COURSE OUTCOMES
FIRST YEAR
B. PHARMACY

COURSE OUTCOMES

B.Pharm First Year –SEM-I

BP101T. HUMAN ANATOMY AND PHYSIOLOGY-I (Theory)

Upon the completion of the course student shall be able to

CO1	Describe various parts of human body and their roles.
CO2	Explain the structure of cells, tissues and organs along with its significance, various parts of CNS and PNS.
CO3	Explain different bones in the human skeleton system, their location and significance, Endocrine system and its importance with the help of charts and models.

BP107P. HUMAN ANATOMY AND PHYSIOLOGY-I (Practical)

Upon the completion of the course student shall be able to

CO1	Identify, compare and contrast between the microscopy of epithelial, connective, muscular, nervous tissue of human body.
CO2	Explain the significance of bleeding time, clotting time, blood group detection, hemoglobin detection and measurement of blood pressure.
CO3	Demonstrate procedure of white blood cell count and red blood cell count and red blood cell count of blood sample.

BP102T. PHARMACEUTICAL ANALYSIS-I (Theory)

CO1	Outline the method of expressing the concentration with preparation and standardization of various molar and normal solutions.
CO2	Recall the sources, type and method of minimizing the errors.
CO3	Explain the principle involved in volumetric and electrochemical analysis of inorganic compounds

BP108P. PHARMACEUTICAL ANALYSIS (Practical)

CO1	Prepare and standardize primary and secondary standard solutions of various normality and molarity
CO2	Perform various volumetric and electrochemical titrations

BP103T. PHARMACEUTICS- I (Theory)

Upon the completion of the course student shall be able to

CO1	Outline the history of profession of pharmacy.
CO2	Enumerate the basics of different dosage forms.
CO3	Identify pharmaceutical incompatibilities in prescription ,their manifestation and suggest solution to correct same
CO4	Describe the professional way of handling prescription.
CO5	Perform the pharmaceutical calculations required during formulation of dosage form.

BP109P. PHARMACEUTICS I (Practical)

Upon the completion of the course student shall be able to

1	Formulate various conventional dosage forms in professional way.
2	Emphasize on the concepts of prescription like translation, calculation and suitability

BP104T. PHARMACEUTICAL INORGANIC CHEMISTRY (Theory)

CO1	Explain the sources of impurities and method to determine the impurities in an inorganic drugs and pharmaceuticals.
CO2	Describe the importance of radiopharmaceuticals.
CO3	Explain the method of preparation, assay, storage conditions and uses of Inorganic compounds such as acidifiers, antacids, cathartics, electrolyte replenisher, antimicrobials, dental products, medicinal gases and miscellaneous compounds like expectorant, sedative, antidotes and radiopharmaceuticals.

BP110P. PHARMACEUTICAL INORGANIC CHEMISTRY (Practical)

CO1	Identify the Inorganic compounds through various chemical tests.
CO2	Perform the limit test for certain impurities like chloride, sulphate, iron, arsenic, lead and heavy metals as per the Indian Pharmacopoeia

BP105T.COMMUNICATION SKILLS (Theory)

Upon the completion of the course student shall be able to

CO1	Explain need of communication skills, barriers to communicate effectively and perspectives of communication required to function effectively in areas of pharmaceutical operation
CO2	Apply various elements, styles of communications, Basic listening skills, writing skills to communicate effectively and manage team as team player
CO3	Apply Interview skills presentation skills and group discussion for development of leadership qualities and essentials

BP105T COMMUNICATION SKILLS (Practical)

CO1	Demonstrate and Apply basic communication skills and advance learning skills

BP 106RBT. REMEDIAL BIOLOGY (Theory)

Upon completion of the course student shall be able to

CO1	Describe the classification and salient features of five kingdoms of life.
CO2	Explain the basic component of anatomy and physiology of plant
CO3	Discuss the basic components of anatomy and physiology of animal with special reference to Human
CO4	Explain various parts of CNS, PNS and their Role

BP112RBP. REMEDIAL BIOLOGY (Practical)

Upon completion of the course student shall be able to

CO1	Demonstration of different bone in human skeleton system, their location and significance.
CO2	Perform blood group detection, measurement of blood pressure and tidal volume.
CO3	Able to identify microscopy of tissues pertinent to stem, root, leaf, seed, fruit and flower.

