. Understand and summarize different autocoids and their role in physiological functioning
MPL 103T	Pharmacological and Toxicological Screening Methods I	1. 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. 2. Describe the various laboratory animals used in experimental pharmacology and their applications. 3. Classify the various preclinical screening methods involved in experimental pharmacology 4. Describe the various preclinical screening methods involved in experimental pharmacology

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		5. Summarize the general principles and methods of immunoassay.
MPL 104T	Cellular and Molecular Pharmacology	1. Understand the basics of cell biology, recombinant DNA technology and transfer of genes to mammalian cells. 2. Apprehend the genetic elements of DNA, fingerprint analysis and various molecular techniques applicable in drug discovery. 3. Apply the knowledge of molecular pharmacology and biomarkers in drug discovery process. 4. Demonstrate molecular biology techniques as applicable for drug discovery. 5. Explain the molecular pathways affected by drugs.
MPL 105P	Pharmacological Practical I	1. To demonstrate the biological evaluation of drugs by in vitro and in vivo methods 2. To analyze knowledge how to deal with experimental animals to test the potency of drugs. 3. To develop skills in handling animals and perform and evaluate experiments on them. 4. To calculate and compare experimental observations and results statistically. Student can differentiate between actual experimental results or if these results are due to chance. 5. Manage her / his time effectively by performing pharmacological activity on experimental animals.
SEMESTER II **Department: Pharmaceutics**		
MPH 201T	Molecular Pharmaceutics (Nano Tech and Targeted DDS)	1. To integrate the knowledge of various approaches for development of TDDS 2. To discuss and elaborate the criteria for selection of drugs and polymers for the development of TTDS 3. To demonstrate basics involved in the formulation and evaluation of TDDS 4. To integrate and apply various concepts and strategies for improving targeting and absorption in the design of TDDS
MPH 202T	Advanced Biopharmaceutics and Pharmacokinetics	1. Understand and analyze the concept of biopharmaceutics andpharmacokinetic. 2. Compile and integrate pharmacokinetic data and derive thepharmacokinetic models and parameters that best describe the process ofdrug absorption, distribution and metabolism. 3. Analyze and apply critical evaluation of biopharmaceutics studies involvingdrug product equivalency. 4. Demonstrate and understand the design and evaluation of dosage regimensof the drugs using pharmacokinetic and biopharmaceutics parameters. 5. Outline and analyze the potential clinical

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		pharmacokinetic problems andapplication of basics of pharmacokinetic. 6. Demonstrate and apply the applications of biopharmaceutics and pharmacokinetic in drug delivery development.
MPH 203T	Computer Aided Drug Development	1. Discuss the role of Computer Aided Drug Delivery in drug discovery 2. Explain different Computer Aided Drug Delivery techniques and their applications 3. Demonstrate various strategies to design and develop new drug-like molecules 4. Explain in detail the working with molecular modeling software to design new drug molecules 5. Discuss various in silico virtual screening protocols.
MPH 204T	Cosmetic and Cosmeceuticals	1. Explain, illustrate and understand scientific knowledge required to develop cosmetic & cosmeceuticals to evaluate its safety, efficacy and stability 2. Illustrate key ingredients and basic science used to developed all cosmetic & herbal cosmetics products like skin care, dental, hair, facial, eye etc 3. Understand the various aspects of cosmetics like regulatory, biological, formulation, design and production of herbal cosmetics. 4. Explain current technologies used to developed different cosmetics & herbal cosmetics product like skin care, dental, hair, facial, eye etc 5. Understand & study classification and application of cosmetics and cosmeceuticals like perfume, dental, skin care, hair care, oral, facial & eye with its regulatory aspects
MPH 205P	Pharmaceutics Practical II	1. Understand and evaluate the effect of various factors on development offormulation of drug. 2. Compile and apply different types of in vitro dissolution studies of drug formulation and its comparison with marketed product. 3. Analyze and understand the techniques in ex vivo and in situ evaluation of the formulation for its performance. 4. Demonstrate and understand various software's in optimization of the formulation 5. Outline and learn various in silico methods used in formulation development and optimization. 6. Demonstrate and apply the formulation knowledge and skills in development of herbal formulations.
Department: Pharmaceutical Quality Assurance		
MQA 201T	Hazard and Safety Management	1. Understand the environment related problem and find remedies to combat them. 2. Develop and ensure safety standards in pharmaceutical industry.

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		3. Impart basic knowledge and comprehensive study on safety management. 4. Execution of different innovative methods for different types of hazard management system. 5. Design method of hazard assessment, procedure and methodology for safe industrial atmosphere.
MQA 202T	Pharmaceutical Validation	1. Explain the concepts, importance, scope types, methodology and application of calibration, qualification and validation activities in pharma industry 2. Prepare protocols for qualification and validation of instruments, facilities and processes as per guidelines. 3. Explain the importance of patent and intellectual property rights 4. Suggest methodology for qualification of laboratory, analytical and manufacturing equipments. 5. Suggest methodology for validation of utilities, analytical methods, cleaning methods, computerized systems and manufacturing processes of various dosage forms.
MQA203T	Audits and Regulatory Compliance	1. Explain methodology of auditing in different department of pharmaceutical industry like production, vendor, microbiological laboratory, quality assurance 2. Illustrate CGM's practices and regulation of production department, microbiological department, quality assurance & engineering department 3. Understand the process of carry out audit in department like production, quality assurance and different laboratory of pharmaceutical industry. 4. Understand preparation of audit report and check list of auditing which is required by various department of pharmaceutical industry like vendor, production, packaging, laboratory, quality assurance etc. 5. Understand the role and importance of Quality systems and audits in pharmaceutical manufacturing environment, auditing of vendors & production department, auditing of microbiological laboratory and auditing of quality assurance & engineering department.
MQA 204T	Pharmaceutical Manufacturing Technology	1. To understand and discuss legal requirements, plant layout provisions and production planning in pharmaceutical industry. 2. To describe aseptic process technology, requirements for advanced sterile product manufacturing and process automation in sterile manufacturing and extrapolate to all parenteral products. 3. To elaborate non-sterile manufacturing process technology with reference to tablets and capsules, to illustrate improvements in their production and to analyze problems during tablet coating.

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		4. To distinguish sterile product manufacturing and non-sterile product manufacturing technology. 5. To classify and compare different containers and closures for pharmaceuticals and to correlate stability aspects of packaging materials. 6. To understand and apply principles of Quality by Design (QbD) and Process Analytical Technology (PAT) in pharmaceutical manufacturing.
MQA205P	Pharmaceutical Quality Assurance Practical II	1. Perform qualitative and quantitative analysis of certain pharmaceutical contaminants and drugs 2. Analyze and validate pharmaceutical facilities, processes, methods and equipment 3. Study qualification of pharmaceutical equipment 4. Create checklist for pharmaceutical facilities 5. Design plant layout for sterile and nonsterile products 6. Perform case study on certain quality management tools.
Department: Pharmaceutical Chemistry		
MPC 201T	Advanced Spectral Analysis	1. Understand, discuss and determine in detail the theory and principle of chromatography and hyphenated techniques, Thermal methods of analysis, Bioassay, ELISA, Radioimmuno assay, ATR-IR. 2. Explain, discuss, and demonstrate in details the instruments of above technique. 3. Understand, discuss and compare the applications of instruments. 4. Understand, discuss, interpret and elucidate the data of Woodward Fieser rule and IR, NMR, Mass, DSC, DTA TG, Interpretation of organic compounds.
MPC 202T	Advanced Organic Chemistry - II	1. Apply the principles and techniques of green chemistry in synthesis of organic compounds. 2. Synthesize chiral compounds using various methods of asymmetric synthesis based on the stereochemistry. 3. Use different methods of catalysis and catalysts in synthesis of organic compounds. 4. Apply the principles of photochemical and pericyclic reactions 5. Apply the techniques of peptide synthesis.
MPC 203T	Computer Aided Drug Design	1. To utilize various molecular modeling software in the design of novel drug-like molecules. 2. To apply the various software for physicochemical property prediction. 3. To understand how current drugs were developed by using pharmacophores modeling and docking technique. 4. To study Case studies in Molecular Modeling to apply those in the development of novel entities by the use of computer-aided drug design. 5. Discuss the History, different techniques, and

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		applications of Computer-aided drug design & apply them to determine routes for designing new molecules. 6. To know the history, physicochemical parameters, applications, and statistical methods used to develop QSAR &apply these concepts in developing the best QSAR model.
MPC 204T	Pharmaceutical Process Chemistry	1. Assess Synthetic strategy Stages of process in Bench, pilot and large scale. 2. Outline Industrial Safety MSDS (Material Safety Data Sheet and Personal ProtectionEquipment (PPE) Fire hazards, Occupational Health & Safety.Assessment Series 1800(OHSAS-1800) and ISO-14001 3. Classify Extraction Filtration Distillation Evaporation Crystallization operations inPharmaceutical process chemistry. 4. Summarize Nitration, Halogenation and Oxidation and Reduction operations inPharmaceutical process chemistry and Case study on industrial reduction process. 5. Select Fermentation used in production of medicine and Reaction progress kinetic analysisuseful for scale-up.
MPC 205P	Pharmaceutical Chemistry Practical -II	1. Compare synthesis of API's / intermediates by different synthetic routes and use various approaches for synthesis of organic compounds. 2. Synthesize organic compounds using microwave technique 3. Design drug molecules using computer aided drug design. 4. Interpret and characterize synthesized organic compounds using FT–IR, NMR, CNMR and Mass spectra 5. Describe, discuss and compare study of synthesis of APIs/intermediates by different synthetic routes and assignments on regulatory requirements in API. 6. Describe, discuss, explain and demonstrate calculation of ADMET properties of drug molecules and its analysis using softwares Pharmacophore modelling, 2D–QSAR based experiments, 3D–QSAR based experiments, docking study-based experiment, virtual screening-based experiment
Department: Pharmacology		
MPL 201T	Advanced Pharmacology II	1. 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. 2. Identify the etiological aspects of various infective disorders, be able to classify different drugs used in

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		infective disorders and be able to summarize their pharmacology in relevance to the management of different microbial infections. 3. 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. 4. 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. 5. 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	1. Explain the various types of toxicity studies. 2. Appreciate the importance of ethical and regulatory requirements for toxicity studies. 3. Demonstrate the practical skills require conducting the preclinical toxicity studies. 4. To study Importance and applications of toxicokinetic studies. 5. To study and apply good laboratory practices and its importance in drug development
MPL 203T	Principles of Drug Discovery	1. Outline the various stages of drug discovery. 2. Justify the importance of the role of genomics, proteomics and bioinformatics in drug discovery. 3. Apply the knowledge of various targets, biomarkers and *in vitro* screening techniques for drug discovery. 4. Summarize various lead seeking and lead optimization methods. 5. Integrate the concepts of computer aided drug design in drug discovery.
MPL 204T	Clinical Research and Pharmacovigilance	1. Explain the regulatory requirements for conducting clinical trial. 2. Demonstrate the types of clinical trial designs. 3. Explain the responsibilities of key players involved in clinical trials. 4. Execute safety monitoring, reporting and close-out activities. 5. Explain the principles of Pharmacovigilance. 6. Detect new adverse drug reaction and their assessment. Perform the adverse drug reaction reporting systems and communication in Pharmacovigilance.
MPL 205P	Pharmacological Practical II	1. To demonstrate the biological evaluation of drugs by in vitro and in vivo methods 2. To analyze knowledge how to deal with experimental

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		animals to test the potency of drugs. 3. 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. 4. To develop skills in handling animals and perform and evaluate experiments on them. 5. To calculate and compare experimental observations and results statistically. Student can differentiate between actual experimental results or if these results are due to chance. 6. Manage her / his time effectively by performing pharmacological activity on experimental animals.

