



INTEGRAL UNIVERSITY, LUCKNOW
FACULTY OF PHARMACY
BACHELOR IN PHARMACY (B. PHARM.)

PROGRAM OUTCOMES (PO's)

- PO1. Pharmacy Knowledge:** Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioural, social, and administrative pharmacy sciences; and manufacturing practices.
- PO2. 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.
- PO3. Problem analysis:** Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyse, evaluate and apply information systematically and shall make defensible decisions.
- PO4. Modern tool usage:** Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.
- PO5. Leadership skills:** Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfilment 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.
- PO6. 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).
- PO7. 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.

- PO8. Communication:** Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.
- PO9. 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.
- PO10. 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.
- PO11. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an on-going basis.

PROGRAM EDUCATIONAL OBJECTIVES (PEO's)

- PEO1:** To produce pharmacy graduates with basic and applied concepts of different pharmaceutical disciplines.
- PEO2:** To impart students with adequate knowledge and skills to perform as health care provider and contribute towards National Health Programme.
- PEO3:** To develop trained pharmacists having technical expertise along with strong communication skills and multidisciplinary approach.
- PEO4:** To train students in drug regulatory affairs and price control of drugs.
- PEO5:** To inculcate entrepreneurship and management aptitudes in future pharmacists.
- PEO6:** To ensure continuous development of graduates to participate in life-long learning process for a highly productive career.

PROGRAMME SPECIFIC OUTCOMES (PSO's)

- PSO1.** Work in different divisions of pharmaceutical industry like manufacturing, quality control, quality assurance, sales, marketing and regulatory divisions.
- PSO2.** Explore opportunities as pharmacists in community and hospital pharmacy settings.
- PSO3.** Join different government organizations as drug analyst, chemist and drug inspectors for better management and control of pharmaceutical activities.

COURSE OUTCOMES (CO's)

HUMAN ANATOMY AND PHYSIOLOGY (BP101T)

- CO1:** Gain knowledge of the basic structural organisation of human body; Understand the levels of organization at cellular level.
- CO2:** Understand the structural and functional classification of skeletal system.
- CO3:** Learn the role of blood and lymph; Understand the function of Lymphatic system.
- CO4:** Learn the concepts of Peripheral Nervous System and special senses.
- CO5:** Understand the structural and functional classification of Cardio-vascular system.

PHARMACEUTICAL ANALYSIS-I (BP102T)

- CO:1** Understand the knowledge on preparatory pharmacy and professional way of evaluating various conventional drugs, raw materials and formulations.
- CO2:** Explain the theoretical basis of commonly used statistical methods & correctly analyze & interpret the results of statistical data from surveys, experiments & observational studies.
- CO3:** Illustrate sources of errors in analytical techniques, methods to minimize them.
- CO4:** Describe the various titrimetric and electrochemical methods of analysis and their application in quality control of pharmaceuticals.
- CO5:** Describe gravimetry and limit tests-principles and applications.
- CO6:** Differentiate between the ability and limitations of all the methods and be able to choose a suitable method, when needed.

PHARMACEUTICS I (BP103T)

- CO1:** After completion of this course students will able to know about the career opportunities in pharmacy, Pharmacopoeias and history of profession of Pharmacy in India.
- CO2:** Know about the different types of dosage form, prescription along with their parts and calculation of dose on the basis of age, body weight and body surface area.
- CO3:** After completion of this course students will able to understand the Pharmaceutical calculations, its different system along with methods of calculation.

- CO4:** Describe about powders and liquid dosage forms, excipients used in formulation of liquid dosage forms and solubility enhancement techniques.
- CO5:** After completion of this course students will able to explain the different types of monophasic liquids formulations along with their preparation methods.
- CO6:** Explain the biphasic liquids formulations, stability problems associated with these formulations and the methods to overcome these problems.
- CO7:** After completion of this course students will able to know about suppository, its methods of preparation, Displacement value & its calculations.
- CO8:** Describe pharmaceutical incompatibilities, its type with examples.
- CO9:** After completion of this course students will able to describe semisolid dosage forms, mechanisms and factors influencing dermal penetration of drugs, preparation of different types of semisolid dosage forms and its evaluation

PHARMACEUTICAL INORGANIC CHEMISTRY (BP104T)

- CO1:** Study the monographs of inorganic drugs and pharmaceuticals.
- CO2:** Distinguish the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals.
- CO3:** Recognize the medicinal and pharmaceutical importance of inorganic compounds.