BP 106 RMT. REMEDIAL MATHEMATICS (Theory)

Upon the completion of the course student shall be able to

CO1	Know the theory and their application of Partial fraction, Logarithms , Function, in Pharmacy Limits and continuity, Matrices and Determinant, Calculus in Pharmacy
CO2	Solve the different types of problems by applying theory of Partial fraction, Logarithms , Function, in Pharmacy Limits and continuity, Matrices and Determinant, Calculus

B.Pharm First Year –SEM-II

BP 201T. HUMAN ANATOMY AND PHYSIOLOGY-II (Theory)

Upon the completion of the course student shall be able to

CO1	Explain the gross morphology, structure and functions of various organs of the human body.
CO2	Describe various homeostatic mechanisms and their imbalances.
CO3	Discuss the anatomy of lungs and other parts of respiratory system, tidal volume, artificial respiration and resuscitation methods.

BP 207 P. HUMAN ANATOMY AND PHYSIOLOGY-II (Practical)

Upon the completion of the course student shall be able to

CO1	Identify various tissues and organs of different systems of human body.
CO2	Explain construction and working of spirometer for the measurement of lung volume and capacities.

BP202T. PHARMACEUTICAL ORGANIC CHEMISTRY – I (Theory)

Upon completion of the course student shall be able to

CO1	Outline the structure, name and the type of isomerism of the organic compound.
CO2	Describe the reaction name of the reaction and orientation of reactions
CO3	Explain the mechanism, kinetics and reactivity of the certain reactions

BP208P. PHARMACEUTICAL ORGANIC CHEMISTRY – I (Practical)

Upon completion of the course student shall be able to

CO1	Perform the systematic qualitative analysis of organic compounds
CO2	Prepare the suitable solid derivatives from organic compounds

BP203 T. BIOCHEMISTRY (Theory)

Upon completion of the course student shall be able to

CO1	Describe the chemistry, biological importance and metabolism pattern of Biomolecules.
CO2	Summaries the concept of biological oxidation emphasizing on ETC and oxidative phosphorylation and identifying related inhibitors.
CO3	Explain catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzyme
CO4	Explain the genetic organization of mammalian genome and functions of DNA in synthesis of RNAs and proteins.

BP 209 P. BIOCHEMISTRY (Practical)

Upon completion of the course student shall be able to

CO1	Identify and characterize carbohydrates, proteins by various qualitative chemical tests in a given sample.
CO2	Determine blood creatinine, sugar, total cholesterol and action of salivary amylase.

BP 204T. PATHOPHYSIOLOGY (THEORY)

Upon the completion of the course student shall be able to

CO1	Explain the etiology and pathogenesis and complications of severe diseases and disorders.
CO2	Discuss the signs and symptoms of different diseases and their diagnostic procedures.
CO3	Differentiate between acute and chronic diseases based on etiology, signs and symptoms and complications.

BP205 T. COMPUTER APPLICATIONS IN PHARMACY (Theory)

Upon the completion of the course student shall be able to

CO1	know the various types of application of computers in pharmacy
CO2	Understand Concept of Information Systems and Software, various types of databases like MYSQL, MS ACCESS, Pharmacy Drug database, Number systems, Web technologies and Bioinformatics
CO3	Apply computer knowledge for Chromatographic dada analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System(TIMS)

BP210P. COMPUTER APPLICATIONS IN PHARMACY (Practical)

Upon the completion of the course student shall be able to

CO1	Use MS Word, MS Access for designing questionnaire, form to record patient information, creating patient database, mailing labels, invoice table, and generate reports
CO2	Create HTML web page, Export Tables, Queries, Forms and Reports to web pages and XML Pages

BP 206 T. ENVIRONMENTAL SCIENCES (Theory)

Upon the completion of the course student shall be able to

CO1	Understand Multidisciplinary nature of environmental studies Natural Resources Renewable and non-renewable resources, associated problems
CO2	Understand, explain and Draw Structure and function of various ecosystem.
CO3	Understand Environmental Pollution and its remedial methods to reduce it.

COURSE OUTCOMES
SECOND YEAR
B. PHARMACY

B.Pharm Second Year –SEM-III

BP 301T. PHARMACEUTICAL ORGANIC CHEMISTRY-II (Theory)

Upon completion of the course student shall be able to

CO1	Describe the reaction and mechanism of Benzene, phenols, aromatic amines and polynuclear hydrocarbons.
CO2	Explain the stabilities of cycloalkanes through different theories.
CO3	Summarize the chemistry of fats and oils.

