

	<b>JAYAWANT SHIKSHAN PRASARAK MANDAL'S</b> <b>JAYAWANTRAO SAWANT COLLEGE</b> <b>OF PHARMACY &amp; RESEARCH</b>	
	S. No. 58, Handewadi Road, Hadapsar, Pune- 411028. Phone : +91-020- 64005920 Tel Fax: +91-020-26970565 E-mail : <a href="mailto:jspm.jscopr@gmail.com">jspm.jscopr@gmail.com</a> Website : <a href="http://www.jspm.edu.in">www.jspm.edu.in</a> (Approved by PCI & AICTE, New Delhi, DTE, Govt. of Maharashtra, Mumbai, and Affiliated to Savitribai Phule Pune University, Pune) DTE Code: PH6387	
<b>Prof. T. J.SAWANT</b> D.E.E.B.E.(Elec.), MISTE Founder-Secretary		

To,  
 The Coordinator,  
 NAAC, Bengaluru.

Subject: Proof of Teachers and students are aware of the stated Programme and course outcomes of the Programmes offered by the institution.

Reference: 2.6.1 Teachers and students are aware of the stated Programme and course outcomes of the Programmes offered by the institution.

Dear Sir/Madam,

2.6.1

- Relevant documents pertaining to learning outcomes and graduate attributes
- Course Outcomes for all courses

## **Course Outcome**



**JAYAWANT SHIKSHAN PRASARAK MANDAL'S**  
**JAYAWANTRAO SAWANT**  
**COLLEGE OF PHARMACY & RESEARCH**  
S. No. 58, Handewadi Road, Hadapsar, Pune- 411 028.



**VISION**

"To serve the needs of the Society and to provide integrated and effective Quality Pharmaceutical Education to the aspiring students".

**MISSION**

"To create a premiere student focused and integrated Institution which achieve excellence in Pharmaceutical Education".

"To provide state-of-the-art infrastructure to the students and faculty to upgrade their skills and knowledge".

"To collaborate with various agencies of mutual interest in Educational and Career spheres".



## F. Y. B. Pharm (SEM-I) Course Outcome

### BP101: Human Anatomy and Physiology I

Students will be able to:

CO1-1.0.1A Explain the gross morphology, structure and functions of various organs of the human body.

CO2-1.0.1B Describe the various homeostatic mechanisms and their imbalances.

CO3-1.0.1C Identify the various tissues and organs of different systems of human body.

CO4-1.0.1D Perform the various experiments related to special senses and nervous system.

CO5-1.0.1E Appreciate coordinated working pattern of different organs of each system

### BP102: Pharmaceutical Analysis I

Students will be able to:

CO1-1.0.2A: Understand and explain the methods assuring the quality and safety of pharmaceuticals.

CO2-1.0.2B.: Explain about accuracy, precision and significant figure error concepts.

CO3-1.0.2C: Acquire knowledge on computation of analytical results, physiochemical concepts of analysis, theories of acids and bases, stoichiometry etc.

CO4-1.0.2D: Explain the principles and applications of gravimetric, volumetric and gas analysis Techniques

CO5-1.0.2E: Understand and explain the applications of complexometric, iodometric, redox and non-aqueous titrations.

ELO 1.: Understand the importance of calibration and adopt techniques like calibration of weights, pipette and burette

ELO 2.: Gain knowledge in standardization of solutions with different strength

ELO 3: Estimate creatinine levels in urine and liver function test.

### BP103: Pharmaceutics I

Students will be able to:

CO1-1.0.3A: Know the history of profession of pharmacy

CO2-1.0.3B: Understand the basics of different dosage forms, pharmaceutical Incompatibilities and pharmaceutical calculations:

CO3-1.0.3C: Explain the preparation of various conventional dosage forms.

CO4-1.0. 3D: Understand the professional ways to handle the Prescription.

#### **BP104: Pharmaceutical Inorganic Chemistry**

Students will be able to:

- CO1-1.0.4. A: Highlight applicability and explain the relevance and significance of inorganic chemistry to pharmaceutical sciences. Differentiate and describe various pharmacopoeias currently in use and discuss the contents of official monographs in pharmacopoeias.
- CO2-1.0.4.B: Explain meaning of impure and pure chemical compounds and describe official methods of control like limit tests and qualitative tests.
- CO3- 1.0.4.C: Classify & illustrate importance of different inorganic pharmaceutical agents and their preparation, properties, storage, uses, marketed formulations used.
- CO4-1.0.4.D: Prepare inorganic pharmaceutical compounds, perform qualitative analysis for detection of acidic and basic radicals from given inorganic binary mixture and apply them for unknown sample.
- CO5- 1.0.4.E: Explain method of manufacturing, identification tests of important inorganic substances used for pharmaceutical purpose. Performing limit tests and tests for purities for various inorganic agents