COMMUNICATION SKILLS (BP105T)

- CO1:** Students will learn basic concepts/ knowledge of Communication process, its types, Barriers to communication and Perspectives in communication
- CO2:** Students will learn Elements of communication: Tone, body language, gesture, communication styles, Verbal and Non-verbal mode of communications
- CO3:** Students will learn about Basic Listening skills: active listening, listening in difficult situations, Written communication: shades of meaning, complexity of topic, Audience factor, organization of the message
- CO4:** Students will be made aware about Interview skills, Do's and Don'ts of an interview, Presentation skills: planning and structuring, delivery and techniques of presentation as well
- CO5:** Students will be made aware about Group Discussion and its nuanced aspects: role of communication skills in GD and Do's and Don'ts of GD

REMEDIAL BIOLOGY (BP106RBT)

- CO1:** Students will be able to learn about basic concept/ Knowledge of animal cell, Animal Tissue, cell division and cell organelles'
- CO2:** Students will be able to learn about basic concept/ Knowledge of plant respiration, plant growth and development, plant and mineral nutrition, photosynthesis
- CO3:** Students will be able to learn about classifications & salient feature of five kingdoms of life Anatomy and Physiology human, anatomy and physiology of plant
- CO4:** Students will be able to learn about circulatory, digestive, respiratory and excretory system of human
- CO5:** Students will be able to learn about Morphology of plant, Root, Stem, Leaf and its modification

REMEDIAL MATHEMATICS (BP106RMT)

- CO1:** Students will be able to learn about basic skills and extend their knowledge as they prepare for more advanced work.
- CO2:** Students will be able to learn about mathematical concepts and principles to perform computations for Pharmaceutical Sciences.
- CO3:** Students will be able to learn about classifications & salient feature of basic mathematics such as Identifying numbers, arrange numbers into arrays, to find solution of pharmacokinetics equations, etc.
- CO4:** Student shall be able to Know Trigonometry, Analytical geometry, Matrices, Determinant, Integration, Differential equation, Laplace transform and their applications.
- CO5:** Students will be able to learn to solve the problems of different types by applying theory and appreciate the important applications of mathematics in pharmacy.

MEDICAL TERMINOLOGY (PMT113)

- CO1:** Knowledge about basic terms of medicine and pharmaceutical field.
- CO2:** Application Understanding of Constructed and Non Constructed medical terms.
- CO3:** Ability to relate with new terms by understanding of Word Roots, Prefixes and Suffixes.
- CO4:** Development of scientific knowledge and aptitude
- CO5:** Better understanding of different subjects in the curriculum for eg: Anatomy, Pathophysiology Pharmacology.

PRINCIPLE OF BUSINESS MANAGEMENT (BM110)

- CO1:** To understand key functions in management as applied in practice and also throw light on development of management thoughts.
- CO2:** To understand in more specific management related areas from planning and also the role of MBO and decision making in setting organizational objectives
- CO3:** To understand about the principle of organization and also the role of authority and responsibility in different organizational structure.
- CO4:** To understand about the importance of staffing and also the role of leadership and motivation in an organization
- CO5:** To understand the importance of controlling in Management and how different control techniques are used for effective performance.

HUMAN ANATOMY AND PHYSIOLOGY-II (BP201T)

- CO1:** The chief objective of the unit was to provide basic knowledge about the ANATOMY AND PHYSIOLOGY OF NERVOUS SYSTEM
- CO2:** This subject is designed to impart basic knowledge about the anatomy and physiology of gastrointestinal system and its accessory organ.
- CO3:** The chief objective of this unit is to provide basic knowledge of functioning of respiratory system and urinary system.
- CO4:** This subject is designed to impart basic knowledge on the area of endocrinology. To study the anatomy and physiology of various endocrine glands
- CO5:** The chief objective of the unit was to provide basic knowledge of anatomy and physiology of male and female reproductive system

PHARMACEUTICAL ORGANIC CHEMISTRY-I (BP202T)

- CO1:** Recognise the classification, nomenclature and structural isomerism in organic compounds.
- CO2:** Account the preparation and reactions of alkanes, alkenes and conjugated dienes.
- CO3:** Explore the methods of synthesis, reactions and uses of alkyl halides and alcohols.
- CO4:** Investigate the synthetic routes, nucleophilic addition reactions, qualitative tests utilized for carbonyl compounds.
- CO5:** Evaluate the preparation, effect of substituents on reactivity, structure and uses of carboxylic acids & aliphatic amines.