BP305P. PHARMACEUTICAL ORGANIC CHEMISTRY-II (Practical)

Upon completion of the course student shall be able to

CO1	Determine the physical constants like acid value, saponification value and Iodine value of organic compounds.
CO2	Synthesize certain organic compounds through acetylation, halogentaion, nitration, oxidation, hydrolysis, Perkins and claisen condensation reactions

BP302T. PHYSICAL PHARMACEUTICS-I (Theory)

Upon the completion of the course student shall be able to

CO1	Explain various physicochemical properties of drug molecules applicable in the designing of dosage forms.
CO2	Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms

BP306P. PHYSICAL PHARMACEUTICS – I (Practical)

Upon the completion of the course student shall be able to

CO1	Determination of various physicochemical properties of drug molecules applicable in the designing of dosage forms.
CO2	Analyze and interpret the data generated from the experiments.
CO3	Compare and contrast between different method used in the determination of the same physicochemical parameters.

BP 303 T. PHARMACEUTICAL MICROBIOLOGY (Theory)

Upon the completion of the course student shall be able to

CO1	Explain methods of identification, cultivation and preservation of various microorganisms
CO2	Summarize the importance and implementation of sterilization in pharmaceutical processing and industry.
CO3	Discuss microbiological standardization of Pharmaceuticals.
CO4	Outline cell culture technology and its applications in pharmaceutical industries.

BP 307P.PHARMACEUTICAL MICROBIOLOGY (Practical)

Upon completion of the subject student shall be able to

CO1	Select and utilize different equipment and processing in experimental microbiology
CO2	Identify and isolate various microorganisms
CO3	Perform sterility testing of pharmaceutical products
CO4	Perform microbiological standardization of Pharmaceuticals.

BP 304 T. PHARMACEUTICAL ENGINEERING (Theory)

Upon the completion of the course student shall be able to

CO1	Explain use of various unit operations used in Pharmaceutical industries.
CO2	Describe the material handling techniques.
CO3	Discuss various methods of hazards and safety management used in Pharmaceutical industry
CO4	Outline the significance of plant layout design for optimum use of resources.
CO5	Enumerate the various preventive methods used for corrosion control in Pharmaceutical industry

BP308P - PHARMACEUTICAL ENGINEERING (Practical)

CO1	Perform various unit operation process involved in pharmaceutical manufacturing
CO2	Perform numerical involved in calculating process related determinants.
CO3	Create graphs and illustrate actions for data representation
CO4	Analyze and interpret the data generated from the experiments performed.

B.Pharm Second Year –SEM-IV

BP 401 T PHARMACEUTICAL ORGANIC CHEMISTRY III (Theory)

On completion of course, student should be able to,

CO1	understand the methods of preparation and properties of organic compounds
CO2	explain the stereo chemical aspects of organic compounds and stereo chemical reactions
CO3	know the medicinal uses and other applications of organic compounds

BP 402T MEDICINAL CHEMISTRY-I (Theory)

Upon completion of the course student shall be able to

CO1	Correlate the physicochemical properties and metabolism of drugs with biological activity.
CO2	Explain the chemistry of drugs acting on nervous system, opioid and non opioid receptor.
CO3	Describe the mechanism of action of certain pharmacodynamics agents.

BP406P. MEDICINAL CHEMISTRY-I (Practical)

Upon completion of the course student shall be able to

CO1	Synthesize and explain reaction mechanism of medicinally important compounds by using conventional methods and purify them by using TLC and Column Chromatography.
CO2	Perform quantitative analysis of drugs such as Chlorpromazine, Phenobarbitone, Atropine, Ibuprofen, Aspirin, Furosemide.

BP 403 T. PHYSICAL PHARMACEUTICS-II (Theory)

Upon completion of the subject student shall be able to

CO1	Compare and contrast between colloidal and coarse dispersion based on their general properties, principles of formulation and evaluation.
CO2	Explain and comprehend the principles of preformulations like rheology, deformation of solid and micromeretics.
CO3	Explain use of physicochemical properties in the formulation development and evaluation of dosage forms
CO4	Explain with illustration the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations

BP 407P. PHYSICAL PHARMACEUTICS- II (Practical)

Upon completion of the subject student shall be able to

CO1	Determine physicochemical properties in the formulation development and evaluation of dosage forms.
CO2	Make use of principles of chemical kinetics & to use them for stability testing.
CO3	Compare and contrast between different method used in the determination of the same physicochemical parameters.
CO4	Demonstrate and explain the effect of different excipients and their differing concentration on physicochemical determinants of dosage forms.