#### **BP105: Communication skills**

Students will be able to:

- CO1-1.0.5. A: Understand the behavioral needs for a Pharmacist to function effectively in the areas of Pharmaceutical operation
- CO2-1.0.5. B: Students can communicate effectively.
- CO3-1.0.5. C: Effectively manage the team as a team player
- CO4-1.0.5. D: Develop interview skills
- CO5-1.0.5. E: Develop Leadership qualities and essentials

#### **BP106RB: Remedial Biology**

Students will be able to:

- CO1- 106A: Understand the classification and salient features of five kingdoms of life
- CO2- 106B: Understand the basic components of anatomy & physiology of plant
- CO3- 106C: Know understand the basic components of anatomy & physiology animal with special reference to human
- ELO1- 112A: Understand the classification and salient features of five kingdoms of life
- ELO2- 112B: Understand the basic components of anatomy & physiology of plant, Know understand the basic components of anatomy & physiology animal with special reference to human

#### **BP106RM: Remedial Mathematics**

Students will be able to:

- CO1- 1.0.6.A: Know the theory and their application in Pharmacy.
- CO2- 1.0.6.B: Solve the different types of problems by applying theory.
- CO3- 1.0.6.C: Appreciate the important application of mathematics in Pharmacy.
- CO4- 1.0.6.D: Appreciate the important application of statistics in Pharmacy.
- CO5- 1.0.6.E: This subject deals with the introduction to Partial fraction, Logarithm, matrices and Determinant, Analytical geometry, Calculus, differential equation and Laplace transform.

## F. Y. B. Pharm (SEM-II) Course Outcome

### BP201: Human Anatomy and Physiology II

Students will be able to:

CO1-2.0.1A Explain the gross morphology, structure and functions of various organs of the human body.

CO2-2.0.1B Describe the various homeostatic mechanisms and their imbalances.

CO3-2.0.1C Identify the various tissues and organs of different systems of human body.

CO4-2.0.1D Perform the hematological tests like blood cell counts, haemoglobin estimation, bleeding/clotting time etc. and also record blood pressure, heart rate, pulse and respiratory volume.

CO5-2.0.1E Appreciate coordinated working pattern of different organs of each system

### BP202: Pharmaceutical Organic Chemistry I

Students will be able to:

CO1-2.0.2A: Explain basic structure, IUPAC Nomenclature, name and concept of isomerism of organic compound.

CO2-2.0.2B: Explain method of preparation, hybridization classes of reactions stability, orientation, of various organic compounds.

CO3-2.0.2C: Describe acidity, basicity, inductive effect, qualitative test, structure & uses of organic compound.

CO4-2.0.2D: Operate various laboratory equipment, use safety measures and demonstrate laboratory techniques.

CO5-2.0.2E: Perform qualitative analysis and synthesis of various organic compounds.

### BP203: Biochemistry

Students will be able to:

CO1-2.0.3A: Catalytic role of enzymes and importance of enzyme in biochemical Process.

CO2-2.0.3B: The metabolism of nutrient molecules in physiological and Pathological conditions.

CO3-2.0.3C: The genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.

CO4-2.0.3D: Able to understand the uses of diagnostic kits

ELO 1-2.0.3: Perform qualitative analysis of carbohydrates, proteins and lipids.

ELO 2-2.0.3.: Estimate blood glucose and blood cholesterol levels

ELO 3-2.0.3: Estimate creatinine levels in urine and liver function test

### BP204: Pathophysiology

Students will be able to:

CO1-2.0.4A: Describe the etiology and pathogenesis of the selected disease states.

CO2-2.0.4B: Name the signs and symptoms of the diseases.

CO3-2.0.4C: Mention the complications of the diseases.

### **BP205: Computer Applications in Pharmacy**

Students will be able to:

CO1-2.0.5A: Understand the various types of application of computers in pharmacy.

CO2-2.0.5B: Describe the various types of databases.

CO3-2.0.5C: Know the various applications of databases in pharmacy.

CO4-2.0.5D: Describe computer application in clinical studies and use of databases.

### **BP206: Environmental sciences**

Students will be able to:

CO1-2.0.6A: Demonstrate multidisciplinary nature of environmental studies.

CO2-2.0.6B: Understand the different natural resources and their conservation to save the environment.