BIOCHEMISTRY (BP203T)

- CO1:** Understand the importance of metabolism of substrates and their bioregulation
- CO2:** Will acquire chemistry and biological importance of biological macromolecules
- CO3:** Acquainted with qualitative and quantitative estimation of the biological
- CO4:** Know, understand and apply the interpretation of data emanating from a Diagnostic Test Lab
- CO5:** To know how physiological conditions and their variation influence the structures and reactivities of biomolecules
- CO6:** To understand the basic principles of protein and polysaccharide structure

PATHOPHYSIOLOGY (BP204T)

- CO1:** Basic principles of cell injury, adaptation along with basic mechanism involved in the process of inflammation and repair.
- CO2:** Students will be demonstrated with a basic understanding of the concepts and elements and will learn also learn about various diseases of the cardiovascular system
- CO3:** Students will understand the mechanisms, the diagnosis, and the treatment of diseases of the haematological and endocrine system and they will understand the mechanisms, the diagnosis, and the treatment of diseases of the nervous and gastrointestinal system
- CO4:** Students will learn about different infectious diseases and they will get preliminary information about the sexually transmitted disease
- CO5:** Students will develop basic understanding of the concepts and elements of Inflammatory and liver disease. They will develop a basic understanding of cancer and the disease of bones and joints.

COMPUTER APPLICATIONS IN PHARMACY (BP205T)

- CO1:** Understanding various types number systems.
- CO2:** Understanding various types of databases.
- CO3:** Understanding various types of application of computers in pharmacy.
- CO4:** Understanding Bioinformatics and databases and impact of Bioinformatics in Vaccine Discovery.
- CO5:** Understanding Computers as data analysis in Preclinical development.

PHARMACEUTICAL ORGANIC CHEMISTRY-II (BP301T)

- CO1:** Understand the concept of aromaticity, structure and general reactions of Benzene.
- CO2:** recognize different reactions given by different acidic and basic aromatic compounds
- CO3:** Learn about lipids, their types and different analytical constants to find the quality of lipids.
- CO4:** Learn about polynuclear hydrocarbons, their reactions and structure elucidation
- CO5:** Learn about cycloalkanes and different theories for the stabilities of cycloalkanes

PHYSICAL PHARMACEUTICS I (BP302T)

- CO1:** After completion of this course students will able to understand the mechanisms of solute solvent interactions, different factors which improve solubility of drugs and diffusion principles in biological systems.
- CO2:** Know about solubility of gas in liquids, solubility of liquid in liquids, Raoult's law, Distribution law and different types of liquids.
- CO3:** After completion of this course students will able to understand states of matter and properties of matter, eutectic mixtures and different forms of solids.
- CO4:** Explain various physicochemical properties of drug molecules in designing the dosage forms.
- CO5:** After completion of this course students will able to know about surface tension, differentiate between surface and interfacial tension and how to measure surface and interfacial tension by different methods.
- CO6:** Explain surface active agents, HLB Scale and adsorption at solid interface.
- CO7:** After completion of this course students will able to know about complexation, different types of complexation, and their methods of analysis.
- CO8:** Describe protein binding and how protein binding effect on drug action and crystalline structures of complexes.
- CO9:** After completion of this course students will able to describe pH scale given by Sorensen, its determination methods, buffer isotonic solutions, purpose behind maintaining the isotonicity of drug solution, and buffers in pharmaceutical and biological systems.

PHARMACEUTICAL MICROBIOLOGY (BP303T)

- CO1:** The students should understand the methods of identification, cultivation and preservation of various microorganisms.
- CO2:** The students should understand about Staining, sterilization and Evaluation of the efficiency of sterilization methods.
- CO3:** To understand about disinfectants, and their evaluation, sterility testing methods of pharmaceutical products.
- CO4:** The students should understand about aseptic area, sources of contamination, clean area classification and microbiological standardization methods of Pharmaceuticals.
- CO5:** The students should understand the microbial spoilage of pharmaceutical products, reservation of pharmaceutical products, cell culture technology and its applications in pharmaceutical industries.