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Course Outcomes (COs) for Pharm D.

A.Y. 2019-20

	Subject	Course Outcome
FIRST YEAR PHARM D.		
1.1 T	Human Anatomy and Physiology (Theory)	CO1.Understand Basic terminologies used, prefixes & suffixes used to identify body parts and directional terms as well as relevance and significance to Health Sciences. CO2.Understand various homeostatic mechanisms and their imbalances of various systems. CO3.Understand the coordinated working pattern of different organs of each system. CO4.Understand interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body. CO5.Understand the importance of health education and health promotion.
1.1 P	Human Anatomy and Physiology (Practical)	CO1.Understand the construction, working, care and handling of instruments, glassware's and equipment's required for practical. CO2.Understand the significance of Bleeding time, Clotting time, Blood group detection, Haemoglobin detection and measurement of blood pressure. CO3.Knowledge of mechanism of White Blood Cell Count, Red Blood Cell Count and Erythrocytes Sedimentation rate of blood sample. CO4.Demonstration of various systems with the help of charts and models. CO5.Understand the mechanism of experimental physiology
1.2 T	Pharmaceutics (Theory)	CO1. Integrate the knowledge related to introduction and classification of dosage form, prescription and posology. CO2. Build knowledge about the historical background and development of Pharmacy profession including different pharmacopoeias. CO3. Develop and demonstrate solid dosage form like powders and granules and pharmaceutical calculations related to weights and measures. CO4. Build knowledge of liquid dosage form including both monophasic and biphasic dosage form. CO5. Investigate information related to suppositories and surgical aids. CO6. Develop knowledge related to different galenical products and its extraction processes along with incompatibilities associated with dosage form
1.2 P	Pharmaceutics (Practical)	CO1. Demonstrate the skill of preparation and evaluation of various solid and liquid dosage forms. CO2. Explain principles of formulation and evaluation of dosage forms.

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		CO3. Calculate evaluation parameters like density, specific gravity, angle of repose, carr's index and hausner's ratio of pharmaceutical preparation. CO4. Classify various dosage forms by using different criteria. CO5. Create labels in prescribed manner for various dosage forms. CO6. Build knowledge regarding different types of incompatibilities for safety, efficacy and therapeutic effect of dosage forms.
1.3T	Medicinal Biochemistry (Theory)	CO1.To summarize biomolecules and to conclude, evaluate and discuss chemical nature and biological role of it with concepts in bioenergetics. CO2.To summarize, justify and conclude catalytic role of enzymes, importance of enzyme in inhibitors in design of new drugs, therapeutics and diagnostics applications of enzymes. CO3.To summarize, explain, discuss and compose, synthesis and metabolism of important biomolecules like carbohydrates, lipids, proteins, nucleic acids and the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins. CO4.Understand biological/physiological role, to evaluate and discuss chemical nature, storage, metabolism, biochemical principles. CO5.Identify, interpret, analyze and infer test of organ function tests of kidney, liver, lipid and immunochemical techniques. CO6.To understand, summarize, illustrate and investigation of biomolecules in body fluid.
1.3P	Medicinal Biochemistry (Practical)	CO1.Evaluate and analyze presence of various biomolecules/ normal and abnormal constituents in body fluids using qualitative and quantitative tests. CO2.Understand and analyze the catalytic activity of enzymes and importance of isoenzymes in diagnosis of diseases. CO3.Apply the biochemical principles of organ function tests of kidney, liver and endocrine gland. CO4.Understand importance of levels of various biomolecules in body fluids.
1.4T	Pharmaceutical Organic Chemistry (Theory)	CO1.Explain the physical properties of organic compounds CO2.Identify the structures of a given organic compound and give the nomenclature CO3.Explain the mechanisms involved in various named organic reactions CO4.Illustrate the reactivity, orientation and stability of organic reactions CO5.Identify the products obtained through simple organic reactions CO6.Summarize the studies on some important official organic compounds
1.4 P	Pharmaceutical Organic Chemistry (Practical)	CO1.Compose different classes of organic pharmaceuticals using some named organic reactions with mechanisms CO2.Apply stereo models and explain the structural aspects of organic compounds

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		CO3.Integrate and Analyze the elements in different organic pharmaceuticals by Performing organic qualitative analysis CO4.Identify various classes of organic compounds by systematic qualitative analysis CO5. Analyze various organic pharmaceuticals
1.5 T	Pharmaceutical Inorganic Chemistry (Theory)	CO1.To discuss and explain the principles and procedures of analysis of drugs. CO2.To apply and determine the applications of inorganic pharmaceuticals in analysis of drug. CO3.To discuss the fundamentals of analytical chemistry and examine inorganic pharmaceuticals regarding their monograph. CO4.To justify the importance of inorganic pharmaceuticals in preventing and curing disease. CO5.Knowledge about the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals CO6.To have been introduced to a variety of inorganic drug classes
1.5P	Pharmaceutical Inorganic Chemistry (Practical)	CO1.Perform the limit test for certain impurities like chloride, sulphate, iron, arsenic, lead and heavy metals as per the Indian Pharmacopoeia CO2.Determine percentage purity of given pharmaceutical drugs by titrimetric analysis CO3.Perform qualitative analysis of given inorganic mixtures. CO4.Identify the Inorganic compounds through various chemical tests. CO5.Know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals CO6.Use different methods for preparation of Inorganic substances
	SECOND YEAR PHARM D.	
2.1T	Pathophysiology (Theory)	CO1.To understand the process of cell injury by various etiological agents, morphology of cell injury and cellular adaptations. CO2.To summarize the events of acute and chronic inflammation and to relate them to the process of wound healing. CO3.To apply the knowledge of immune tolerance and Human Leucocytic antigen system in understanding the process of organ transplantation, autoimmunity and hypersensitivity reactions. CO4.To assess the need of balanced diet and the effect of radiation and air pollution on human body. CO5.To appraise the principles of physical, chemical and biologic carcinogenesis and to evaluate the pathological changes observed in a cancer tissue. CO6.To adapt the principles of cell injury, inflammation and immune pathology in understanding pathogenesis of various disease states and their clinical features and complications.

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2.2T	Pharmaceutical Microbiology (Theory)	CO1.To list the branches, scope of microbiology and morphology of microbes. CO2.To explain the methods of identification, cultivation and preservation of various microorganisms. CO3.To apply the principles of sterilization in pharmaceutical processing and sterility testing. CO4.To compare different types of immunological reactions, antigens, vaccines and their role in immunity. CO5.To evaluate microbiological standards of pharmaceuticals and presence of pathogens. CO6.To elaborate the characteristics, mode of infection, diagnosis, prophylaxis and treatment of bacterial, fungal and viral infectious agents.
2.2P	Pharmaceutical Microbiology (Practical)	CO1.To recall different techniques of sterilization and equipment used in microbiology laboratory. CO2.To interpret characteristics of microbes using staining techniques, isolation methods and quantitative estimation. CO3.To construct standard graphs for estimating antibiotics and vitamins using microbes. CO4. To test for possible microbial contamination in a given sample. CO5.To estimate qualitatively and quantitatively the amount of microbes in a sample. CO6.To choose the correct method for evaluating the microbes by serological and bacteriological methods.
2.3T	Pharmacognosy&Phytopharmaceuticals (Theory)	CO1.Develop and design agricultural & storage requirement of crude drugs & explain detailed pharmacognostic account of medicinal plants CO2.Develop and design the technique for extraction, isolation, purification of phytoconstituents for medicinal, agricultural, food & healthcare industry CO3.Design & explain various methods for determination of authenticity of crude drugs, extracts, phytoconstituents, formulations & detect their adulteration CO4.Develop to design a method for analysis, detection, purification of various extracts, phytoconstituents& herbal raw materials. CO5.Correlate various techniques involved in extraction, isolation, estimation & application of phytoconstituents
2.3P	Pharmacognosy&Phytopharmaceuticals (Practical)	CO1.Illustrate the anatomical architecture of various crude drugs & its significance for the plants & for its analysis CO2.Correlate the various staining reagents required for the authentication of crude drugs during microscopy CO3.Design various analytical parameters required for the authentication of crude drugs, extracts, Oils etc. CO4.Judge various crude drugs on the basis of their morphological &microscopical Studies. CO5.Evaluate the purity &/Or stability of various unorganized crude drugs & oils.

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2.4T	Pharmacology-I (Theory)	CO1.Relate pharmacokinetics and pharmacodynamics of a drug with drug action CO2.Identify the factors modifying drug action CO3.Assess drug interactions and detect adverse drug reactions CO4.Classify and explain the pharmacology of drugs acting on various systems CO5.Apply the basics of pre-clinical and clinical evaluations in the development of new drugs
2.4P	Pharmacology-I (Practical)	CO1. Utilize and handle the Experimental animals CO2.Assess and handle the computerized simulated software programme such as COLPHARM CO3. Compare the effects of various drugs on animals CO4.Test and Utilize the instruments used in experimental Pharmacology CO5.Recommend physiological salt solutions for different isolated tissues CO6.Apply different routes of drug administration and the techniques of Euthanasia and analgesia in laboratory animals
2.5T	Community Pharmacy (Theory)	CO1.Identify drug discuss the roles and responsibilities of community pharmacist CO2.Outline the layout and infrastructure requirements for community pharmacy CO3.Recognize the need of inventory control and discuss the various methods CO4.Discuss the factors affecting medication adherence CO5. Perform general patient counselling CO6. Apply health screening services in community pharmacy
2.6T	Pharmacotherapeutics-I (Theory)	CO1. To recall the pathophysiology of cardiovascular disorders and relate their etiology with the therapeutic approach including treatment controversies. 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. 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. CO4. To distinguish between various disease conditions and analyze the results with drug induced disorders. CO5. To select the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy among pediatric, geriatric, pregnant and lactating women. CO6. To develop competency to design individual care plan for cardiovascular, respiratory, ocular and hormonal disorders.
2.6P	Pharmacotherapeutics-I (Practical)	CO1.To list the sign and symptoms, laboratory parameters of the cardiovascular diseases. CO2.To identify the drug interactions and find a solution to overcome drug interactions in the given prescriptions. CO3.To plan an individual care plan in the cases with endocrine and thyroid disorders.

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		CO4.To analyze the prescription for rational drug use. CO5.To explain the safety of oral contraceptives, hormone replacement therapy and the drugs used on ocular disorder CO6.To minimize the drug related problems in the prescriptions and to choose a choice of drugs in various diseases.