CO3-2.0.6C: Aware the basic characteristic features, structure and function of the ecosystems.

CO4-2.0.6D: Understand the different types of ecosystems

CO5-2.0.6E: Understand the different kinds of environmental pollution and measures to minimize it.

## **S. Y. B. Pharm (SEM-III) Course Outcome**

### **BP301: Pharmaceutical Organic Chemistry II**

Students will be able to:

CO1- 3.0.1A: Write the structure, name and the type of isomerism of the organic compounds.

CO2- 3.0.2B: Write the reaction, name the reaction and orientation of reactions.

CO3- 3.0.3C: Account for reactivity/stability of compounds.

CO4- 3.0.4D: Write the chemical synthesis of some compounds..

CO5- 3.0.5 E: Prepare small organic compounds.

### **BP302: Physical Pharmaceutics I**

Students will be able to:

CO1-3.0.2. A: Define various terminologies of solubility, states of matter, surface tension and interfacial phenomenon, complexation of drug and buffers.

CO2-3.0.2. B: Explain physicochemical properties of drug in designing the dosage forms.

CO3-3.0.2. C: Describe mechanism and factors influencing solubility of drug, methods of analysis of complexes, distribution law.

CO4-3.0.2. D: Discuss importance of solubility parameters, classification of surfactants, complexes, pH and buffers in Pharmaceutical and biological systems.

CO5-3.0.2. E: Explain applications of solubility, solubilization phenomenon, surface and interfacial phenomenon and complexation in pharmaceuticals

### **BP303: Pharmaceutical Microbiology**

Students will be able to:

- CO1- 3.0.3.A: Understand methods of identification, cultivation and preservation of various microorganisms
- CO1- 3.0.3.B: To understand the importance and implementation of sterilization in pharmaceutical processing and industry
- CO3-3.0.3C: Learn sterility testing of pharmaceutical products.
- CO4-3.0.3D: Carried out microbiological standardization of Pharmaceuticals.
- CO5-3.0.3E: Understand the cell culture technology and its applications in Pharmaceutical industries.

### **BP304: Pharmaceutical Engineering**

Students will be able to:

- CO1-3.0.4A: To know various unit operations used in Pharmaceutical industries and understand the material handling techniques.
- CO2-3.0.4B: To perform various processes involved in pharmaceutical manufacturing process.
- CO3-3.0.4C: To carry out various test to prevent environmental pollution.
- CO4-3.0.4D: To appreciate and comprehend significance of plant lay out design for optimum use of resources.
- CO5-3.0.4E: To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.

### **S. Y. B. Pharm (SEM-IV) Course Outcome**

### **BP401: Pharmaceutical Organic Chemistry III**

Students will be able to:

- CO1-4.0.1A: Understand the methods of preparation and properties of organic compounds.
- CO2-4.0.1B: Explain the stereo chemical aspects of organic compounds and stereo chemical reactions.
- CO3-4.0.1C: Explain chemistry and methods of preparation of heterocyclic rings and plan synthesis of heterocyclic compounds with reaction mechanisms.
- CO3-4.0.1D: Understand the name reactions
- CO3-4.0.1E: Know the medicinal uses and other applications of organic compounds.



### **BP402: Medicinal Chemistry I**

Students will be able to:

- CO1- 4.0.2A: Understand the chemistry of drugs with respect to their pharmacological activity.
- CO2- 4.0.2B: Understand the drug metabolic pathways, adverse effect and therapeutic value of Drug.
- CO3- 4.0.2C: Know the Structural Activity Relationship (SAR) of different class of drugs.
- CO4- 4.0.2D: Write the chemical synthesis of some drugs.
- CO5- 4.0.2E: This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs ( structure activity relationships of drugs).

### **BP403: Physical Pharmaceutics II**

Students will be able to:

- CO1-4.0.3.A: Relate various physicochemical properties of drug and excipient molecules in designing the dosage forms.
- CO2-4.0.3.B: Distinguish the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations
- CO3-4.0.3.C: Interpret the behaviour and mechanism of drugs and excipients in the formulation development and evaluation of dosage forms.