PHARMACEUTICAL ENGINEERING (BP304T)

- CO1:** Recognize the importance of size reduction, size separation and fluid flow during pharmaceutical manufacturing.
- CO2:** Schematize and apply the principles of different heat processes used in pharmaceutical industries.
- CO3:** Describe the mechanisms and applications of drying and mixing processes.
- CO4:** Solve the issues related to filtration and centrifugation.
- CO5:** Apply different preventive methods used for the control of corrosion in pharmaceutical plants.

PHARMACEUTICAL ORGANIC CHEMISTRY-III (BP401T)

- CO1:** Understand the concept of stereoisomerism especially optical isomerism.
- CO2:** Understand the concept of geometrical isomerism
- CO3:** Learn about nomenclature, classification and chemical reactions of heterocyclic compounds.
- CO4:** Understand different reactions and medicinal uses of larger heterocyclic compounds
- CO5:** Learn the concept of reduction, oxidation, rearrangement reactions and their applications

MEDICINAL CHEMISTRY-I (BP 402T)

- CO1:** Well acquainted with chemistry of general anesthetics, Narcotics, Non-narcotics & Anti-inflammatory agents.
- CO2:** Well acquainted with the chemistry of cholinergic and anticholinergic drugs.
- CO3:** To understand chemistry of drugs acting on Autonomic nervous system.
- CO4:** Have basic knowledge, chemistry of drugs acting on CNS like sedatives, hypnotics, antipsychotic & anticonvulsant.
- CO5:** Understand basic concept of medicinal chemistry physicochemical properties and drug metabolism.

PHYSICAL PHARMACEUTICS-II (BP-403T)

- CO1:** Understand various physicochemical properties of drug molecules in the designing the dosage form
- CO2:** Understand the concept of viscosity and flow behaviour in the formulation development and evaluation of dosage forms.
- CO3:** Knowledge of physicochemical properties, formulation factors and instability markers in development of biphasic liquid dosages forms.
- CO4:** Demonstrate the application of particle size in designing the dosages forms.
- CO5:** Know the principles of chemical kinetics & to use them in assigning expiry date for Formulation

PHARMACOLOGY-I (BP404T)

- CO1:** Understand the pharmacological actions of different categories of drugs
- CO2:** Explain the mechanism of drug action at organ system/sub cellular/macromolecular levels
- CO3:** Apply the basic pharmacological knowledge in the prevention and treatment of various diseases
- CO4:** Observe the effect of drugs on animals by simulated experiments
- CO5:** Appreciate correlation of pharmacology with other bio medical sciences

PHARMACOGNOSY AND PHYTOCHEMISTRY-I (BP405T)

- CO1:** Gain knowledge on biological source, active constituents and uses of crude drug; Understand the techniques of evaluation of crude drugs as per the WHO guidelines.
- CO2:** Understand the basic principles of cultivation, collection and storage of crude drugs; Application of the crop improvement concepts involved in techniques for improvement of quality of medicinal plants.
- CO3:** Exploring the tissue culture technique in medicinal plants.
- CO4:** Appreciate the applications of Primary & Secondary metabolites of the plant and explore its medicinal importance.
- CO5:** Understand the principles and application of different system of alternative medicine.
- CO6:** Explore novel medicinal agents from different sources of natural origin.

MEDICINAL CHEMISTRY- II (BP501T)

- CO1:** Know the types of biological targets in humans and the structural requirement of drugs interacting with them and comprehend & correlate the biological systems involved in drug action for drugs acting as Antihistamines, Gastric Proton pump inhibitors, Antineoplastics, Diuretics, CVS drugs, Steroids, Thyroids and antithyroids, Antidiabetics and Local Anesthetics.
- CO2:** Explain chemical interactions of endogenous molecules with specific receptors or enzymes and the molecular effects of their respective agonists and antagonists through Structure Activity relationship studies of drugs for the following category of drugs Antihistamines, Gastric Proton pump inhibitors, Antineoplastics, Diuretics, CVS drugs, Steroids, Thyroids and antithyroids, Antidiabetics and Local Anesthetics.
- CO3:** Justify the absorption, distribution and selectivity of drugs based on chemical structure for the following category of drugs Antihistamines, Gastric Proton pump inhibitors, Antineoplastics, Diuretics, CVS, Steroids, Thyroids and antithyroids, Antidiabetics and Local Anesthetics.
- CO4:** Predict the drug metabolic pathways, adverse effect and therapeutic value from the structure of drugs and provide information on the storage of drugs based on the chemical stability. Antihistamines, Gastric Proton pump inhibitors, Antineoplastics, Diuretics, CVS, Steroids, Thyroids and antithyroids, Antidiabetics and Local Anesthetics.
- CO5:** Demonstrate knowledge of chemical synthesis of important drugs such as Cimetidine, Mechllorethamine, Mercaptopurine, Methotrexate, Acetazolamide, Chlorothiazide, Furosemide, Methyl dopa, Nitroglycerin, Isosorbide, Disopyramide, Warfarin, Tolbutamide, Benzocaine, Procaine and Dibucaine.