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Course Outcomes

Academic Year 2018-19

Course Outcome (COs) for B. Pharmacy A.Y.2018-2019

Semester	Subject Name	COs
First Year Sem I 2018 pattern		
BP101T	HUMAN ANATOMY AND PHYSIOLOGY I–T	1. To summarize the basic knowledge of importance of Human Anatomy and Physiology in pharmacy field. 2. To outline the Introduction to human body, Cellular level of organization, Tissue level of organization 3. To summarize Integumentary system, Skeletal system, Joints, Body fluids and blood, Lymphatic system and Cardiovascular system 4. To summarize Peripheral nervous system: Special senses
BP102T	PHARMACEUTICAL ANALYSIS I – T	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
BP103T	PHARMACEUTICS I – T	1. Demonstrate skill of preparation and evaluation of various solid,liquid and semisolid dosage forms. 2. Explain principles of formulation and evaluation of powder preparations 3. Calculate evaluation parameters like density, specific gravity, angle of repose, Carr's index and Hausner ratio of pharmaceutical preparations. 4. Classify the various dosage forms by using different criteria 5. Create labels in prescribed manner for various dosage form.
BP104T	PHARMACEUTICAL INORGANIC CHEMISTRY T	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 4. inorganic drugs and pharmaceuticals. 5. Derive acids, bases, buffers, water and different GIT agents and recall the fundamental principles of them 6. Develop the medicinal used of topical agents, gases and vapors', dental products, pharmaceuticals aid and radio pharmaceuticals. 7. Integrate about the major intra and extra cellular electrolytes, essential and trace elements, cationic and anionic components of inorganic drugs.
BP105T	COMMUNICATION SKILLS – T *	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 extra curricular activities

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		6. To develop graduates with ethics, morals and social sense and decision making
BP106RBT	REMEDIALBIOLOGY/	1. To study and understand the fundamental concepts of the structural and functional systems of plants and animals. 2. To understand the principle of classification and salient features of plant and animal kingdom. 3. To understand macro and micromorphology and phytochemistry of medicinal plants. 4. To study and understand the basic concept of human anatomy and physiology 5. To understand the interdisciplinary significance of biological concepts for pharmaceutical studies.
BP106RMT	REMEDIAL MATHS –T*	
BP107P	HUMAN ANATOMY AND PHYSIOLOGY –P yelmar	1. To summarize the basic knowledge of importance of Human Anatomy and Physiology in pharmacy field. 2. To be able to apply knowledge of microscope (types, uses, care and handling of microscopes) to study epithelial, connective tissue, muscular and nervous tissue, human skeleton (axial), human skeleton (appendicular). 3. To develop practical skill in Students convergent with the techniques for identification, counting, estimation of various integral components of the body such as RBC count, WBC count and haematological studies 4. To develop practical skill in Student to determine blood group, clotting time, bleeding time. hemoglobin content, erythrocyte sedimentation rate,heart rate and pulse rate, blood pressure.
	PHARMACEUTICAL ANALYSIS I –P	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
BP109P	PHARMACEUTICS I – P	1. Illustrate history of pharmacy, development of pharmacy profession and industry in India. 2. Explain and evaluate different preparation like powders, monophasic-biphasic liquid dosage form, semisolid dosage form and suppositories 3. Define & classify physical, chemical and therapeutic incompatibilities with examples. 4. Summarize the factors influencing formulation of various dosage forms like solution, to predict the choice of route of administration based on dosage form and to define preformulation, describe various preformulation parameters and define additives with its examples
BP110P	PHARMACEUTICAL INORGANIC CHEMISTRY –P	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

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		pharmaceuticals. 4. Invent the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals
BP111P	COMMUNICATION SKILLS – P*	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.
BP112RBP	REMEDIAL BIOLOGY – P*	1. To Discuss various experiments in biology. 2. To summarized cell and its inclusions. 3. To discuss various parts of plant and explain modification of it. 4. To discuss bones of human system. 5. To summarize the significance of blood group, blood pressure & tidal volume.
First YearSemester II		
BP201T	HUMAN ANATOMY AND PHYSIOLOGY II – T	1. Students will be able to organize the gross morphology, structure and function of various organs of the human body. 2. Student will be able to differentiate the various homeostatic mechanism and their imbalances 3. Student will be able to identify the various tissue and organs of different systems of the human body 4. Students will be able to design the hematological tests like blood cell counts, hemoglobin estimation, bleeding/ clotting time etc and also record blood pressure, heart rate, pulse and respiratory volume. 5. Student will be able to construct the model based on coordinated working pattern of different organs of each system 6. Student will be comparing the interlinked mechanism in the maintenance of normal functioning (homeostasis) of human body.
BP202T	PHARMACEUTICAL ORGANIC CHEMISTRY I-T	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	1. To summarize biomolecules and to conclude, evaluate and discuss chemical nature and biological role of it with concepts in bioenergetics. 2. To summarize and compose carbohydrate metabolism and biological oxidation 3. To integrate, compose, explain and discuss lipid metabolism 4. To compose, assess, explain and discuss amino acid metabolism

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		5. To integrate, discuss and summarize nucleic acid metabolism and the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins 6. To summarize, justify and conclude catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes
BP204T	PATHOPHYSIOLOGY – T	1. Define medical terminology with respect to pathophysiology aspects. 2. Discuss the etiology and pathogenesis of various diseases on different organ systems. 3. Relate and analyze the clinical manifestations to pathophysiology of various diseases 4. Describe the diagnosis of various diseases
BP205T	COMPUTER APPLICATIONS IN PHARMACY – T *	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 SCIENCES – T *	1. Create awareness about environmental problems among 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 –	1. To be able to demonstrate integumentary and special senses, nervous and endocrine using specimen model 2. To be able to analyze neurological examination, function of olfactory nerves, visual and reflex activity and total blood count 3. To be able to distinguish the techniques for recording body temperature, basal mass index 4. Students will be able to interpret knowledge of various human system like digestive, respiratory, cardiovascular, urinary and reproductive system 5. Students will be able to examine various devices like pregnancy diagnostic test and family planning 6. Students will be able to compare the detailed information about the human body.
BP208P	PHARMACEUTICAL ORGANIC	1. Integrate the reaction, Possess knowledge and synthesis of organic compounds

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	CHEMISTRY I– P	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
BP209P	BIOCHEMISTRY – P	1. Assess the fundamentals of Separate, Identify and Characterize Proteins, amino acid Carbohydrates 2. Compare metabolism Pathway of Proteins, Lipids, Carbohydrates and vitamins 3. Measure various method of bio analytical sample identification 4. Test of glucose, fructose, galactose, ribose, lactose, maltose, sucrose, starch, glycogen in the given sample
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 2015 pattern SEMESTER-III		
2.3.1 T	PHYSICAL PHARMACEUTICS-I (THEORY)	1. Integrate and apply basic knowledge and principles of physical pharmacy as they used for development and assessment of various types of drug delivery systems 2. Demonstrate basics involved in existence and coexistence of states and phases, solutions of electrolytes and nonelectrolytes, solubility and distribution phenomenon 3. Demonstrate ability to develop critical thinking and problem solving required to address problems related toaddress problems related to dosage form design 4. Recognize and Apply basic rules and equations regarding physical principles essential for pharmaceutical applications. 5. Apply rationally the principles in choosing adjuvants used for delivery and in formulation of biologically active molecules 6. Demonstrate a wide background in physical pharmaceutical principles essential for their pharmacy study in the next years
2.3.1 P	PHYSICAL PHARMACEUTICS-I (PRACTICAL)	1. Exercise different pharmaceutical laboratory procedures used in determining various physical properties such as Solubility, adsorption and partition coefficient 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

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		preformulation and formulation point of view 5. Employ proper documentation system to record observations and analyze information gathered through experimentation
2.3.2 T	PHARMACEUTICAL MICROBIOLOGY (THEORY)	1 The Learner will be able to design models by applying microbiology knowledge 2 The Learner will be able to develop and demonstrate different methods for isolation, characterization, cultivation, multiplication, counting and identification of microbes i.e. bacteria, yeast, moulds, & virus. 3 The Learner will be able to design and demonstrate validation of sterilization process; calibration and OQ of sterilization equipments, also acquire knowledge about Preservation and Disinfection 4 The Learner will be able to build microbiological laboratory safety and Microbial limit test protocols 5 The Learner will be able to integrate knowledge related to basic principal of immunology, antigen-antibody reaction with its application 6 The Learner will be able to modify process for production and quality control of vaccine and sera
2.3.2 P	PHARMACEUTICAL MICROBIOLOGY (PRACTICAL)	1. The Learner will be able to design sterility testing and minimum inhibitory conc. Protocols. 2. The Learner will be able to derive Staphylococcus aureus, E. Coli and salmonella 3. The Learner will be able to develop process for determination of total viable count and microbial assay 4. The Learner will be able to construct laboratory Equipment like compound light microscope, Autoclave, Incubator and Laminar air flow. 5. The Learner will be able to create and sterilize nutrient broth and nutrient agar and also develop aseptic technique of inoculation with identification of motility of *Pseudomonas aeruginosa* 6. The Learner will be able to modify different staining techniques to demonstrate morphology of bacteria.
2.3.3 T	PHARMACEUTICAL BIOCHEMISTRY (THEORY)	1. Assess the fundamentals Pharmaceutical Biochemistry 2. Summarize metabolism Pathway of Proteins, Lipids, Carbohydrates 3. Categorize various sample and bio analytical sample identification techniques 4. Outline role of glucose, fructose, galactose, ribose, lactose, maltose, sucrose, starch, glycogen, hyaluronic acid and heparin
2.3.3 P	PHARMACEUTICAL BIOCHEMISTRY (PRACTICAL)	1 Assess the fundamentals of Separate, Identify and Characterize Proteins, amino acid Carbohydrates 2 Compare metabolism Pathway of Proteins, Lipids, Carbohydrates and vitamins 3 Measure various method of bio analytical sample identification 4 Test of glucose, fructose, galactose, ribose, lactose, maltose, sucrose, starch, glycogen in the given sample

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2.3.4 T	PHARMACEUTICAL ORGANIC CHEMISTRY-III (THEORY)	1. Conclude relevance of stereochemistry & its significance in Pharmaceutical Sciences. 2. Summarize rules and choose proper conformation & configuration for assigning them by building various projection formulas &by generating their interconversions. 3. Assess various conformations of ethane, butane, cyclohexane and substituted cyclohexane and compare stability in between them. 4. Comprehend & summarize basic concepts in pericyclic reactions. 5. Summarize the chemistry of carbohydrates and amino acids, methods of preparation and underlying concepts. 6. Summarize reaction, mechanism, stereochemistry, applications of name rearrangement reactions & decide, justify proper interacting species in given predict the product equation.
2.3.4 P	PHARMACEUTICAL ORGANIC CHEMISTRY-III (PRACTICAL)	1 Synthesize the organic compounds based on rearrangement reaction and decide reaction & build mechanism behind it. 2 Summarize principle and design procedure involved in column chromatographic separation techniques and TLC, support it in purification of organic compounds. 3 Summarize principle behind various qualitative tests and integrate them in the identification of given unknown binary organic compounds having different functional groups. 4 Summarize principles and mechanism in each confirmatory test for identification of various organic compounds, 5 Separate and evaluate unknown organic compound by qualitative Analysis.
2.3.5 T	PHARMACOLOGY –I (THEORY)	1 Compare various routes of drug administration and dosage forms. 2 Judge various terms and factors that influence the pharmacokinetics and Pharmacodynamics. 3 Build the concept of discovery and development of New drugs-Preclinical and clinical studies. 4 Develop and create an understanding of various concepts of pharmacodynamics 5 Integrate the knowledge of various principles of therapeutics 6 Summarize various physiological factors influencing pharmacodynamics
2.3.6 T	PHARMACOGNOSY & PHYTOCHEMISTRY-I (THEORY)	1. To summarize the basic knowledge and importance of pharmacognosy & phytochemistry-I in pharmacy field 2. To assess the basic knowledge of primary & secondary metabolites. Including Carbohydrates, lipids, proteins, enzymes & natural fibers, Glycosides & Tannins etc. 3. To discuss the production of glycosides & tannins in plants, other organism & to contribute their significance as medicinal molecules. 4. To justify the basic knowledge regarding qualitative/ quantitative analysis of primary and secondary metabolites.
2.3.6 P	PHARMACOGNOSY & PHYTOCHEMISTRY-I (PRACTICAL)	1. To develop techniques of preparation of permanent slides 2. Understand, analyze and differentiate between various natural fibres 3. Understand,analyze and differentiate between starches obtain from various sources