BP404T. Pharmacology I – Theory

Upon completion of the course student shall be able to

CO1	Explain various terminologies used in pharmacology like synergism, agonist, antagonist, side effect, adverse effects etc.
CO2	Describe the pharmacological actions of different categories of drugs.
CO3	Discuss the mechanism of drug action at organ system/sub cellular/ macromolecular levels.
CO4	Classify various drugs used for the treatment of disorders of nervous system according to their mechanism of action and apply the basic pharmacological knowledge in the prevention and treatment of various diseases.

BP408P. Pharmacology I – Practical

Upon completion of the course student shall be able to

CO1	Handle the laboratory equipments and apply techniques used in experimental pharmacology.
CO2	Identify various laboratory animals and describe CPCSEA guidelines for care and handling and care of laboratory animals.
CO3	Explain common laboratory techniques, like blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies.
CO4	Describe the different routes of drug administration in mice/rats.
CO5	Demonstrate the effect of drugs on animals by simulated experiments.

BP 405 T. PHARMACOGNOSY & PHYTOCHEMISTRY-I (Theory)

Upon completion of the course student shall be able to

CO1	Explain history, scope, development of pharmacognosy, sources of drugs and differentiate between organized and unorganized drugs
CO2	Understand and explain classification of drugs and quality control of drugs of natural origin.
CO3	Comprehend and understand cultivation, collection, processing, storage of drugs of natural origin, conservation of medicinal plants, plant tissue culture including its development, applications.
CO4	Explain and understand morphology and anatomy of plant parts. Explain classification, properties, identification of Glycosides, Tannins, volatile oil, Flavanoids and Resins
CO5	Comprehend the biological source, chemical nature, uses of plant fibers, hallucinogens, Teratogens, Natural allergens
CO6	Understand and explain pharmacognostic study of carbohydrates, Proteins, enzymes, lipids, marine drugs

BP 405 P. PHARMACOGNOSY & PHYTOCHEMISTRY-I (Practical)

Upon completion of the subject student shall be able to

CO1	Perform analysis of crude drugs by chemical tests
CO2	Determine and perform stomatal number, stomatal index, vein islet number, vein islet termination and palisade ratio of leaf drug
CO3	Understand and determine size of starch grains, calcium oxalate crystals, length and width of fiber by eye piece micrometer and number of starch grains by Lycopodium spore method
CO4	Perform Ash value, Extractive values, moisture content, swelling and foaming index of crude drug

COURSE OUTCOMES
THIRD YEAR
B. PHARMACY

B.Pharm Third Year –SEM-V (2015 Pattern)

3.5.1 T INDUSTRIAL PHARMACY-I (THEORY):-

The students will be able to

CO1	Perceive the knowledge of dosage form design & formulation strategies.
CO2	Learn tablets as a dosage form, physic-chemical principles guiding tablet formulation, various tablet additives, manufacture & evaluation, equipments, defects in tablets & remedies their off.
CO3	Interpret the concept, types, pharmacopoeial specifications, techniques & equipments used in tablet coating.
CO4	Describe the capsules, its types, additives, size selection, manufacturing, evaluation and equipments used & its defects.

3.5.1 P INDUSTRIAL PHARMACY-I (PRACTICAL):-

The students will be able to

CO1	Utter the correct use of various equipments in pharmaceutics laboratory relevant to tablets, capsules and tablet coating.
CO2	Inculcate the knowledge of formulation, evaluation and labeling of tablets & capsules.
CO3	Use the equipments and apparatus needed for the preparation as per SOP.
CO4	Perform pharmaceutical calculations to determine evaluation of granules.
CO5	Describe use of ingredients in formulation and category of formulation.
CO6	Select the suitable packaging material for the preparation.

3.5.2 T PHARMACEUTICAL ANALYSIS-III (Theory)

Upon completion of the course student shall be able to

CO1	Enumerate the different types of instrumental analytical techniques available for quality control of APIs & formulations.
CO2	Explain sampling techniques used for analysis of solid, semisolid and liquids dosage forms.
CO3	Describe principles, instrumentation and applications of UV-VIS, Flourimetry, Flame photometry, phosphorimetry and Nepheloturbidimetry.

3.5.2 P PHARMACEUTICAL ANALYSIS-III (Practical)

Upon completion of the course student shall be able to

CO1	Operate UV-VIS Spectrometer, Flame Photometer, Fluorimetry and Phosphorimeter.
CO2	Interpret the data obtained through analytical experiments.