INDUSTRIAL PHARMACY-I (BP502T)

- CO1:** Acquire the knowledge of Preformulation
- CO2:** Know the various pharmaceutical dosage forms and their manufacturing techniques.
- CO3:** Know various considerations in development of pharmaceutical dosage forms.
- CO4:** Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality.

PHARMACOLOGY-II (BP503T)

- CO1:** Discuss & Interpret about the application of various blood forming agents and their role in treatment of cardiovascular disorders. Further able to analyze the importance of Diuretics in certain CVDs.
- CO2:** Explain about the mechanism of drug action and its relevance in the treatment of different diseases.
- CO3:** Apply their knowledge to understand and describe about how Autocoids involved in development of inflammatory disorders like Gout and Arthritis and their treatment.

CO4: Demonstrate about endocrine hormones and their physiological role and can justify the uses of Insulin, OHA, Corticosteroids, Thyroid hormone regulators in various disorders.

CO5: Detect the role of sex hormones and their applications as in Oral contraceptives. Define Bioassay types and methods for specific drug.

PHARMACOGNOSY AND PHYTOCHEMISTRY (BP504T)

CO1: Discuss the general technique of biosynthesis of phytoconstituents in plants.

CO2: Apprehended the composition, chemistry & chemical classes, bio-sources, therapeutic uses and commercial applications of different plants secondary metabolites.

CO3: Accomplished in the Isolation, Identification and Analysis of Phytoconstituents.

CO4: Accomplished in the production estimation and utilization of phytoconstituents in industrial scale

CO5: Accomplished in the estimation and analysis of the different phytoconstituents with help of instrument based on chromatography and spectroscopy.

PHARMACEUTICAL JURISPRUDENCE (BP505T)

CO1: The Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals.

CO2: Various Indian pharmaceutical Acts and Laws.

CO3: The regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals.

CO4: The code of ethics during the pharmaceutical practice.

CO5: Various Intellectual Property Rights.

CO6: Various offences and penalties in contravention to different Acts.

MEDICINAL CHEMISTRY- III (BP 601T)

CO1: Know the types of biological targets in humans and the structural requirement of drugs interacting with them and comprehend and correlate the biological systems involved in drug action for drugs acting as Antibiotics, Anti-infective – Antibacterial, Antiprotozoals, Antivirals, Antifungals and Anthelmintics

CO2: Explain chemical interactions of endogenous molecules with specific receptors or enzymes and the molecular effects of their respective agonists and antagonists through Structure Activity relationship studies of drugs for the following category of drugs Antibiotics, Anti-infective – Antibacterial, Antiprotozoals, Antivirals, Antifungals and Anthelmintics

CO3: Justify the absorption, distribution and selectivity of drugs based on chemical structure – Antibiotics, Anti-infective – Antibacterial, Antiprotozoals, Antivirals, Antifungals and Anthelmintics.

- CO4:** Predict the drug metabolic pathways, adverse effect and therapeutic value from the structure of drugs and provide information on the storage of drugs based on the chemical stability.
- CO5:** Demonstrate knowledge of chemical synthesis of important drugs such as Chloramphenicol, Chloroquine, Pamaquine, Isoniazid, Para amino salicylic acid, Ciprofloxacin, Nitrofurantoin, Acyclovir, Miconazole, Metronidazole, Diethylcarbamazine, Mebendazole, Sulfacetamide, Sulfamethoxazole, Dapsone.
- CO6:** Explain physico chemical properties related to QSAR and Describe various approaches and designing of drug molecules including prodrug and Combinatorial chemistry

PHARMACOLOGY-III (BP 602T)