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		4. Gain hand on skills of extraction, isolation and purification of pectin and mucilage 5. Hands on skills of preparation and evaluation of permanent microscopic slide in order to boost entrepreneurial talent
	ENVIRONMENTAL SCIENCES	1. Create awareness about environmental problems among 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
Second year SEMESTER-IV		
2.4.1 T	PHYSICAL PHARMACEUTICS-II (THEORY)	1. Integrate and apply basic knowledge and principles of physical pharmacy as they used for development and assessment of various types of drug delivery systems 2. Demonstrate basics involved in existence and coexistence of states and phases, solutions of electrolytes and nonelectrolytes, solubility and distribution phenomenon 3. Demonstrate ability to develop critical thinking and problem solving required to address problems related toaddress problems related to dosage form design 4. Recognize and Apply basic rules and equations regarding physical principles essential for pharmaceutical applications. 5. Apply rationally the principles in choosing adjuvants used for delivery and in formulation of biologically active molecules 6. Demonstrate a wide background in physical pharmaceutical principles essential for their pharmacy study in the next years
2.4.1 P	PHYSICAL PHARMACEUTICS-II (PRACTICAL)	1. Exercise different pharmaceutical laboratory procedures used in determining various physical properties such as surface tension, viscosity, order of reaction 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
2.4.2 T	PATHOPHYSIOLOGY AND CLINICAL BIOCHEMISTRY (THEORY)	1. To summarize basic knowledge of importance of pathophysiology and clinical biochemistry in pharmacy field 2. Integrate the knowledge of etiology and pathogenesis of various diseases on different organ system. 3. Compare to conclude the clinical manifestations to pathophysiology of various diseases 4. Generate an understanding of the pathogenesis and diagnosis of various diseases using modern tools 5. Justify and summarize pathological change with physiological

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		data.
2.4.2 P	PATHOPHYSIOLOGY AND CLINICAL BIOCHEMISTRY (PRACTICAL)	1. To summarize basic knowledge of importance of pathophysiology and clinical biochemistry in pharmacy field 2. To apply the basic knowledge of application, maintenance and uses of various instruments in clinical biochemistry and techniques of biological fluid collection and separation. 3. Able to measure various estimation of function tests for liver, kidney and heart diseases and erythrocyte sedimentation rate. 4. To summarize basic knowledge of basics of histology, determination of arterial blood gas, serum c reactive protein, blood glucose level. To outline basic knowledge of blood bank.
2.4.3 T	PHARMACEUTICAL ORGANIC CHEMISTRY-IV (THEORY)	1. Recall structures, numbering, and examples of drugs containing heterocyclic rings, methods of preparation, chemical reactions and mechanisms of name reactions of some heterocyclic polycyclic rings. 2. Recall and infer various reagents used in particular organic synthesis, their methods of preparation, reactions and application. 3. Explain various techniques of combinatorial chemistry and understand applications of combinatorial chemistry in the speedy synthesis of organic compounds and peptides 4. Recall general rules and guidelines involved in retro-synthesis, analyze, plan & construct retrosynthetic pathway of pharmaceutically important compounds. 5. Outline the basics in microwave assisted synthesis and discuss applications of microwave assisted synthesis in pharmaceutical research.
2.4.3 P	PHARMACEUTICAL ORGANIC CHEMISTRY-IV (PRACTICAL)	1. Synthesize various heterocyclic compounds and explain reaction, mechanism behind it. 2. Explain the principle behind various qualitative tests and analyze the given unknown binary organic compounds having different functional groups. 3. Perform quantitative determination of different reactive groups. 4. Demonstrate microwave assisted reaction of organic compounds.
2.4.4 T	PHARMACEUTICAL ANALYSIS-II (THEORY)	1. Assess the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs 2. Select a quality control of chemicals, drug intermediates, APIs, excipients, pharmaceutical formulations and cosmetic products 3. Summarize various volumetric and electrochemical titrations 4. Outline end point of various electro chemicals analysis and oxidation and reduction reaction
2.4.4 P	PHARMACEUTICAL ANALYSIS-II (PRACTICAL)	1. Support the fundamental of analytical chemistry and principles of electrochemical analysis of drugs 2. Evaluate a purity of some pharmaceutical substances by conductometric titrations 3. Select pKa of some monobasic, dibasic or tribasic acids of pharmaceutical importance 4. Measure optical rotation and specific optical rotation of some sugars

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2.4.5 T	PHARMACOGNOSY &PHYTOCHEMISTRY-II (THEORY)	1. To summarize the basic knowledge of importance of pharmacognosy and phytochemistry field 2. To assess the crude drugs in detail, chemical nature, chemical constituents, cultivation and collection and uses. 3. To apply and demonstrate the basic knowledge on alkaloids, explain sources, describe methods of their extraction, qualitative and quantitative analysis of alkaloids 4. To apply and demonstrate the basic knowledge on terpenoids, classify, explain source, qualitative and quantitative analysis of terpenoids and resins
2.4.5 P	PHARMACOGNOSY & PHYTOCHEMISTRY-II (PRACTICAL)	1. Explain and understand the principle, assembly, working and application of clavenger and soxhlet apparatus for extraction. 2. Classify and analyze various herbal volatile oils 3. Develop and explain the morphology and microscopy of intact crude drug and also characterize the crude drugs in their powder form 4. Design method for extraction, isolation and purification of caffeine and reserpine 5. Design and hands on skill of isolation and purification of eugenol from clove oil.
2.4.6 T	PHARMACEUTICAL ENGINEERING	1. Define drying, crystallization, evaporation, heat transfer, mass transfer distillation, corrosion and know the mechanism, theory and factors affecting it. 2. Illustrate types of drying crystallizer, evaporation, heat transfer, flow of fluids, distillation, corrosion, mass transfer 3. Study the principle, theory, mechanism, working and construction of equipment's of different unit operations. 4. Illustrate fundamental and facts about flow of fluids, mass transfer, heat transfer and corrosion 5. Describe types of distillation and corrosion, their mechanism with appropriate diagrams.
Third year 2015 SEMESTER - V		
3.5.1 T	INDUSTRIAL PHARMACY –I (THEORY)	1. Summarise the concept of solid dosage form design and formulation strategies 2. Formulate tablets and capsules as a solid dosage forms, manufacture and evaluation 3. Integrate the concepts, pharmacopoieal specifications, techniques and equipments used in tablets, tablet coatings and capsules 4. Build the tablet coating process and evaluate parameters of coated tablets 5. Develop tablet manufacture, tablet coating and capsules manufacture by analysing critically the problems/defects involved and select possible remedies to them 6. Summarise the concept of scale up and technology transfer
3.5.1 P	INDUSTRIAL PHARMACY –I (PRACTICAL)	1. Formulate and evaluate uncoated tablets, coated tablets and capsules 2. Design formulations on the basis of necessary calculations and evaluate it 3. Justify the role of ingredients and their quantity in formulation and category of formulation

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		4. Decide the use of appropriate equipment and select the apparatus needed for the particular preparation 5. Design labels to suit regulatory requirements and select proper packaging (container and closure) and labelling materials for preparations 6. Summarise pharmaceutical plant layout and demonstrate product details
3.5.2 T	PHARMACEUTICAL ANALYSIS –III (THEORY)	1. Integrate and assess the different types of instrumental analytical techniques available for quality control of APIs & Pharmaceutical dosage forms. 2. Choose and evaluate the various sampling techniques employed in analysis of solid, semisolid and liquids dosage forms 3. Develop the understanding regarding principles, instrumentation and applications of absorption spectroscopy techniques such as UV-VIS, Fluorimetry, Atomic absorption spectroscopy 4. Integrate and summarize the various analytical techniques such as atomic emission spectroscopy, Flame photometry, Phosphorimetry and Nepheloturbidimetry.
3.5.2 P	PHARMACEUTICAL ANALYSIS –III (PRACTICAL)	1. Integrate and independently able to operate, calibrate various analytical instruments for the assay of various APIs and formulations as per Pharmacopoeial standards 2. Generate and judge the beer's law limit and calculate different absorptivity constants 3. Derive the value of λmax by calculating Woodward rule 4. Develop and perform assay of APIs and formulations by UV Spectrophotometry, fluorimetry and Nepheloturbidimetry 5. Derive and estimate the concentration of Na, K, Ca, Li from Pharmaceutical formulations by flame photometry
3.5.3 T	MEDICINAL CHEMISTRY –I (THEORY) PNS	1. Explain and relate physicochemical properties with action of drug. 2. Define; explain types and applications of bioisosterism 3. Understand receptor types and forces involved in drug receptor interactions 4. Evaluate the chemistry of drugs with respect to their pharmacological activity. 5. Summerize the mechanism pathways of different class of medicinal compounds. 6. Derive and understand the structural activity relationship of different class of drugs. 7. Understand biosynthesis of Adrenaline and Acetyl choline
3.5.3 P	MEDICINAL CHEMISTRY –I (PRACTICAL)	1. Understand techniques of purification of solvents by fractional distillation and vacuum distillation 2. Derive synthesis of hydrochloric acid and phosphoric acid salt of piperazine 3. Evaluate partition coefficient and dissociation constant of medicinal compounds 4. Understand technique of Thin Layer Chromatography and Column Chromatography 5. Perform synthesis and purification by recrystalization of medicinal

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		compounds for ex sulfanilamide, 1, 2, 3, 4-tetrhydrocarbazole etc
3.5.4 T	PHARMACOLOGY –II (THEORY)	1. Describe, explain and summarize the specific knowledge related to the different classes of drugs, and important distinctions among members of each class, in relation to the organ systems they affect, and the diseases for which they are used therapeutically 2. Classify and summarize the drugs and diseases of autonomic nervous system and understand general pharmacology. 3. Describe various adrenoreceptor and cholinoreceptor, Classify their subtype and the clinical spectrum of their agonist and antagonist. 4. Students can able to describe the agent that stimulate or relax skeletal muscle, including the cholinergic neuromuscular agonist and antagonist. 5. Summarize, classify and apply epidemiology, etiology, pathophysiology sign and symptoms, diagnosis, complications, treatment and management of disease like Hypertension, Coronary Heart disease Congestive heart failure, Cardiac arrhythmias. 6. Explain and outline correlation of pharmacology with related medical sciences
3.5.4 P	PHARMACOLOGY –II (PRACTICAL)	1. Summarize different types of experimental animals and instruments used in experimental pharmacology. 2. Design the in-vitro bioassay technique. 3. Demonstrate different simulated pharmacological screening experiments 4. Analyze the results in evaluation of preclinical studies of drugs.
3.5.5 T	ANALYTICAL PHARMACOGNOSY & EXTRACTION TECHNOLOGY (THEORY)	1. Explain the source, active constituents and uses of crude drugs. 2. Discuss the application and extraction methods of phytochemicals. 3. Summarized the principle & applications of chromatography & non chromatographic separation methods for natural products. 4. Summarize the various analytical techniques used for herbal drug analysis. As per WHO.
3.5.5 P	ANALYTICAL PHARMACOGNOSY & EXTRACTION TECHNOLOGY (PRACTICAL)	1. Evaluate crude drug based on pharmacognostic & physicochemical analysis. 2. Discuss the various extraction techniques used for herbal drug analysis 3. Summarize various chromatographic & non chromatographic separation methods for natural phytoconstituents analysis. 4. Discuss the meaning & the significance of 'Good Laboratory Practices' learn in theory& demonstrate through laboratory behavior.
3.5.6 T	PHARMACEUTICAL BUSINESS MANAGEMENT & DISASTER MANAGEMENT (THEORY)	1. Explain the basic knowledge of fundamentals of management. 2. Apply fundamentals of setting objective, plan, organize, make decision and control activities. 3. Illustrate the basic knowledge pharmaceutical marketing. 4. Illustrate the basic knowledge human resource development. 5. Define requirements and role of medical representative.