### **BP404: Pharmacology I**

Students will be able to:

- CO1-4.0.4A: Explain the basics and scope of pharmacology, the nature and sources of drugs, route of drug administration, pharmacokinetic and pharmacodynamics of drugs.
- CO2-4.0.4B: Illustrate the process drug discovery and development.
- CO3-4.0.4C: Outline the concept and categories receptor, interpret drug-receptor, drug-drug, drug food interaction and outline adverse drug reactions and drug toxicity.
- CO4-4.0.4D: Illustrate physiological and pathological role of autocooids.
- CO5-4.0.4E: Elaborate rational use of drug in pediatric, geriatric and in pregnancy and lactation

### **BP405: Pharmacognosy I**

Students will be able to:

- CO1-4.0.5A: comprehend & explain basics of various secondary metabolites, and deduce their significance as medicinal molecules.
- CO2-4.0.5B: explain historical significance & contribution of phytoconstituents, the techniques in the cultivation and production of crude drugs
- CO3-4.0.5C: discuss and elaborate the crude drugs, their uses and chemical nature
- CO4-4.0.5D: handle various equipment's as per SOPs and conduct various analytical parameters to evaluate techniques for the herbal drugs
- CO5-4.0.5 E: evaluate of crude drugs with quality control parameters

## T. Y. B. Pharm (SEM-V) Course Outcome

### BP501: Medicinal Chemistry II

Students will be able to:

**1- 5.0.1A:** This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs

**CO2- 5.0.1B:** Emphasis on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs.

**CO3- 5.0.1C:** Emphasis on chemical synthesis of important drugs under each class.

**CO4- 5.0.1D** Upon completion of the course the student shall be able to Understand the chemistry of drugs with respect to their pharmacological activity

**CO5- 5.0.1E:**..Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs.

**CO6- 5.0.1F:** To Know the Structural Activity Relationship of different class of drugs4.Study the chemical synthesis of selected drugs.

### BP502: Industrial Pharmacy-I

Students will be able to:

**CO1-5.0.2A:** Describe physicochemical phenomena, basic laws governing behavior of fluids

**CO2-5.0.2B:** Define and differentiate various forms of solids and significance of polymorphism in pharmaceuticals including various detection techniques.

**CO3-5.0.2C:** Correlate the interrelationships between the physicochemical properties of a drug in consideration with their routes of administration and delivery system.

**CO4-5.0.2D:** Apply the key physical chemistry concepts to states of matter such as solubility, partitioning phenomena in the field of Pharmaceutics.

**CO5-5.0.2E:** Perform and interpret results of various experiments based on solubility behaviour, partitioning behavior, conductometry, phase rule, colligative properties.

### BP503: Pharmacology II

Students will be able to:

**CO1-5.0.3A:** Describe pharmacotherapy of various drug acting on CVS along with mechanism of drug action and its relevance in the treatment of different diseases.

**CO2-5.0.3B:** Explain pharmacology on various drug acting on endocrine system along with mechanism of drug action and its relevance in the treatment of different diseases.

**CO3-5.0.3C:** Illustrate Classification and Pharmacology of Autocoids and urinary system.

**CO4-5.0.3D:** Analyze process of isolation of different organs/tissues from the laboratory animals by simulated experiments.

**CO5-5.0.3E:** Demonstrate the various receptor actions using isolated tissue preparation and correlation of pharmacology with related medical sciences.

### **BP504: Pharmacognosy and Phytochemistry II**

Students will be able to:

**CO1-5.0.4A:** To know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents

**CO2-5.0.4 B:** To understand the production of of Phytoconstituents /herbal formulation

**CO3-5.0.4 C:** To understand the metabolic pathways in formation of secondary metabolites and application of biogenetic studies.

**CO4-5.0.4 D:** To carryout isolation and identification of phytoconstituents

**CO5-5.0.4 E:** Demonstrate different techniques for extraction of phytochemicals and verify extracted material by qualitative tests.

### **BP505: Pharmaceutical Jurisprudence**

Students will be able to:

**CO1- 5.0.5A:** Understand the Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals

**CO2- 5.0.5B:** Understand Various Indian pharmaceutical Acts and Laws

**CO3- 5.0.5C:** Understand the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals

**CO4- 5.0.5D:** Understand the code of ethics during the pharmaceutical practice

### **T. Y. B. Pharm (SEM-VI) Course Outcome**

#### **BP601: Medicinal Chemistry III**

Students will be able to:

**CO1- 6.0.1A:** Understand the importance of drug design and different techniques of drug design.

**CO2- 6.0.1B:** Understand the chemistry of drugs with respect to their biological activity

**CO3- 6.0.1C:** Know the metabolism, adverse effects and therapeutic value of drugs

**CO4- 6.0.1D:** Know the importance of SAR of drugs.

#### **BP602: Pharmacology III**

Students will be able to:

**CO1-6.0.2 A:** Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases

**CO2-6.0.2 B:** Comprehend the principles of toxicology and treatment of various poisonings & appreciate correlation of pharmacology with related medical science

**CO3-6.0.2 C:** Explain the use of marketed products along with its adverse reaction.

**CO4-6.0.2 D:** Analyze process of isolation of different organs/tissues and various receptor actions using isolated tissue preparation from the laboratory animals by simulated experiments.