- CO1:** The chief objective of the unit was to provide basic knowledge about the disease of respiratory system / gastrointestinal system B8 and drugs used in these problems.
- CO2:** This subject is designed to impart basic knowledge on the area of medicine used in infectious problems.
2. The chief objective of the unit was to provide basic knowledge about the disease arises due to infections by bacteria / virus and drugs used in these problems.
 3. Mechanism of action, adverse effect, drug interaction, contraindication arises due to use of Penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline and aminoglycosides drugs and their management .
- CO3:** The chief objective of this unit is to provide basic knowledge of drugs used in the treatment of tuberculosis, leprosy, viral infection, worm infestation, fungal and amoebic infection
- CO4:**
1. This subject is designed to impart basic knowledge on the area of medicine used in malignancy, sexually transmitted diseases, transplantation and immunity enhancer agents.
 2. The chief objective of the unit was to provide basic knowledge about the anticancer drugs, drugs used in sexually transmitted diseases, immunostimulants and immunosuppressants drugs.
 3. Mechanism of action, adverse effect, drug interaction, contraindication arises due to use of these drugs and their management .
- CO5:** The chief objective of the unit was to provide basic knowledge about the of acute, subacute and chronic toxicity and drugs used in these problems.
2. Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity, General principles of treatment of poisoning, Clinical symptoms and management of barbiturates, morphine, organophosphorus compound and lead, mercury and arsenic poisoning.
 3. Definition of rhythm and cycles. Biological clock and their significance leading to chronotherapy.

HERBAL DRUG TECHNOLOGY (BP603T)

- CO1:** Discuss the crude drug raw material as source of herbal drugs by cultivation process and knowledge of traditional system of medicine.
- CO2:** Apprehended the role of Nutraceuticals in treatment of various disease and Herbal-Drug and Herb-Food Interactions.
- CO3:** Apprehended the role of natural excipients in Herbal formulations and cosmetics.
- CO4:** Accomplished the Patenting aspects, Regulatory Issues and WHO and ICH guidelines for evaluation and assessment of Traditional drugs and Natural Products.
- CO5:** Discuss the General Introduction to Herbal Industry and Good Manufacturing Practice of Indian systems of medicine.

BIOPHARMACEUTICS & PHARMACOKINETICS (BP604T)

- CO1:** After completion of this course students will able to understand the mechanisms of drug absorption through GIT, factors influencing drug absorption through GIT and absorption of drug from non per oral extra-vascular routes.
- CO2:** Know about the tissue permeability of drugs, kinetics of protein binding and clinical significance of protein binding of drugs.
- CO3:** After completion of this course students will able to understand the basic understanding of metabolic pathways, factors affecting renal excretion of drugs and non renal routes of drug excretion of drugs.
- CO4:** Know about the absolute and relative bioavailability, *in-vitro* drug dissolution models, *in-vitro-in-vivo* correlations, bioequivalence studies and methods to enhance the dissolution rates and bioavailability of poorly soluble drugs.
- CO5:** After completion of this course students will able to explain compartmental modeling, various pharmacokinetic parameters, their significance and applications.
- CO6:** After completion of this course students will able to know about kinetics of multiple dosing, calculations of loading and maintenance doses and their significance.
- CO7:** After completion of this course students will able to understand the concept of non-linear pharmacokinetics and factors causing non-linearity and Michaelis-menton method of estimating parameters.

PHARMACEUTICAL BIOTECHNOLOGY (BP605T)

- CO1:** Understanding the basics of biotechnology including genetic engineering, Protein Engineering and Production of Enzymes, enzymes immobilization and biosensors.
- CO2:** Understanding Genetic engineering, Study of Recombinant DNA technology, PCR and production of biotechnological products.
- CO3:** Understanding the immune system, Hypersensitivity reactions, Monoclonal antibodies and vaccines.
- CO4:** Know the importance of various immunological techniques i.e. Microbial genetics, Microbial biotransformation and Mutation.
- CO5:** Study of fermentation technology, production of various pharmaceutical products and Collection, Processing and Storage of Blood Products.

INDUSTRIAL PHARMACY-I (BP606T)

- CO1:** Understand the cGMP aspects in Pharmaceutical industry.
- CO2:** Acquire knowledge about prevention and control of various diseases.
- CO3:** Acquire the scope of certification in pharmaceutical industries.
- CO4:** Understand the responsibilities of QA & QC departments

INSTRUMENTAL METHODS OF ANALYSIS (BP701T)

- CO1:** Investigate the pharmaceutical substances by UV Visible and fluorescence spectroscopy .
- CO2:** Analyze the essentials of nepheloturbidometry, flame photometry and atomic absorption spectroscopy.
- CO3:** Apprehend the analysis of a pharmaceutical substances by chromatographic techniques and electrophoresis.
- CO4:** Recognize the principle, instrumentation and applications of gas chromatography & high performance liquid chromatography.
- CO5:** Deal with the fundamentals of ion exchange, affinity chromatography and gel chromatography.