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		6. Illustrate preparedness and mitigation of disasters.
3.5.7 T	ACTIVE PHARMACEUTICAL INGREDIENTS TECHNOLOGY (THEORY)	1. Discuss overview of API and fine chemical industry & basics of chemical process kinetics, some classes of reactions with examples of API for each unit process. 2. Explain techniques and process of synthetic routes and optimization of reactions, raw material & reagent selection, scale up techniques for APIs, Quality control aspects, material safety data sheet (MSDS), Scale up techniques in API manufacturing, environmental aspects in manufacturing of APIs, green chemistry approaches, health hazards with chemical handling. 3. Summarize Chirality in API industry with some examples. 4. Summarize principle, industrial process, select scale up techniques, choose Industrial manufacturing process & design flow charts of some important APIs. 5. summarize Quality assurance (QA) and quality control (QC) of APIs and GMP Guidelines in API manufacturing like ICH Q7, Q7A and Q11 & recommend them in determining quality of API.
Third year SEMESTER -VI		
3.6.1 T	INDUSTRIAL PHARMACY –II (THEORY)	1. Summarise concept of disperse system, its classification, types and judge its stability 2. Design formulation, manufacturing and evaluation of suspension and emulsion 3. Design formulation, manufacturing and evaluation of semisolids 4. Choose and recommend layout for manufacturing and select manufacturing equipment for suspension, emulsion and semisolids 5. Design labelling of suspension, emulsion and semisolids; select proper packaging and recommend proper storage 6. Summarise scale up and technology transfer for disperse system
3.6.1 P	INDUSTRIAL PHARMACY -II (PRACTICAL)	1. Design formulation, manufacturing and evaluation of suspension, emulsion and semisolids 2. Design formulations on the basis of necessary calculations needed to conclude working formula and evaluation tests 3. Justify role of ingredients and its quantity in formulation and summarise respective formulations with its category. 4. Decide the use of appropriate equipment and select the apparatus needed for the particular preparation 5. Convince a logic/rational involved in the development of different semisolid dosage forms of the same drug
3.6.2 T	PHARMACEUTICAL ANALYSIS –IV (THEORY)	1. Develop the understanding of basics of various chromatography techniques such as Column Chromatography, paper chromatography, Thin layer chromatography and HPTLC. 2. Integrate and summerize the brief knowledge on various thermal methods of analysis such asDSC, DTA, TGA, ITC. 3. Develop the understanding regarding knowledge of principles, instrumentation and applications of various chromatographic, thermal, X ray Diffraction and radio chemical techniques employed for the analysis of APIs and formulations 4. Integrate and develop the process of validation of analytical instruments and methods as per ICH/USP guidelines
3.6.2 P	PHARMACEUTIC	1. Compose the mobile phase system to separate & determine Rf

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	AL ANALYSIS –IV (PRACTICAL)	values of mixture of amino acids by Ascending, Radial and two dimensional Paper chromatography 2. Develop a mobile phase to separate & determine Rf values of mixture of carbohydrates/amino acids by TLC 3. Design Validation protocol for spectrophotometric assay methods as per ICH guidelines 4. Select and recommend the experiment for analysis of particular sample such as HPTLC/DSC/Electrophoresis
3.6.3 T	MEDICINAL CHEMISTRY –II (THEORY) Anita Malusare	1. Classify local anesthetics 2. Discuss Structure activity Relationship (SAR) and Mechanism of Action (MOA) of Sulfonylurea's as oral hypoglycemic agents 3. Design and development of Benzodiazepines as CNS drugs 4. Describe Scheme of synthesis of certain CNS drugs 5. Analyse Diagnostic agents and anti-migraine 6. Understand metabolism of some medicinal compounds along with application of drug metabolism in drug discovery
3.6.3 P	MEDICINAL CHEMISTRY –II (PRACTICAL)	1. Determining molar refractivity of using refractometer by finding refractive index of medicinal compounds 2. Performing synthesis and purification of medicinal compounds by recrystallization 3. Organic synthesis of certain medicinal compounds using microwave 4. Interpret IR of synthesized compounds 5. Understand technique of steam distillation for separation of compounds
3.6.4 T	PHARMACOLOGY –III (THEORY)	1. Classify and summarize the disease and drug acting on Central nervous system 2. Explain the significance of opioid analgesics and Non steroidal anti-inflammatory Drugs, etc 3. Explain and apply the preferred therapies for the different types of epileptic seizures. 4. Assess the treatment for Anxiety, mania, depression and psychosis 5. Classify, analyze the concepts of, detail study & management of various diseases on respiratory system like-asthma, COPD 6. Classify, analyze the concepts of detail study & management of various diseases on gastrointestinal system like-peptic ulcer Laxative, antidiarrhoeal drugs, Emetics, etc
3.6.4 P	PHARMACOLOGY –III (PRACTICAL)	1. Explain the various alternatives to animal experimentation. 2. Compare various OECD guidelines for acute oral toxicity of drugs. 3. Design the various in-vitro bioassay methods to find out unknown drug concentration 4. Summarize various computerized simulation software programme.
3.6.5 T	NATURAL PRODUCT CHEMISTRY (THEORY)	1. Compose the contribution of natural product used in the drug discovery process. 2. Integrate the significance of nutraceuticals & functional foods. 3. Summarize natural products used as dietary supplements.

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		4. Conclude the source, extraction, processing, chemistry & applications of natural products used in pharmaceutical & allied industry.
3.6.5 P	NATURAL PRODUCT CHEMISTRY (PRACTICAL)	1. Developed isolation of pure natural material using column chromatography. 2. Design various extraction methods & physical constants required in characterization of natural products. 3. Demonstrate and compile records of the UV / IR spectrum of giving natural sample & interpret them. 4. Summarize the evaluation of isolated phytoconstituents by chemical, chromatographic and spectral means.
3.6.6 T	BIOORGANIC CHEMISTRY AND DRUG DESIGN (THEORY)	1. Classify Enzymes: Oxidoreductases: Monoamine Oxidase and Cyclooxygenase-1and 2, HMGCoA reductase, DHFR (Human), DHFR (Bacterial), Transferase: Tyrosine Lysases: DOPA Carboxylase. 2. Classify Isomerases: Thymidylate Synthase (Fungal and Human), Phosphofructokinase (Leishmanial). 3. Assess biochemical features, physiological role and their substrates/antagonists studies. 4. Outline the Topoisomerase-II, reverse transciptase (human and viral). mRNA, rRNA and antisense therapy
3.6.7 T	PHARMACEUTICAL BIOTECHNOLOGY (THEORY)	1. To Summarize the basic knowledge of Biotechnology and its scope in pharmacy integrate 2. To assess knowledge of principles genetic engineering techniques, Hybridoma technology, enzyme immobilization, Fermentation, downstream process in development of Biotechnology derived Products 3. To demonstrate the basic knowledge on cloning, r DNA technology, transformation, transduction, conjugation, plasmids, Mutation, transgenic animals. 4. To assess the basic knowledge regarding use of Recombinant DNA technology, Gene cloning, Types of cloning vector.
Final year 2015 SEMESTER-VII		
4.7.1 T	STERILE PRODUCTS (THEORY)	1. Illustrate the basic knowledge of sterile products with respect to: Preformulation. Formulation parameters with respect to parenteral route of administration. Packaging material as well as packaging technologies. Basic types, formulation and evaluation. 2. Illustrate design of aseptic area, HVAC system. 3. Demonstrate the basic knowledge of lyophilization and its application in sterile product formulation and stabilization. 4. Compare SVPS and LVPs. 5. Compare and classify various types of packaging material. 6. Demonstrate the basic knowledge of blood products, surgical products and parenteral devices.
4.7.1 P	STERILE PRODUCTS (PRACTICAL)	1. Demonstrate the basic knowledge of validation of aseptic area as well as gowning and de-gowning procedure for entry and exit from aseptic area. 2. Analyze packaging components of sterile products.

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		3. Formulate and evaluate SVPs and LVPs as per IP. 4. Formulate and evaluate ophthalmic products as per official compendia. 5. Assess accelerated stability studies and prediction of shelf life. 6. Demonstrate labeling requirements of parenterals, parenterals devices, blood products and surgical.
4.7.2 T	PHARMACEUTICAL ANALYSIS-V (THEORY)	1. To summarize, explain and discuss principle and theory of analytical techniques like Gas chromatography, IR spectroscopy, FTIR, Near IR spectroscopy, Raman spectroscopy, HPLC, UPLC, SEM and TEM. 2. To explain, discuss, integrate and demonstrate instrumentation in Gas chromatography, IR spectroscopy, FTIR, Near IR spectroscopy, Raman spectroscopy, HPLC, UPLC, SEM and TEM. 3. To assess, conclude and summarize use and applications of Gas chromatography, IR spectroscopy, FTIR, Near IR spectroscopy, Raman spectroscopy, HPLC, UPLC, SEM and TEM for separation and identification analysis. 4. To outline, critique, defend and rank Gas chromatography, IR spectroscopy, FTIR, Near IR spectroscopy, Raman spectroscopy, HPLC, UPLC, SEM and TEM. 5. To conclude, analyze, discuss and compare IR with FTIR, Near IR spectroscopy, Raman spectroscopy, HPLC with UPLC and SEM with TEM. 6. To integrate, compile, select and interpret IR ranges of simple organic compounds for structure elucidation
4.7.2 P	PHARMACEUTICAL ANALYSIS-V (PRACTICAL)	1. To design and develop UV spectrophotometric estimation of two-component formulations by simultaneous equation method 2. To design and develop UV spectrophotometric analysis of two component formulations by Q-Method 3. To measure and generate IR spectra of compounds with different functional groups (-COOH, -COOR, - CONHR, -NH2,-NHR, -OH, -CHO, -CO etc.) 4. To integrate, interpret and justify IR-Spectra of aliphatic and aromatic compounds 5. To demonstrate and summarize working of Gas Chromatography /Atomic Absorption Spectrophotometry/ SEM
4.7.3 T	MEDICINAL CHEMISTRY-III (THEORY)	1. Students will be able to make correct use of various equipment's and take safety measures while working in Medicinal Chemistry Laboratory. 2. Students will be able to explain, apply, and justify the principle and theory behind synthesis of compound of our interest. 3. Students will be able to develop skill to synthesize compounds. 4. Students will be able to choose and develop skill to purify synthesized compounds. 5. Students will be able to predict andderive structure of synthesized compoundwith the help of spectroscopic analysis and physicochemical properties.
4.7.3 P	MEDICINAL CHEMISTRY-III	1. Students will be able to recall, apply and illustrate SAR of drugs 2. Students will be able to tell, describe, apply, categorize and