3.5.3 T MEDICINAL CHEMISTRY-I (THEORY)

Upon completion of the course student shall be able to

CO1	Explain physicochemical properties and pharmacokinetics affecting drug action
CO2	Describe concept of Receptor along with drug-receptor mechanism.
CO3	Classify certain therapeutic agents and outline the synthetic route for the selective medicinal compounds of sympathetic, parasympathetic and cardiovascular system.
CO4	Explain the structural activity relationship of certain therapeutic agents with their uses, adverse effects and recent developments.

3.5.3 P MEDICINAL CHEMISTRY-I (PRACTICAL)

Upon completion of the course student shall be able to

CO1	Synthesize and explain reaction mechanism of medicinally important compounds by using conventional methods and purify them by using TLC and column chromatography.
CO2	Evaluate physicochemical properties of synthesized acid/basic salts of drugs.

3.5.4 T. PHARMACOLOGY II (Theory)

Upon completion of the course student shall be able to

CO1	Discuss ANS with respect to various neurotransmitters and their signal transduction mechanisms in the body.
CO2	Explain Cholinergic and Anti-cholinergic drugs, their classification and pharmacology.
CO3	Explain Adrenergic and Anti-adrenergic drugs, their classification and pharmacology.
CO4	Describe Pharmacotherapy of CVS disorders and Respiratory tract disorders.

3.5.4 P. PHARMACOLOGY II (Practical)

Upon completion of the subject student shall be able to

CO1	Handle the laboratory equipments and apply techniques used in experimental pharmacology.
CO2	Identify various laboratory animals and describe CPCSEA guidelines for care and handling and care of laboratory animals.
CO3	Explain various routes of drug administration, various methods for collection of blood, body fluids and urine from experimental animals.
CO4	Knowledge of various types of bioassays along with their principals, drug agonism and antagonism.
CO5	Perform recording of CRC/DRC of Acetylcholine on suitable isolated tissue preparation.

3.5.5T. ANALYTICAL PHARMACOGNOSY & EXTRACTION TECHNOLOGY (Theory)

Upon the completion of the course student shall be able to

CO1	Comprehend principle of mass transfer process, effect of various factors on mass transfer & principle, working, merits, demerits and applications of various extraction techniques.
CO2	Explain principle & applications of chromatographic & nonchromatographic separation methods.
CO3	Understand and describe applications of various extraction techniques of phytochemicals by identifying their source, properties, isolation and tests.
CO4	Explain types, social relevance, Sampling techniques and quality control parameters of herbal drug analysis, WHO guidelines for quality control of herbal drugs & Current approaches in standardization.

3.5.5P. ANALYTICAL PHARMACOGNOSY & EXTRACTION TECHNOLOGY (Practical)

Upon the completion of the course student shall be able to

CO1	Understand and analyze micrometric data of herbal crude drug, perform solvent extractions from various plant crude drug and chemical analysis of plant extract.
CO2	Analyze herbal crude drug by applying various quality control parameters and adulterants in crude drugs and explain microwave extraction and column chromatography technique.

3.5.6 T PHARMACEUTICAL BUSINESS MANAGEMENT (Theory)

Upon completion of the course student shall be able to

CO1	Describe the Pharmaceutical business and management strategy.
CO2	Gain knowledge of marketing research, product management.
CO3	Discuss about human resource and development needs.
CO4	Explain about the disaster management and preparedness, mitigation.
CO5	Participate in group discussion elocution/Extempore/Debate
CO6	How to crack job interviews.
CO7	Differentiate Management concepts and Marketing concepts.

3.5.7 T ACTIVE PHARMACEUTICAL INGREDIENTS TECHNOLOGY (Theory)

Upon completion of the course student shall be able to

CO1	Describe API and fine chemical industry.
CO2	Explain certain classes of reaction , chemical process ,reaction system, equipment used in API.
CO3	Explain quality control aspects, material safety data sheet (MSDS), health hazards, green chemistry approaches.
CO4	Summarize industrial manufacturing methods of certain APIs.
CO5	Explain polymorphism and the techniques involved in resolution of racemates and asymmetric synthesis.
CO6	Apply GMP guidelines like ICH Q7,Q7A AND Q11 IN API manufacturing.