INDUSTRIAL PHARMACY-II (BP702T)

- CO1:** Acquire the ability about process of pilot plant and scale up of pharmaceutical dosage forms
- CO2:** Able to communicate the process of technology transfer from lab scale to commercial batch
- CO3:** Know the different Laws and Acts that regulate pharmaceutical industry
- CO4:** Understand the approval process and regulatory requirements for drug products

PHARMACY PRACTICE (BP703T)

- CO1:** Know and understand the Hospital organization and detect and assess adverse drug reactions, reporting and its management.
- CO2:** Knowledge of various drug distribution methods system in the hospital, and monitor drug therapy of Patient, role pharmacist in medication adherence and community pharmacy management .also know how to obtain medication history interview
- CO3:** Know and understand guideline of know pharmaceutical care services such therapeutic committee, drug information services, patient counseling, and also able to answer the role of pharmacist in education and training of program., monitor drug therapy of patient through medication chart review and clinical review.
- CO4:** Able to understand the medication of management, budget preparation and its implementation, and also help in rational use of common over the counter medication
- CO5:** Able to understand the appreciate pharmacy stores and inventory control management and able to interpret selected laboratory results of specific disease states and controlling of investigational use of drugs.

NOVEL DRUG DELIVERY SYSTEMS (BP704T)

- CO1:** Know the criteria for selection of drugs and polymers for the development of novel drug delivery systems and understand various approaches for development of novel drug delivery systems, their formulation and evaluation.
- CO2:** Know the approaches, technologies and drug carriers used in the process of drug delivery which serves to improve the selectivity, effectiveness, and/or safety of drug administration.
- CO3:** The students should understand about Transdermal Drug Delivery Systems, Gastro-retentive drug delivery systems and Naso-pulmonary drug delivery system.
- CO4:** To understand Targeted Drug Delivery including liposomes, niosomes, nanoparticles, monoclonal antibodies.
- CO5 :** To understand Ocular Drug Delivery Systems and Intrauterine Drug Delivery Systems including intra uterine devices (IUDs).

BIOSTATISTICS AND RESEARCH METHODOLOGY (BP801T)

- CO1:** Discuss the applications of Biostatics such as Correlation, Mean, Median, Mode, \ Range and standard deviation.
- CO2:** Discuss the applications of Biostatics in Pharmacy such as Regression, Probability theory, Sampling technique, Parametric tests and Non Parametric tests
- CO3:** Apprehended the design of experiments for Phases of clinical trials and observational and experimental studies.
- CO4:** Accomplished the operation of M.S. Excel, SPSS, R and MINITAB®, DoE (Design of experiment).
- CO5:** Accomplished the statistical techniques in Design and Analysis of experiments.

SOCIAL AND PREVENTIVE PHARMACY (BP802T)

- CO1:** Able to know about disease, health and health education and acquire the knowledge of nutrition and hygiene.
- CO2:** Acquire knowledge about prevention and control of various diseases.
- CO3:** Able to understand various national health programs.
- CO4:** Understand about National health intervention programme.
- CO5:** Acquire the knowledge of community services, NRHM and NUHM.

PHARMACEUTICAL MARKETING MANAGEMENT (BP803ET)

- CO1:** The pharmaceutical industry, requires skilled managers who can take the industry forward by managing and taking the complex decisions which are imperative for the growth of the industry.
- CO2:** The Knowledge and Know-how of marketing management groom the people for taking a challenging role in Sales and Product management.
- CO3:** The course aims to provide an understanding of marketing concepts and techniques and their applications in the pharmaceutical industry.

PHARMACEUTICAL REGULATORY SCIENCE (BP804ET)

- CO1:** Understand the concepts of innovator and generic drugs, drug development process.
- CO2:** Know the regulatory guidance's and guidelines for filing and approval process, preparation of dossiers and their submission to regulatory agencies in different countries
- CO3:** Know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals and the submission of global documents in CTD/ eCTD, ASEAN formats.
- CO4:** Understand the clinical trials requirements for approvals for conducting clinical trials, pharmacovigilance and process of monitoring in clinical trials
- CO5:** Knowledge of basic terminology, regulatory guidance's, guidelines, laws and acts.