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	(PRACTICAL)	justify of Physiochemical properties of drug molecules in relation to drug ADME. 3. Students will be able to identify, discuss, examine and conclude recent developments in the drug development and discovery. 4. Students will be able to explain, determine, justify and formulate some routes for the chemical synthesis of some drugs. 5. Students will be able to describe, explain the importance of drug design and illustrate different techniques of drug design, for development of new drugs. 6. Students will be able to explain and apply knowledge to guide society and professionals regarding application to making drug therapy decisions.
4.7.4 T	PHARMACOLOGY-IV (THEORY)	1. Describe and apply the fundamental principles of pharmacology and toxicology. 2. Analyze the usage of different chemotherapeutic agent with respect to disease and their side effects. 3. Discuss pharmacology of drugs on different systems of the body. 4. Describe pharmacology of various steroidal hormones and oral contraceptives
4.7.4 P	PHARMACOLOGY-IV (PRACTICAL)	1. Demonstrate the multiple point bioassays to find out unknown concentration of drugs 2. Discuss various marketed fixed dose drug combinations with respect to complete specification 3. Discuss various case study reports 4. Justify standard treatment protocols
4.7.5 T	NATURAL DRUG TECNOLOGY (THEORY)	1. Describe and explain various difficulties in the standardization of herbal material and steps in the development of plant monograph 2. Discuss and apply various guidelines issued by WHO in relation with cultivation, collection, storage etc. in order to ethically develop pharmaceutical dosage forms. 3. Describe & explain concept of health & pathogenesis, philosophical basis, diagnosis & treatment aspects of Ayurveda, Unani, Siddha &Homeopathic system of medicine; Understand & explain method of preparation of Ayurvedic dosage forms; importance of novel drug delivery of natural products; herbs used in cosmetic preparation & methods of their formulations. 4. Apply and explain the applications of plant tissue culture for Secondary metabolite production. 5. Explain the approaches and potentials of herbal new drug delivery systems like liposomes, phytosomes, nanoparticles and vesicles
4.7.5 P	NATURAL DRUG TECNOLOGY (PRACTICAL)	1. Classify and analyze various herbal raw materials required for formulation of herbal products 2. Develop skills of formulation, labeling & evaluation of various Ayurvedic or herbal formulations such as Churna, vati, gutika, vaporub etc 3. Design various parameters required for evaluation of formulation & their role in optimization & product development 4. Design, evaluate, optimize & develop natural skin & hair cosmetic products such as Lipsticks, face powders, shampoos etc 5. Analyze & evaluate the marketed herbal pharmaceutical as well as

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		3. Develop and evaluate shaving and bath preparations 4. Design and develop cosmetics formulation for hair, eyes, nail, dental and baby care products 5. Illustrate the concept of cosmetics, cosmeceuticals & cosmeceutical agents
4.8.2 P	COSMATIC SCIENCE (PRACTICAL)	1. Use various equipments in Pharmaceutics laboratory relevant to cosmetics and show their handling as per SOP 2. Formulate and evaluate various cosmetics preparations 3. Demonstrate skill of good manufacturing practices in laboratory 4. Predict correct use of various ingredients used in cosmetics formulation 5. Design labels as per regulatory requirements
4.8.3 T	PHARMACEUTICAL ANALYSIS-VI (THEORY)	1. To explain, discuss and integrate theory and principle of various analytical techniques like ^{1}HNMR, ^{13}CNMR, ESR, Ion exchange chromatography, Flash chromatography, Super critical fluid chromatography, Mass spectrometry. 2. To explain, discuss, compose, demonstrate and evaluate instrumentation in NMR, ESR, Ion exchange chromatography, Flash chromatography, Super critical fluid chromatography, Mass spectrometry. 3. To apply, compare, rank and justify the analytical tools ^{1}HNMR, ^{13}CNMR, ESR, Ion exchange chromatography, Flash chromatography, Super critical fluid chromatography and Mass spectrometry for separation and identification analysis. 4. To summarize, integrate, analyze, critique, compare and discuss ^{1}HNMR with ^{13}CNMR, Ion exchange chromatography, Flash chromatography, Super critical fluid chromatography with GC and HPLC 5. To discuss, explain, integrate and apply automated methods of analysis 6. To compose and explain advantages and applications of hyphenated techniques like LC-MS, GC-MS and MS-MS.
4.8.3 P	PHARMACEUTICAL ANALYSIS-VI (PRACTICAL)	1. To discuss, explain and compare the UV, IR, NMR and Mass spectrometry ranges in problem solving and structural elucidation of organic compounds. 2. To utilize, apply and interpret UV, IR, NMR, MS spectra of simple organic compounds for structure elucidation 3. To explain, discuss, compose and justify validation of analytical methods (UV & HPLC) as per ICH & USP guidelines. 4. To explain, discuss compose and justify system suitability parameters as per IP/BP/USP protocol for HPLC methods and quantitation techniques in HPLC (% Area/Area Normalization, Internal Standard addition)
4.8.4 T	MEDICINAL CHEMISTRY-IV (THEORY)	1. Students will be able to recall, apply and illustrate SAR and physiochemical properties of drug molecules in relation to drug target interactions. 2. Students will be able to describe, predict, outline and design chemical basis of pharmacology and therapeutics. 3. Students will be able to predict and design fundamental of

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		pharmacophores for drug used to treat disease. 4. Students will be able to recall, summarize, apply and design chemical pathway of drug metabolism. 5. Students will be able to explain, determine, justify and formulate some routes for the chemical synthesis of some drugs. 6. Students will be able to describe, summarize,apply and illustrate the importance of resistance to drug and its significance use and abuse of drug.
4.8.4 P	MEDICINAL CHEMISTRY-IV (PRACTICAL)	1. Students will be able to use of various equipments and take safety measures while working in medicinal chemistry laboratory. 2. Students will be able to explain, apply, and justify the principle and theory behind synthesis of compound of our interest. 3. Students will be able to develop skillto synthesize compounds. 4. Students will be able to develop skilltopurify the solvents using fractional and vacuum distillation. 5. Students will be able to choose techniques and develop skill to purify synthesized compounds. 6. Students will be able to predict andderive structure of synthesized compoundwith the help of spectroscopic analysis and physicochemical properties.
4.8.5 T	PHARMACOLOGY-V (INCLUDING BIOSTATICS) (THEORY)	1. Justify various drug-drug and drug-food interactions 2. Describe various terminologies related to pharmacovigilance 3. Summarize various objectives of safety pharmacology 4. Discuss various departments and units in hospital pharmacy 5. Describe good clinical practices and ethical issues in clinical trial.
4.8.5 P	PHARMACOLOGY-V (INCLUDING BIOSTATICS) (PRACTICAL)	1. Develop skill to isolate different tissues from experimental animals. 2. Design the experimental set up for experiments related to biological standardization of drugs using isolated tissues. 3. Demonstrate the agonistic and antagonistic effect of a drug through experiments on isolated tissues. 4. Illustrate the effect of drugs on animals by simulated experiments. 5. Discuss the basic aspects of neurobehavioural characterization.
4.8.6 T	NATURAL PRODUCTS: COMMERCE, INDUSTRYY& REGULATIONS	1. Classify different segments in market, demand & supply position; export & import potential of herbal drugs & formulations; position of Indian herbal drug industry in global contest. Also, comprehend the market potential of natural products & explore entrepreneurship skills 2. Assessgovernment organizations & policies for promotion of herbal drugs; their regulation in India & other countries and their ethical issues. 3. Classify and explain plant allergens, their method of preparation & applications 4. Classify, analyze & explain safe use of natural products, possible toxicities & interactions with synthetic drugs or food. 5. Explain theneed & significance and challenges of Pharmacovigilance systems for herbal drugs, different players involved in the PV system as per WHO guidelines.
4.8.7 T	QUALITY	1. Integrate the concepts and significance of quality, QC and QA in

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Course Outcomes (COs) for M. Pharmacy
A.Y. 2018-2019

Subject Code	Subject Name	COS
SEMESTER I **Department: Pharmaceutics**		
MPAT 101T	Modern Pharmaceutical Analytical Techniques	1. Integrate and apply theoretical knowledge of various spectroscopic techniquesavailable for analysis of drugs. 2. Understand and apply basic Knowledge of chromatographic and electrophoreticseparation techniques. 3. Summarize the instrumentation of modern analytical techniques 4. Elucidate a structure based on UV, IR, NMR and Mass data. 5. Explain, Compare and appraise X-ray crystallographic and Thermal Techniques
MPH 102T	Drug Delivery System	1. To formulate and evaluate novel drug delivery systems 2. To justify selection criteria of drug and polymers for the development of novel drug delivery system 3. To understand and construct rate controlled drug delivery systems 4. To construct, justify and evaluate gastro-retentive drug delivery systems 5. To construct, justify and evaluate ocular drug delivery systems and transdermal drug delivery systems 6. To construct, justify and evaluate protein and peptide delivery systems and vaccine delivery systems.
MPH 103T	Modern Pharmaceutics	1. Understand and analyze the concept of preformulation studies in oral soliddosage form development. 2. Compile and integrate preformulation data and apply this knowledge indevelopment of disperse systems and parenterals. 3. Analyze and apply optimization and scale up techniques in formulationdevelopment and manufacturing. 4. Demonstrate and understand the concept of validation of pharmaceuticalprocesses, equipment's and methods. 5. Outline and analyze the industrial management techniques and GMPconsiderations. 6. Evaluate and understand stability, compression, diffusion and dissolutionprocesses in drug product development.
MPH 104T	Regulatory Affairs	1. Discuss the basic regulatory Documentation in pharmaceutical industry 2. Discuss the preparation and submission of CTD,e-CTD 3. Explain the chemistry, manufacturing controls and their regulatory importance in ANDA,NDA Submission &

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		Approval process by different regulatory agencies 4. Describe the process of Preparation of Dossiers and their submission to regulatory agencies in different countries 5. What are Clinical trials requirements & different approval procedures for conducting clinical trials
MPH 105P	Pharmaceutics Practical I	1. Understand and apply the analytical methods for pharmaceuticalcompounds 2. Compile and integrate various analytical techniques for estimation of drugalone or in combination. 3. Analyze and evaluate formulation aspects of different drug deliverysystems 4. Demonstrate and understand in vitro dissolution studies and effect ofvarious parameters on dissolution of drug. 5. Outline and perform preformulation studies as a significant step in drugproduct development. 6. Demonstrate and apply the concept of preformulation studies in product life cycle.
Department: Pharmaceutical Quality Assurance		
MPAT 101T	Modern Pharmaceutical Analytical Techniques	1. Integrate and apply theoretical knowledge of various spectroscopic techniques available for analysis of drugs. 2. Understand and apply basic Knowledge of chromatographic and electrophoretic separation techniques. 3. Summarize the instrumentation of modern analytical techniques 4. Elucidate a structure based on UV, IR, NMR and Mass data. 5. Explain, Compare and appraise X-ray crystallographic and Thermal Techniques
MQA 102T	Quality Management Systems	1. Explain the basic concepts, terminology and factors affecting the framework of quality, quality control and quality management systems and implement the same. 2. Explain the scope of quality certifications applicable to pharmaceutical industries. 3. Demonstrate the effective utilization of different QMS tools for monitoring and improving product quality and process performance within the regulatory framework. 4. Suggest suitable guidelines for quality management which can be applied to pharmaceutical industry.
MQA 103T	Quality control and Quality Assurance	1. Explain significance of quality in pharmaceutical manufacturing and understand the responsibilities of QA & QC departments. 2. Explain role of national and international regulatory agencies in deciding quality standards 3. Follow cGMP while working in Pharmaceutical industry. 4. Describe various aspects of documentation 5. Perform analysis of raw materials, IPQC and FPQC of drug products and other manufacturing operations and controls 6. Explain different guidelines related to Pharmaceutical industry.