**CO5-6.0.2 E:** Demonstrate of different bio statistical parameters using isolated tissue preparation from the laboratory animals by simulated experiments.

### **BP603: Herbal Drug Technology**

Students will be able to:

- CO1-6.0.3A: understand raw material as source of herbal drugs from cultivation to herbal drug product
- CO2-6.0.3B: know the WHO and ICH guidelines for evaluation of herbal drugs
- CO3-6.0.3C: know the herbal cosmetics, natural sweeteners, nutraceuticals
- CO4-6.0.3D: appreciate patenting of herbal drugs, GMP.

### **BP604: Biopharmaceutics and Pharmacokinetics**

Students will be able to:

- CO1- 6.0.4A: Understand the basic concepts in biopharmaceutics and pharmacokinetics and their Significance.
- CO2-6.0.4B: Use plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.
- CO3-6.0.4C: Understand the concepts of bioavailability and bioequivalence of drug products and their significance.
- CO4-6.0.4D: Understand the concept of dissolution and application of in vitro in vivo correlation in drug product development.
- CO5-6.0.4E: the significance of principles and theories bio-pharmaceutics in design of pharmaceutical dosage forms.

### **BP605: Pharmaceutical Biotechnology**

Students will be able to:

- CO1-6.0.5A-To understand the scope of Biochemistry and Understand role of biochemical processes in cell Metabolism
- CO2-6.0.5B-Understand chemistry, function, classification, biological importance, qualitative tests Identify proteins amino acids and carbohydrates by various qualitative as well as quantitative chemical tests.
- CO3-6.0.5C To understand Separation, identify and characterize proteins from various samples like egg, milk, etc and understand principle behind the technique&applications of various bio-molecules. e.g. proteins, carbohydrates, lipids, nucleic acids and vitamins
- CO4-6.0.5D To establish the correlation of metabolism, process, steps involved in metabolism of carbohydrates, lipids, protein and nucleic acid.
- CO5-6.0.5E-To know the enzyme structures, their functions, mechanism for enzymatic activity and applications of enzymes in routine life and in industrial development.

### **BP606: Quality Assurance**

Students will be able to:

- CO1-6.0.6A- Understand the cGMP aspects in a pharmaceutical industry
- CO2- 6.0.6B-Appreciate the importance of documentation
- CO3- 6.0.6C-Understand the scope of quality certifications applicable to pharmaceutical industries
- CO4-6.0.6D-Understand the responsibilities of QA & QC departments

## Final B. Pharm (SEM-VII) Course Outcome

### 4.7.1 Sterile Products

Students will be able to:

CO1-4.7.1A: Demonstrate the general requirements, routes of administration, significance of tonicity adjustment and sterility and pre-formulation of sterile products.

CO2-4.7.1B: Distinguish various packaging materials, choice of containers, official quality control

tests and use of ingredients in formulation and category of formulation.

CO3-4.7.1C: Adapt the processing, manufacturing and quality control of LVP, SVPs along with special types of SVPs and its pilot plant scale up.

CO4-4.7.1D: Demonstrate the concept of design and development of formulation, types, evaluation and labelling of SVP, LVP such as ophthalmic products and to describe types and evaluation of blood products, surgical dressings and marketed preparations of SVP and LVP.

CO5-4.7.1E: Describe essential components of parenteral facility layout as per MP/Schedule M recommendations the GMP and design its layout of parenteral production facility, environmental control zones, heating ventilation air conditioning (HVAC), HEPA filter and laminar area flow systems.

### 4.7.2 Pharmaceutical Analysis-V

**Student Shall be able to -**

**CO1-4.7.2A** :Recite the principles of Infra-red (FTIR, NIR) Raman, Gas Chromatography, Flash Chromatography, Super critical fluid chromatography Atomic Emission spectroscopy and electron microscopy.

**CO1-4.7.2 B**: Explain the Instrumentation of above mentioned analytical techniques with their applications with special reference to quality control and assurance and importance in the pharmaceutical industry.

**CO1-4.7.2 C**: Independently operate and calibrate various analytical instruments for the separation/isolation and assay of various APIs and formulations as per Pharmacopoeial standards.

**CO1-4.7.2D**: Design and execute analytical experimental procedures. Independently calculate process and interpret the data obtained through experimentation and report the results as per regulatory requirements.