B.Pharm Third Year (VI sem) (2015 Pattern)

3.6.1 T INDUSTRIAL PHARMACY-II (THEORY):-

Upon completion of the course student shall be able to

CO1	Understand disperse systems, its classification, theories of disperse systems, thermodynamics v/s kinetic stability considerations.
CO2	Rationalize suspensions, types, formulation development, manufacturing, excipients used, and evaluation of suspensions.
CO3	Determine emulsions, their physic-chemical properties, theory of emulsification, HLB value and phase inversion temperature, Kraft point, cloud point, excipients, and evaluation of emulsions, cracking, coalescence, stability and stress testing.
CO4	Recognize semi-solids, anatomy and physiology of skin, selection of bases, penetration enhancers, formulation development, percutaneous absorption, flux measurement and evaluation.
CO5	Summarize layout for manufacturing of suspensions, emulsions & semisolids as per schedule M.

3.6.1 P INDUSTRIAL PHARMACY-II (PRACTICAL):-

Upon completion of the course student shall be able to

CO1	Explain the correct use of various equipments in pharmaceutics laboratory relevant to suspensions, emulsions and semi-solids,
CO2	Formulate, prepare and evaluate suspensions.
CO3	Formulate, prepare and evaluate emulsions.
CO4	Formulate, prepare and evaluate semisolids preparations.
CO5	Prepare the labels so as to suit the regulatory requirements.

3.6.3 T MEDICINAL CHEMISTRY-II (THEORY)

Upon completion of the course student shall be able to

CO1	Explain general aspects of drug metabolism and drug design aspects of important drugs.
CO2	Classify the medicinal compounds and acquire knowledge about IUPAC names along with mechanism of action of them or the class to which they belong.
CO3	Apply scientific knowledge about relationship between biological activity and structure of various CNS acting drugs and drugs acting on blood .
CO4	Outline the synthetic route for selective medicinal compounds along with their uses, adverse effects and recent developments in CNS active drugs and drugs acting on blood.

3.6.3 P MEDICINAL CHEMISTRY-II (PRACTICAL)

Upon completion of the course student shall be able to

CO1	Synthesize and explain reaction mechanism of medicinally important compounds by using conventional as well as microwave assisted methods and purify them by using recrystallization techniques.
CO2	Explain the principle and procedure for the synthesis of compounds and interpret their characterization data obtained by IR/NMR spectroscopy.

3.6.4 T. PHARMACOLOGY III (Theory)

Upon completion of the course student shall be able to

CO1	Classify various drugs depending upon their pharmacological role and mechanism of action in any disease.
CO2	Describe pharmacology of various anesthetic agents (General and Local), psychotropic agents, various drugs used in treatment of CNS disorders, Parkinson's disease and Alzheimer's disease.
CO3	Explain pharmacology of drugs used in the treatment of G.I. tract disorders, Rheumatoid arthritis, Osteoarthritis and Gout.

3.6.4 P. PHARMACOLOGY III (Practical)

Upon completion of the subject student shall be able to

CO1	Demonstrate the dissection of G.I. tract of chicken to isolate ileum.
CO2	Explain and perform matching point, bracketing and interpolation bioassay to find unknown concentration of Acetylcholine.
CO3	Demonstrate and discuss recording of effects of CNS acting drugs in rats/mice using Actophotometer and anti-epileptic activity using Convulsiometer with the help of software.
CO4	Demonstrate recording of effects of skeletal muscle relaxant drugs in rats/mice using Rota-rod apparatus and Analgesic activity using Eddy's Hot Plate with the help of software.

3.6.5T. NATURAL PRODUCT CHEMISTRY (THEORY)

Upon completion of the course student shall be able to

CO1	Understand and explain about natural product based drug discovery & their contribution in modern drug discovery.
CO2	Comprehend tools & techniques used in study of biosynthetic pathways in plants. Explain cardiovascular-active & anti-cancer agents from marine source.
CO3	Explain Natural products used as Pharmaceutical excipients including Natural colors & dye, Natural sweeteners, Natural polymers
CO4	Describe Herbal dietary supplements, Natural pesticides and natural products as oral as bioavailability enhancers, skin permeation enhancers, Radiation protecting agents, wound healing agents , Biofuels.

3.6.5 P NATURAL PRODUCT CHEMISTRY (Practical)

Upon completion of the course student shall be able to

CO1	Perform extraction, isolation and estimation of various phytoconstituents and analysis of isolated phytoconstituents by chemical tests, chromatography and spectral methods (UV and/IR).
CO2	Derive physical constants of pure natural compound and isolate phytoconstituents by column chromatography.