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MQA 104T	Product development Technology Transfer	1. Describe the regulatory principles and requirements of drug discovery and product development 2. Relate and execute the concept of pre-formulation studies for various formulations 3. Explain in detail the requirements for the pilot plant and scale up 4. Categorize and use various pharmaceutical packaging systems 5. Implement the concept of technology transfer from R & D to production plant
MQA 105P	Pharmaceutical Quality Assurance Practical I	1. Perform qualitative and quantitative analysis of pharmacopoeial compounds in bulk and in their formulations 2. Perform experiments on various analytical instruments such as UV Vis spectrophotometer, HPLC, GC etc. 3. Demonstrate use of tools for quality management 4. Perform quality control tests for drugs, raw materials, dosage forms and primary and secondary packaging materials 5. Perform experiments on pre-formulation studies
Department: Pharmaceutical Chemistry		
MPAT 101T	Modern Pharmaceutical Analytical Techniques	1. Integrate and apply theoretical knowledge of various spectroscopic techniques available for analysis of drugs. 2. Understand and apply basic Knowledge of chromatographic and electrophoretic separation techniques. 3. Summarize the instrumentation of modern analytical techniques 4. Elucidate a structure based on UV, IR, NMR and Mass data. 5. Explain, Compare and appraise X-ray crystallographic and Thermal Techniques
MPC 102T	Advanced Organic Chemistry I	1. Explain, discuss and understand basic aspects of organic chemistry of organic intermediates and addition reactions as mentioned in the syllabus 2. Explain, discuss and understand mechanism and synthetic applications of important name reactions mentioned in the syllabus. 3. Explain, discuss and understand synthetic reagents & its applications as mentioned in the syllabus 4. Understand, discuss, and explain role of protecting groups in organic synthesis, includes protection for the hydroxyl group, carbonyl group and carboxyl group, amino group, and amino acids 5. Explain apply and justify organic name reactions with their respective mechanism and application involved in synthesis of drugs containing five, sixmembered and fused heterocyclic rigs and synthesis of few representative drugs containing heterocyclic nucleus. 6. Develop and apply skill of synthon approach and retrosynthesis applications
MPC 103T	Advanced Medicinal	1. Plan strategies and prepare new chemical entities as potential drugs by following the process of drug discovery knowledge.

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	Chemistry	2. 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. 3. Understand the concept of, & design of peptidomimetics including the chemistry of prostaglandins, leukotrienes and thromboxanes. 4. Rationally design the enzyme inhibitors in medicine. 5. Understand the concept of, & design prodrugs, analogs and peptidomimetics and drug resistance.
MPC 104T	Chemistry of Natural Products	1. Develop the understanding and analyze the chemistry of drugs affecting the central nervous system, anticancer drugs, cardiovascular drugs, neuromuscularblocking drugs, anti-malarial drugs and analogues, macrolid antibiotics. 2. Understand and summarize the classification, isolation, purification, molecular modification and biological activity of alkaloids, flavonoids and steroids. 3. Understand, evaluate and summarize the classification, isolation, isoprene rule and general methods of structural elucidation of Terpenoids as well as chemistry and physiological significance of Vitamins. 4. Integrate, summarize and interpret the data for structural characterization of natural compounds.
MPC 105P	Pharmaceutical Chemistry Practical -I	1. Synthesize compounds of medicinal importance and characterize the synthesized compounds using physicochemical and spectroscopic methods. 2. Purify organic solvents using column chromatographic techniques. 3. Isolate and characterize the isolated compounds using physicochemical and spectroscopic techniques and carry out degradation reactions on selected plant constituents. 4. Operate, demonstrate, apply and record UV Vis spectrophotometer, column chromatography, HPLC, GC, fluorimetry and flame photometry 5. Perform degradation reactions on selected plant constituents 6. 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: Pharmacology		
MPAT 101T	Modern Pharmaceutical Analytical Techniques	1. Integrate and apply theoretical knowledge of various spectroscopic techniques available for analysis of drugs. 2. Understand and apply basic Knowledge of chromatographic and electrophoretic separation techniques. 3. Summarize the instrumentation of modern analytical techniques 4. Elucidate a structure based on UV, IR, NMR and Mass data. 5. Explain, Compare and appraise X-ray crystallographic and Thermal Techniques
MPL 102T	Advanced	1. Discuss the pathophysiology and pharmacotherapy of certain

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	Pharmacology I	diseases 2. Explain the mechanism of drug actions at cellular and molecular level 3. Understand the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases 4. Summarize, classify and apply epidemiology, etiology, pathophysiology sign and symptoms, diagnosis, complications, treatment and management of disease affecting CVS, CNS. 5. Understand and summarize different autocoids and their role in physiological functioning
MPL 103T	Pharmacological and Toxicological Screening Methods I	1. 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. 2. Describe the various laboratory animals used in experimental pharmacology and their applications. 3. Classify the various preclinical screening methods involved in experimental pharmacology 4. Describe the various preclinical screening methods involved in experimental pharmacology 5. Summarize the general principles and methods of immunoassay.
MPL 104T	Cellular and Molecular Pharmacology	1. Understand the basics of cell biology, recombinant DNA technology and transfer of genes to mammalian cells. 2. Apprehend the genetic elements of DNA, fingerprint analysis and various molecular techniques applicable in drug discovery. 3. Apply the knowledge of molecular pharmacology and biomarkers in drug discovery process. 4. Demonstrate molecular biology techniques as applicable for drug discovery. 5. Explain the molecular pathways affected by drugs.
MPL 105P	Pharmacological Practical I	1. To demonstrate the biological evaluation of drugs by in vitro and in vivo methods 2. To analyze knowledge how to deal with experimental animals to test the potency of drugs. 3. To develop skills in handling animals and perform and evaluate experiments on them. 4. To calculate and compare experimental observations and results statistically. Student can differentiate between actual experimental results or if these results are due to chance. 5. Manage her / his time effectively by performing pharmacological activity on experimental animals.
SEMESTER II **Department: Pharmaceutics**		
MPH 201T	Molecular Pharmaceutics (Nano Tech and	1. To integrate the knowledge of various approaches for development of TDDS 2. To discuss and elaborate the criteria for selection of drugs and

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	Targeted DDS)	polymers for the development of TTDS 3. To demonstrate basics involved in the formulation and evaluation of TDDS 4. To integrate and apply various concepts and strategies for improving targeting and absorption in the design of TDDS
MPH 202T	Advanced Biopharmaceutics and Pharmacokinetics	1. Understand and analyze the concept of biopharmaceutics andpharmacokinetic. 2. Compile and integrate pharmacokinetic data and derive thepharmacokinetic models and parameters that best describe the process ofdrug absorption, distribution and metabolism. 3. Analyze and apply critical evaluation of biopharmaceutics studies involvingdrug product equivalency. 4. Demonstrate and understand the design and evaluation of dosage regimensof the drugs using pharmacokinetic and biopharmaceutics parameters. 5. Outline and analyze the potential clinical pharmacokinetic problems andapplication of basics of pharmacokinetic. 6. Demonstrate and apply the applications of biopharmaceutics andpharmacokinetic in drug delivery development.
MPH 203T	Computer Aided Drug Development	1. Discuss the role of Computer Aided Drug Delivery in drug discovery 2. Explain different Computer Aided Drug Delivery techniques and their applications 3. Demonstrate various strategies to design and develop new drug-like molecules 4. Explain in detail the working with molecular modeling software to design new drug molecules 5. Discuss various in silico virtual screening protocols.
MPH 204T	Cosmetic and Cosmeceuticals	1. Explain, illustrate and understand scientific knowledge required to develop cosmetic & cosmeceuticals to evaluate its safety, efficacy and stability 2. Illustrate key ingredients and basic science used to developed all cosmetic & herbal cosmetics products like skin care, dental, hair, facial, eye etc 3. Understand the various aspects of cosmetics like regulatory, biological, formulation, design and production of herbal cosmetics. 4. Explain current technologies used to developed different cosmetics & herbal cosmetics product like skin care, dental, hair, facial, eye etc 5. Understand & study classification and application of cosmetics and cosmeceuticals like perfume, dental, skin care, hair care, oral, facial & eye with its regulatory aspects
MPH 205P	Pharmaceutics Practical II	1. Understand and evaluate the effect of various factors on development offormulation of drug. 2. Compile and apply different types of in vitro dissolution studies of drug formulation and its comparison with marketed product. 3. Analyze and understand the techniques in ex vivo and in situ evaluation ofthe formulation for its performance.

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		4. Demonstrate and understand various software's in optimization of theformulation 5. Outline and learn various in silico methods used in formulationdevelopment and optimization. 6. Demonstrate and apply the formulation knowledge and skills indevelopment of herbal formulations.
Department: Pharmaceutical Quality Assurance		
MQA 201T	Hazard and Safety Management	1. Understand the environment related problem and find remedies to combat them. 2. Develop and ensure safety standards in pharmaceutical industry. 3. Impart basic knowledge and comprehensive study on safety management. 4. Execution of different innovative methods for different types of hazard management system. 5. Design method of hazard assessment, procedure and methodology for safe industrial atmosphere.
MQA 202T	Pharmaceutical Validation	1. Explain the concepts, importance, scope types, methodology and application of calibration, qualification and validation activities in pharma industry 2. Prepare protocols for qualification and validation of instruments, facilities and processes as per guidelines. 3. Explain the importance of patent and intellectual property rights 4. Suggest methodology for qualification of laboratory, analytical and manufacturing equipments. 5. Suggest methodology for validation of utilities, analytical methods, cleaning methods, computerized systems and manufacturing processes of various dosage forms.
MQA203 T	Audits and Regulatory Compliance	1. Explain methodology of auditing in different department of pharmaceutical industry like production, vendor, microbiological laboratory, quality assurance 2. Illustrate CGM's practices and regulation of production department, microbiological department, quality assurance & engineering department 3. Understand the process of carry out audit in department like production, quality assurance and different laboratory of pharmaceutical industry. 4. Understand preparation of audit report and check list of auditing which is required by various department of pharmaceutical industry like vendor, production, packaging, laboratory, quality assurance etc. 5. Understand the role and importance of Quality systems and audits in pharmaceutical manufacturing environment, auditing of vendors & production department, auditing of microbiological laboratory and auditing of quality assurance & engineering department.
MQA 204T	Pharmaceutical Manufacturing	1. To understand and discuss legal requirements, plant layout provisions and production planning inpharmaceutical