**CO1-4.7.2E**: Follow appropriate safety measures while handling instruments, chemicals and apparatus.

#### **4.7.3 T Medicinal Chemistry-III & 4.7.3 P Medicinal Chemistry-III**

Students will be able to:

CO1-4.7.3A: Compose the general aspects of design of the drugs.

CO2-4.7.3 B: Tell detailed information about various classes of antibiotics & chemotherapeutic agents.

CO3-4.7.3C: List recent developments in antibiotics & chemotherapeutic agents.

CO4-4.7.3D: Plan Synthesis, purification & characterization of medicinally important compounds.

CO5-4.7.3E: Construct reaction mechanisms involved in synthesis of medicinally important compounds.

#### **4.7.4 - PHARMACOLOGY-IV**

**Students will be able to:**

**CO1- 4.7.4A:** Explain the general principals of chemotherapy and infectious diseases and describe the pharmacology of antibiotics and antimicrobials.

**CO2- 4.7.4B:** Describe the pharmacology of endocrines, adrenocorticosteroids and corticosteroid antagonists, antithyroid drugs, oral hypoglycemics, androgens, estrogens, progestin and oral contraceptives.

**CO3- 4.7.4C** Illustrate the biosynthesis, mechanism of action, pharmacology and regulation of thyroid, parathyroid hormones, insulin and glucagon and pharmacotherapy of diabetes mellitus.

**CO4- 4.7.4D:** Describe the importance of isolated tissue preparation and demonstrate and analyse mechanism of action of drugs using isolated tissues.

**CO5- 4.7.4E:** Analyse the rational and irrational fixed dose combinations based on various parameters. Justify the prescription pattern and rational use of drugs by performing case study or doing hospital visit

#### **4.7.5 NATURAL DRUG TECHNOLOGY**

Students will be able to:

CO1-4.7.5 A: Describe authentication and standardization of herbal material using conventional and modern techniques.

CO2-4.7.5 B: Explain WHO guidelines in relation with cultivation, collection and storage as well as steps involved in development of plant monograph.

CO3-4.7.5 C: Discuss concept of traditional medicinal systems, Ayurvedic dosage forms, nutraceuticals and cosmoceuticals.

CO4-4.7.5 D: Justify plant material utilization in pharmaceutical & allied industry.

CO5-4.7.5 E: Evaluate and compare marketed and prepared cosmetic as well as nutraceutical formulations, preformulation parameters by handling various equipment as per SOPs.

#### **4.7.6 T BIO-PHARMACEUTICS & PHARMACOKINETICS**

Students will be able to:

CO1-4.7.6A: Define and differentiate between basic concepts of pharmacokinetics and pharmaco-dynamics, identify the physiological, physicochemical and dosage form-related factors that affect drug absorption.

CO2-4.7.6B: Analyze different compartmental and non-compartmental models of pharmacokinetics and determine the basic linear and non-linear pharmacokinetic parameters that describe drug absorption and disposition.

CO3-4.7.6C: Describe concept and principles of dissolution studies and in vitro-in vivo correlation for different drug products and pharmacokinetic basis of modified release dosage forms of medications.

CO4-4.7.6D: Classify biopharmaceutical systems, regulatory requirements for conducting bioequivalence .bio-wavers

CO5-4.7.6E: the significance of principles and theories bio-pharmaceutics in design of pharmaceutical dosage forms.

#### **4.7.7 Pharmaceutical Jurisprudence .**

Students will be able to:

CO1-4.7.7 A. Explain basic principles , purpose ,significance of pharmaceutical laws in India. Important rules, regulations and procedures made to execute the laws.

CO2- 4.7.7 B. Illustrate purpose, qualifications for membership of different admistritative bodies and board as per D and C Act. To know provisions for import, manufacture, sale and distribution of drugs. Schedules to act.

CO3- 4.7.7 C. Describe and make use of various acts sush as Pharmacy act, narcotics and psychotropic substances act , cruelty to animals act.

CO4- 4.7.7 D. Describe act . To study quality and prices of essential medicine. Objectives and Salient features of following legislations Food Safety and Standards Act 2011. Consumer Protection Act1986, Industrial Development & Regulation Act 1951. Drugs and Magic Remedies

CO5- 4.7.7 E. Illustrate patents, IPR and regulatory systems

## Final B. Pharm (SEM-VIII) Course Outcome

4.8.1

### Advanced Drug Delivery System

Students will be able to:

CO1-4.8.1A: Describe the fundamental principles modified drug release including the pre requisites of drug candidates ,various approaches for design and optimization of these dosage forms based on standard monographs.