PHARMACOVIGILANCE (BP805ET)

- CO1:** Understand the national as well as international significance of Pharmacovigilance.
- CO2:** Implement and spread awareness about drug safety.
- CO3:** Identify, analyse and classify the types of ADRs.
- CO4:** Able to prepare ADR report as per international guidelines using Standard terminologies.
- CO5:** Understand preclinical, clinical and post approval phases of a new drug.

QUALITY CONTROL AND STANDARDIZATION OF HERBALS (BP806ET)

- CO1:** Gain knowledge on biological source, active constituents and uses of crude drugs
Understand the techniques of evaluation of crude drugs as per the WHO guidelines
- CO2:** Understand the basic principles of cultivation, collection and storage of crude drugs
Application of the crop improvement concepts involved in techniques for improvement of quality of medicinal plants
- CO3:** Exploring the tissue culture technique in medicinal plants
- CO4:** Appreciate the applications of Primary & Secondary metabolites of the plant and explore its medicinal importance based on its chemical class
Understand the principles and application of different system of alternative medicine
- CO5:** Explore novel medicinal agents from different sources of natural origin

COMPUTER AIDED DRUG DESIGN (BP807ET)

- CO1:** Understand the process of Design and discovery of lead molecules
- CO2:** Appreciate the role of drug design in drug discovery process
- CO3:** Understand and apply the concept of QSAR and docking
- CO4:** Apply various strategies to develop new drug like molecules
- CO5:** Understand the designing of new drug molecules using molecular modeling software
- CO6:** Appreciate importance of computational methods in drug design and discovery processes

CELL AND MOLECULAR BIOLOGY (BP808ET)

- CO1:** Understanding the history of cell and molecular biology, cellular functioning and composition and chemical foundations of cell biology.
- CO2:** Understanding about DNA and RNA and their functioning.
- CO3:** Students able to Describe protein structure and function, Protein Synthesis.
- CO4:** Know the basic molecular genetic mechanisms.
- CO5:** Summarize the Cell Cycle including Cell Signals, Receptors for Cell Signals, Signalling Pathways.

COSMETIC SCIENCE (BP809ET)

- CO1:** Gain information on key ingredients used in cosmetics and cosmeceuticals
- CO2:** Understand key building blocks of cosmetics for various formulations
- CO3:** Know the current technologies in the market
- CO4:** Understand the scientific principles to develop cosmetics and cosmeceuticals with desired safety

EXPERIMENTAL PHARMACOLOGY-II (BP810ET)

CO1: Students can able to explain the applications of various laboratory animals in research.

CO2: Apply knowledge to explain about Screening techniques and analyze the importance of screening models for drugs acting on CNS.

CO3: Describe about Screening models used for drugs acting on ANS

CO4: They can able to apply biostatistics for evaluation of results obtained from research.

Advanced Instrumentation Techniques (BP811ET)

CO1: Investigate the pharmaceutical substances by NMR spectroscopy and mass spectrometry.

CO2: Analyze the essentials of thermal methods of analysis and X ray diffraction methods.

CO3: Apprehend the calibration and validation of analytical instruments.

CO4: Recognize the fundamentals of radio immune assay and extraction techniques.

CO5: Deal with the fundamentals of hyphenated techniques.

DIETARY SUPPLEMENTS AND NUTRACEUTICALS (BP812ET)

CO1: Understand the need of supplements by the different group of people to maintain healthy life.

CO2: Understand the need of supplements by the different group of people to maintain healthy life and the outcome of deficiencies in dietary supplements.

CO3: Know about free radicals production and its damaging reactions on lipids, proteins, carbohydrates, nucleic acids and Study about Dietary fibres and complex carbohydrates.

CO4: Understand the effect of Free Radicals' in Various Disorders and ageing, importance and types of Antioxidants and the effect of various environmental factors on the nutraceuticals.

CO5: Appreciate the regulatory and commercial aspects of dietary supplements including health claims. To know about Adulteration of foods.

PHARMACEUTICAL PRODUCT DEVELOPMENT (BP813ET)

CO1: Explain pharmaceutical product development

CO2: Know pharmaceutical excipients

CO3: Improve pharmaceutical product development by quality by design (QbD) techniques

CO4: Application of excipients in pharmaceutical formulations