3.6.6 T. BIOORGANIC CHEMISTRY AND DRUG DESIGN (THEORY)

Upon completion of the course student shall be able to

CO1	Generalize bioorganic Chemistry and its relevance in drug design and discovery.
CO2	Compare and Contrast various drug targets and their biochemical features, physiological & pathophysiological roles and their significance in drug design
CO3	Describe various approaches in rational drug design.
CO4	Explain the concept of pro-drug in drug design.

3.6.7 T. PHARMACEUTICAL BIOTECHNOLOGY (THEORY)

Upon completion of the course student shall be able to

CO1	Impart the basics of biotechnology techniques and the various systems used and the method of genetic engineering for production of rDNA products including monoclonal antibodies.
CO2	Apply the knowledge about the application of genetic engineering in animals.
CO3	Illustrate use of Fermenter for production of fermentation products and information about their purification by downstream process.

COURSE OUTCOMES
FINAL YEAR
B. PHARMACY

B.Pharm final Year -SEM-VII (2015 Pattern)

4.7.1 T Sterile Products (Theory)

Upon the completion of the course student shall be able to

CO1	Enumerate the basics of sterile products
CO2	Describe various packaging materials used, types, choice of containers, official quality control tests and methods of evaluation.
CO3	Explain GMP, design and layout of Parenteral Production Facility.
CO4	Explain sterile products with respect to formulation, processing, manufacturing, packing and Quality control.

4.7.1 P Sterile Products (Practical)

Upon the completion of the course student shall be able to

CO1	Demonstrate the manufacturing procedure for sterile preparation
CO2	Formulate, pack, evaluate,& label sterile products
CO3	Evaluate Packaging Material for sterile products as per official procedures
CO4	Evaluate marketed parenteral products like lyophilized products as re-constitutable solution or suspension for injection, suspension or emulsion

4.7.2 T Pharmaceutical Analysis-V (Theory)

Upon completion of the course student shall be able to

CO1	Differentiate different types of instrumental analytical techniques available for quality control of API & formulation
CO2	Describe principles, instrumentation and application of HPLC, IR, GC, NIR, Raman and advantages of UPLC
CO3	Explain principles, and application of Scanning Electron Microscopy and Transmission Electron Microscopy.

4.7.2 P Pharmaceutical Analysis-V (Practical)

Upon completion of the course student shall be able to

CO1	Operate, UV-visible spectrophotometer for the assay of various APIs and formulation
CO2	Interpret the data obtained through Infrared spectra and report the result

4.7.3 T Medicinal Chemistry-III (Theory)

Upon completion of the course student shall be able to

CO1	Classify the medicinal compound and acquire knowledge about IUPAC names along with mechanism of action of them or the class to which they belongs.
CO2	Describe the metabolism, adverse effect, therapeutic activity and recent developments of drugs.
CO3	Apply scientific knowledge about relationship between biological activity and structure of various chemotherapeutic agents and antibiotics.
CO4	Outline the synthetic route for selective medicinal compounds.
CO5	Describe the chemotherapy for cancer and bacterial diseases and different anti-viral agents.

4.7.3 P Medicinal Chemistry-III (Practical)

Upon completion of the course student shall be able to

CO1	Synthesize medicinally important compounds and purify them using column chromatography
CO2	Characterize the synthesized compounds using IR and NMR spectras.

4.7.4 T Pharmacology-IV (Theory)

Upon completion of the course student shall be able to

CO1	Describe about general principles of chemotherapy of infections and mechanism of drug resistance.
CO2	Classify and discuss various chemotherapeutic agents depending upon mechanism of action, antibacterial spectrum, resistance, therapeutic uses, adverse effects and contraindications.
CO3	Discuss functions, receptor and mechanisms of hormone actions of endocrine system, thyroid and parathyroid glands, androgens, estrogens, progestin and oral contraceptives.
CO4	Explain the hormones responsible for the cause of diabetes and pharmacotherapy of diabetes.

4.7.4 P. Pharmacology-IV (Practical)

Upon completion of the subject student shall be able to

CO1	Perform and explain three point and four point bioassay to find unknown concentration of Acetylcholine.
CO2	Discuss the fixed dose combination of various drugs based on possible indications, dose, route of drug administration, justification of inclusion of each ingredient, adverse reactions, contraindications, precautions and special instruction to patients.
CO3	Illustrate rational drug therapy for treatment of various diseases.
CO4	Justify whether rational drug therapy is followed from the prescription by RMP for specific patient.