CO2-4.8.1B: Classify and describe the role of polymers used in formulation development of novel drug delivery system and their characterization using modern tool.

CO3-4.8.1C: Enumerate the different novel drug delivery system and describe their advantages, disadvantages, applications and classifications based on design concept with their applications.

CO4-4.8.1D: Describe the therapeutic aerosols along with typical formulations like metered dose, intranasal and topical uses.

CO5-4.8.1E: Describe concept of microencapsulation, merits, demerits and application, types , understanding the concept of design and development of formulation and its evaluation.

### 4.8.2 Cosmetic Science

Students will be able to:

4.8.2 A: Explain the concept & Scope of cosmetic science & cosmeceuticals

4.8.2B: Illustrate the quality of water& microbial control in cosmetic manufacturing.

4.8.2C:Describe formulation manufacturing, labelling & evaluation of skin care , hair, eye, dental care, manicure, & baby cosmetic.

4.8.2D:Comapre the types of additves & different equipments used in cosmetic manufacturing.

4.8.2 E: Formulate, Evaluate & label the different types of cosmetic formulations.

CO5-4.8.2E: Describe the use and need of ingredients in formulation and identify the category of formulation.

4.8.3

### Pharmaceutical Analysis-VI

**Student shall be able to -**

**CO1-4.8.3 A:** Recite principle of NMR, ESR spectroscopy, HPLC, Mass Spectrometry .

**CO1-4.8.3 B:** Explain the Instrumentation of above mentioned analytical techniques with their applications in Pharmaceutical research, quality control of APIs & formulations.

**CO1-4.8.3 C:** Independently operate and calibrate various analytical instruments for the assay of various APIs and formulations as per Pharmacopoeial standards.

**CO1-4.8.3D:** Design and execute analytical experimental procedures. Independently calculate process and interpret the data obtained through experimentation and report the results as per regulatory requirements.

**CO1-4.8.3 E:** Know basic concepts in validation of Equipment & analytical methods & follow appropriate safety measures while handling instruments, chemicals and apparatus.



**T Medicinal Chemistry-IV**

Students will be able to:

CO1-4.8.4A: Interpret the general aspects of drug design.

CO2-4.8.4B: Recognize detailed information about antihistaminics, proton pump inhibitors, Serotonergic agents, Autacoids, NSAIDs, analgesics & antipyretics, Narcotic agents, Steroidal Drugs, Hormones, Insulin & Oral Anti-hyperglycemic drugs and Diagnostic agents.

CO3-4.8.4C: Propose recent developments in antibiotics & chemotherapeutic agents.

CO4-4.8.4D: Organize Synthesis, purification & characterization of medicinally important compounds.

CO5-4.8.4E: Sketch reaction mechanisms involved in synthesis of medicinally important compounds.

**4.8.5- PHARMACOLOGY-V (INCLUDING BIOSTATISTICS)**

Students will be able to:

**CO1- 4.8.5A:** Explain, analyze and report the drug interaction and adverse drug reactions with drug safety and pharmacovigilance aspect.

**CO2- 4.8.5B:** Explain the organization of hospital pharmacy, patient compliance and elaborate the role of hospital pharmacists and strategies of patient compliance.

**CO3- 4.8.5C:** Elaborate clinical trials, ethical issues in clinical trials, good clinical practices and clinical data management.

**CO4- 4.8.5D:** determine the PA<sub>2</sub> and PD<sub>2</sub> value of drugs using isolated tissue.

**CO5- 4.8.5E:** Calculate & analyse parametric and nonparametric biostatistical data using suitable statistical test and software.

**4.8.6 NATURAL PRODUCTS: COMMERCE, INDUSTRY & REGULATIONS**

Students will be able to:

CO1-4.8.6 A: Explain position of Indian herbal drug industry in global contest and classify different market segments, demand & supply position; export & import potential.

CO2-4.8.6 B: Describe government organizations & policies for promotion; their regulation in India & other countries

CO3-4.8.6 C: Discuss safe use of natural products, possible toxicities, interaction & significance of pharmacovigilance systems.

CO4-4.8.6 D: Employ various regulatory guidelines, ethical issues.