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	Technology	industry. 2. To describe aseptic process technology, requirements for advanced sterile product manufacturing and process automation in sterile manufacturing and extrapolate to all parenteral products. 3. To elaborate non-sterile manufacturing process technology with reference to tablets and capsules, to illustrate improvements in their production and to analyze problems during tablet coating. 4. To distinguish sterile product manufacturing and non-sterile product manufacturing technology. 5. To classify and compare different containers and closures for pharmaceuticals and to correlate stability aspects of packaging materials. 6. CO6: To understand and apply principles of Quality by Design (QbD) and Process Analytical Technology(PAT) in pharmaceutical manufacturing.
MQA205P	Pharmaceutical Quality Assurance Practical II	1. Perform qualitative and quantitative analysis of certain pharmaceutical contaminants and drugs 2. Analyze and validate pharmaceutical facilities, processes, methods and equipment 3. Study qualification of pharmaceutical equipment 4. Create checklist for pharmaceutical facilities 5. Design plant layout for sterile and nonsterile products 6. Perform case study on certain quality management tools.
Department: Pharmaceutical Chemistry		
MPC 201T	Advanced Spectral Analysis	1. Understand, discuss and determine in detail the theory and principle of chromatography and hyphenated techniques, Thermal methods of analysis, Bioassay, ELISA, Radioimmuno assay, ATR-IR. 2. Explain, discuss, and demonstrate in details the instruments of above technique. 3. Understand, discuss and compare the applications of instruments. 4. Understand, discuss, interpret and elucidate the data of WoodwardFieser rule and IR, NMR, Mass, DSC, DTA TG, Interpretation of organic compounds.
MPC 202T	Advanced Organic Chemistry - II	1. Apply the principles and techniques of green chemistry in synthesis of organic compounds. 2. Synthesize chiral compounds using various methods of asymmetric synthesis based on the stereochemistry. 3. Use different methods of catalysis and catalysts in synthesis of organic compounds. 4. Apply the principles of photochemical and pericyclic reactions 5. Apply the techniques of peptide synthesis.
MPC 203T	Computer Aided Drug Design	1. To utilize various molecular modeling software in the design of novel drug-like molecules. 2. To apply the various software for physicochemical property

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		prediction. 3. To understand how current drugs were developed by using pharmacophores modeling and docking technique. 4. To study Case studies in Molecular Modeling to apply those in the development of novel entities by the use of computer-aided drug design. 5. Discuss the History, different techniques, and applications of Computer-aided drug design & apply them to determine routes for designing new molecules. 6. To know the history, physicochemical parameters, applications, and statistical methods used to develop QSAR &apply these concepts in developing the best QSAR model.
MPC 204T	Pharmaceutical Process Chemistry	1. Assess Synthetic strategy Stages of process in Bench, pilot and large scale. 2. Outline Industrial Safety MSDS (Material Safety Data Sheet and Personal ProtectionEquipment (PPE) Fire hazards, Occupational Health & Safety.Assessment Series 1800(OHSAS-1800) and ISO-14001 3. Classify Extraction Filtration Distillation Evaporation Crystallization operations inPharmaceutical process chemistry. 4. Summarize Nitration, Halogenation and Oxidation and Reduction operations inPharmaceutical process chemistry and Case study on industrial reduction process. 5. Select Fermentation used in production of medicine and Reaction progress kinetic analysisuseful for scale-up.
MPC 205P	Pharmaceutical Chemistry Practical -II	1. Compare synthesis of API's / intermediates by different synthetic routes and use various approaches for synthesis of organic compounds. 2. Synthesize organic compounds using microwave technique 3. Design drug molecules using computer aided drug design. 4. Interpret and characterize synthesized organic compounds using FT–IR, NMR, CNMR and Mass spectra 5. Describe, discuss and compare study of synthesis of APIs/intermediates by different synthetic routes and assignments on regulatory requirements in API. 6. Describe, discuss, explain and demonstrate calculation of ADMET properties of drug molecules and its analysis using softwares Pharmacophore modelling,2D–QSAR based experiments, 3D–QSAR based experiments, docking study-based experiment, virtual screening-based experiment
Department: Pharmacology		
MPL 201T	Advanced Pharmacology II	1. 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. 2. 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

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		the management of different microbial infections. 3. 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. 4. 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. 5. 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	1. Explain the various types of toxicity studies. 2. Appreciate the importance of ethical and regulatory requirements for toxicity studies. 3. Demonstrate the practical skills require conducting the preclinical toxicity studies. 4. To study Importance and applications of toxicokinetic studies. 5. To study and apply good laboratory practices and its importance in drug development
MPL 203T	Principles of Drug Discovery	1. Outline the various stages of drug discovery. 2. Justify the importance of the role of genomics, proteomics and bioinformatics in drug discovery. 3. Apply the knowledge of various targets, biomarkers and *in vitro* screening techniques for drug discovery. 4. Summarize various lead seeking and lead optimization methods. 5. Integrate the concepts of computer aided drug design in drug discovery.
MPL 204T	Clinical Research and Pharmacovigilance	1. Explain the regulatory requirements for conducting clinical trial. 2. Demonstrate the types of clinical trial designs. 3. Explain the responsibilities of key players involved in clinical trials. 4. Execute safety monitoring, reporting and close-out activities. 5. Explain the principles of Pharmacovigilance. 6. Detect new adverse drug reaction and their assessment. Perform the adverse drug reaction reporting systems and communication in Pharmacovigilance.
MPL 205P	Pharmacological Practical II	1. To demonstrate the biological evaluation of drugs by in vitro and in vivo methods 2. To 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 as well as by simulated experiments which give

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		an idea on the recent methods of bioassay. 4. To develop skills in handling animals and perform and evaluate experiments on them. 5. To calculate and compare experimental observations and results statistically. Student can differentiate between actual experimental results or if these results are due to chance. 6. Manage her / his time effectively by performing pharmacological activity on experimental animals.
SEMESTER III		
MRM 301T	Research Methodology and Biostatistics	1. Demonstrate knowledge about basic concepts about research and the methodology to conduct research 2. Describe the appropriate statistical methods required for a particular research design 3. Explain the rationale, importance and processes for abiding to research ethics in medical research conducted using humans and animals. 4. Develop an appropriate framework for research studies including study design, method of data collection, sampling techniques, data analysis, report writing and publication.

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Course Outcomes (COs) for Pharm D.
A.Y. 2018-19

	Subject	COs
FIRST YEAR PHARM D.		
1.1 T	Human Anatomy and Physiology (Theory)	CO1.Understand Basic terminologies used, prefixes & suffixes used to identify body parts and directional terms as well as relevance and significance to Health Sciences. CO2.Understand various homeostatic mechanisms and their imbalances of various systems. CO3.Understand the coordinated working pattern of different organs of each system. CO4.Understand interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body. CO5.Understand the importance of health education and health promotion.
1.1 P	Human Anatomy and Physiology (Practical)	CO1.Understand the construction, working, care and handling of instruments, glassware's and equipment's required for practical. CO2.Understand the significance of Bleeding time, Clotting time, Blood group detection, Haemoglobin detection and measurement of blood pressure. CO3.Knowledge of mechanism of White Blood Cell Count, Red Blood Cell Count and Erythrocytes Sedimentation rate of blood sample. CO4.Demonstration of various systems with the help of charts and models. CO5.Understand the mechanism of experimental physiology
1.2 T	Pharmaceutics (Theory)	CO1. Integrate the knowledge related to introduction and classification of dosage form, prescription and posology. CO2. Build knowledge about the historical background and development of Pharmacy profession including different pharmacopoeias. CO3. Develop and demonstrate solid dosage form like powders and granules and pharmaceutical calculations related to weights and measures. CO4. Build knowledge of liquid dosage form including both monophasic and biphasic dosage form. CO5. Investigate information related to suppositories and surgical aids. CO6. Develop knowledge related to different galenical products and its extraction processes along with incompatibilities associated with dosage form
1.2 P	Pharmaceutics (Practical)	CO1. Demonstrate the skill of preparation and evaluation of various solid and liquid dosage forms. CO2. Explain principles of formulation and evaluation of dosage forms. CO3. Calculate evaluation parameters like density, specific gravity, angle of repose, carr's index and hausner's ratio of

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		pharmaceutical preparation. CO4. Classify various dosage forms by using different criteria. CO5. Create labels in prescribed manner for various dosage forms. CO6. Build knowledge regarding different types of incompatibilities for safety, efficacy and therapeutic effect of dosage forms.
1.3T	Medicinal Biochemistry (Theory)	CO1.To summarize biomolecules and to conclude, evaluate and discuss chemical nature and biological role of it with concepts in bioenergetics. CO2.To summarize, justify and conclude catalytic role of enzymes, importance of enzyme in inhibitors in design of new drugs, therapeutics and diagnostics applications of enzymes. CO3.To summarize, explain, discuss and compose, synthesis and metabolism of important biomolecules like carbohydrates, lipids, proteins, nucleic acids and the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins. CO4.Understand biological/physiological role, to evaluate and discuss chemical nature, storage, metabolism, biochemical principles. CO5.Identify, interpret, analyze and infer test of organ function tests of kidney, liver, lipid and immunochemical techniques. CO6.To understand, summarize, illustrate and investigation of biomolecules in body fluid.
1.3P	Medicinal Biochemistry (Practical)	CO1.Evaluate and analyze presence of various biomolecules/ normal and abnormal constituents in body fluids using qualitative and quantitative tests. CO2.Understand and analyze the catalytic activity of enzymes and importance of isoenzymes in diagnosis of diseases. CO3.Apply the biochemical principles of organ function tests of kidney, liver and endocrine gland. CO4.Understand importance of levels of various biomolecules in body fluids.
1.4T	Pharmaceutical Organic Chemistry (Theory)	CO1.Explain the physical properties of organic compounds CO2.Identify the structures of a given organic compound and give the nomenclature CO3.Explain the mechanisms involved in various named organic reactions CO4.Illustrate the reactivity, orientation and stability of organic reactions CO5.Identify the products obtained through simple organic reactions CO6.Summarize the studies on some important official organic compounds
1.4 P	Pharmaceutical Organic Chemistry (Practical)	CO1.Compose different classes of organic pharmaceuticals using some named organic reactions with mechanisms CO2.Apply stereo models and explain the structural aspects of organic compounds CO3.Integrate and Analyze the elements in different organic pharmaceuticals by Performing organic qualitative analysis

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		CO4.Identify various classes of organic compounds by systematic qualitative analysis CO5. Analyze various organic pharmaceuticals
1.5 T	Pharmaceutical Inorganic Chemistry (Theory)	CO1.To discuss and explain the principles and procedures of analysis of drugs. CO2.To apply and determine the applications of inorganic pharmaceuticals in analysis of drug. CO3.To discuss the fundamentals of analytical chemistry and examine inorganic pharmaceuticals regarding their monograph. CO4.To justify the importance of inorganic pharmaceuticals in preventing and curing disease. CO5.Knowledge about the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals CO6.To have been introduced to a variety of inorganic drug classes
1.5P	Pharmaceutical Inorganic Chemistry (Practical)	CO1.Perform the limit test for certain impurities like chloride, sulphate, iron, arsenic, lead and heavy metals as per the Indian Pharmacopoeia CO2.Determine percentage purity of given pharmaceutical drugs by titrimetric analysis CO3.Perform qualitative analysis of given inorganic mixtures. CO4.Identify the Inorganic compounds through various chemical tests. CO5.Know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals CO6.Use different methods for preparation of Inorganic substances

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