CO5-4.8.6 E: Analyse the market potential of natural products & explore entrepreneurship skills to grab these opportunities

**4.8.7 QUALITY ASSURANCE TECHNIQUES**

Student shall be able to -

**CO1-4.8.7 A:** Describe the significance of quality in pharmaceutical manufacturing

**CO2-4.8.7 B:** Explain Current Good Manufacturing Practices.

**CO3-4.8.7 C:** Describe various aspects of documentation, SOPs and records

**CO4-4.8.7 D:** Elaborate on the role of validation in assurance of quality in pharmaceutical industry

**CO5-4.8.7 E:** Explain the concept quality by design. Explain about ICH guidelines in stability testing and QMS.

## **M.Pharm(Pharmaceutics)**

### **REGULATORY AFFAIRS (MPH 104T)**

Student **shall be able to -**

CO1-104 A: Explain regulatory guidelines and the approval processes of IND, ANDA, and NDA

CO2-104B: Compare global document formats and post approval requirements

CO3-104C: Distinguish monitoring processes in clinical trial and pharmacovigilance

CO4-104D: Summaries the concepts of innovator and generic drug development process

CO5-104E: Prepare dossier and their submission to regulatory agencies.

### **MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES**

Student shall be able to -

CO1- 101A: Describe Analytical techniques for identification & characterization of drugs.

CO2- 101 B: Learn Analytical techniques for quantification of drugs.

CO3- 101C: Explain theoretical skills of instrument handling and use.

CO4- 101D: Express Structural Elucidation of organic compounds using spectroscopic tools.

CO5- 101E: Analyze practical skills of instrument handling and use.

### **ADVANCED BIOPHARMACEUTICS & PHARMACOKINETICS**

Student shall be able to –

**CO1- 1.2.2A:** The basic concepts in biopharmaceutics and pharmacokinetics.

**CO2- 1.2.2B:** The use raw data and derive the pharmacokinetic models and parameters the best describe the process of drug absorption, distribution, metabolism and elimination.

**CO3- 1.2.2C:** The critical evaluation of biopharmaceutics studies involving drug product equivalency.

**CO4- 1.2.2D:** The design and evaluation of dosage regimens of the drugs using pharmacokinetic and biopharmaceutics parameters.

**CO5- 1.2.2E:** The potential clinical pharmacokinetic problems and application of basics of pharmacokinetic.

### **Research Methodology & Biostatistics**

Student shall be able to –

CO1- MRM 301T: Explain basic concepts of research and its methodologies

CO2- MRM 301T: Describe application, importance and factors affecting sample size and different bio-statistical tests and its application in research

CO3- MRM 301T: Explain basics of medical research and declaration of Helsinki.

CO4- MRM 301T: Explain CPCSEA guidelines for animal handling

### Molecular Pharmaceutics (NanoTech and Targeted DDS)

Student shall be able to –

- CO1-103T.A: explain various concepts for targeting of drug at specific site of action.
- CO2-103T B: describe various approaches for development of novel drug delivery system.
- CO3-103T C: describe criteria for selection of drugs and polymers for the development of NTDS.
- CO4-103T D: describe formulation and evaluation of novel drug delivery systems.
- CO5- 103T E: explain concept, methods of gene therapy in treatment of disease, antisense molecules

### Modern Pharmaceutics

Student shall be able to –

- CO1-103T.A: Explain elements of preformulation study and describe the physiological and formulation consideration of parenteral formulations.
- CO2-103T B: Describe various optimization techniques and interpretation of graphical data.
- CO3-103T C: Explain types of validation, guidelines for validation and development of validation protocol for equipment and dosage forms.
- CO4-103T D: Describe CGMP & elements of industrial managements.
- CO5-103T E: Describe and interpret physics of tablet compression and various dissolution model dependent, independent approaches and statistical tests.

### Pharmaceutics Practical-I

Student shall be able to –

- CO1:** Explain methods for estimation of API, elements of preformulation study excipients and methods used for formulations of conventional and novel delivery system, model dependant and model independent approaches, interpret IR spectra.
- CO2:** Determine drug content by different methods using UV-visible spectroscopy.
- CO3:** Formulate and evaluate various conventional and novel dosage forms.
- CO4:** Articulate the interrelationship between the physicochemical properties of excipients, drug and dosage form

### Pharmaceutics Practical-II

Student shall be able to –

- CO1:** Explain preparation and evaluation techniques of novel dosage form, solid dispersion, parameters PKPD software, bioavailability studies
- CO2:** Select ingredients for preparation of novel dosage forms, solubility enhancement techniques.
- CO3:** Formulate and evaluate novel dosage form, solid dispersion techniques.
- CO4:** Interpret published research data on bioavailability, factorial design, QbD, computer simulation in Pharmacokinetics and Pharmacodynamics, Computational Modeling of Drug Disposition, Clinical Data Collection manual, Sensitivity Analysis, and Population Modelling .