4.7.5 T Natural Drug Technology (Theory)

Upon the completion of the course student shall be able to

CO1	Comprehend & explain various factors effect on level of secondary metabolites, method of cultivation, harvesting, storage .Factors affecting on deterioration of drug. Explain various guidelines issued by WHO in relation with cultivation, collection, storage etc.
CO2	Explain applications of Plant Tissue culture in production of secondary plant metabolites and invitro screening methods and its applications for natural products.
CO3	Understand & explain basic principles of therapy in Ayurveda, Unani, Siddha and Homeopathy and various dosages, its preparation, evaluation used in Ayurveda. Explain various novel drug delivery systems for herbal drugs.
CO4	Comprehend & Explain herbal cosmetics, formulation and evaluation. Explain physical, chemical, spectroscopic means and methods used in structural elucidation of herbal product

4.7.5 P Natural Drug Technology (Practical)

Upon the completion of the course student shall be able to

CO1	Formulate And Evaluate Ayurvedic /Herbal /Cosmetic/Nutraceutical Formulation
CO2	Understand Rationale And Conduct pre-formulation Parameters, *In-vitro* Assays For Correlation With *In-vitro* Assays.

4.7.6. T Biopharmaceutics and Pharmacokinetics-Theory

Upon the completion of the course student shall be able to

CO1	Understand concept of biopharmaceutics and its application in formulation and development, studying various concept of ADME and various factors affecting related to them.
CO2	studying compartment and non-compartment modelling evaluate the quantity/concentration of drug in body at any point of time
CO3	Understanding the concept and mechanism of dissolution and in-vitro and in-vivo correlation and Learning concepts of bioavailability and bioequivalence

4.7.7 T Pharmaceutical Jurisprudence-Theory

Upon the completion of the course student shall be able to

CO1	To understand the basic principles, purpose & dimensions of the laws, significance & relevance of pharmaceutical laws in India, significance of schedule M & schedule Y, regulatory system for safety & effectiveness of medicine & quality of product.
CO2	To Discuss the purpose of the board, inspections by the board or its representative.
CO3	To learn the various laws governing the manufacturing, sale, research& usage of drugs, knowledge about patents, procedure for patent application & IPR.

B.Pharm Final Year (VIII sem) (2015 Pattern)

4.8.1 T Advanced Drug Delivery System (Theory)

Upon the completion of the course student shall be able to

CO1	Describe the Concept of Modified Drug Release, Novel Drug Delivery Systems, Pre requisites of drug candidates, Polymers along with Classification, application, and evaluation approaches.
CO2	Explain therapeutic Aerosols along with typical formulations from, metered dose, intranasal and topical applications.
CO3	Enumerate the concept of microencapsulation and optimization.

4.8.1 P Advanced Drug Delivery System (Practical)

Upon the completion of the course student shall be able to

CO1	To conduct polymer characterization by various methods, DSC, FTIR, XRD, Viscosity and Swelling index.
CO2	Formulation development and evaluation of beads, sustained release, transdermal, gastro-retentive, microencapsulation and liposomal formulations.
CO3	To Study the concept of cosmeceuticals, history, difference between cosmetics & cosmeceuticals & cosmeceuticals agents.

4.8.2 T Cosmetic Science (Theory)

Upon completion of the course student shall be able to

CO1	Recognize the concepts of cosmetics, anatomy of skin Vs hair, general excipients used in cosmetics.
CO2	To perform formulation, manufacturing, equipments & evaluation for skins cosmetics, for hairs cosmetics, for eyes cosmetics, baby cosmetics.
CO3	To Study the concept of cosmeceuticals, history, difference between cosmetics & cosmeceuticals & cosmeceuticals agents.

4.8.2 P Cosmetic Science (Practical)

Upon completion of the course student shall be able to

CO1	To describe use of ingredients in formulation, category of formulation & prepare labels as per regulatory equipments.
CO2	To perform formulation, evaluation and labeling of cosmetics.

4.8.3 T Pharmaceutical Analysis-VI (Theory)

Upon completion of the course student shall be able to

CO1	Differentiate different types of instrumental analytical techniques available for quality control of API & formulation.
CO2	Describe principles, instrumentation and application of NMR, ESR & Mass spectroscopy, Introduction to Flow injection analysis.
CO3	Describe principles, instrumentation, and application of Ion exchange chromatography, Flash chromatography, Super Critical Fluid Chromatography.

4.8.3 P Pharmaceutical Analysis-VI (Practical)

Upon completion of the course student shall be able to

CO1	Operate, UV –Visible spectrophotometer for method validation of various APIs and formulation.
CO2	Interpret the data obtained through UV, IR, NMR, Mass spectra and report the result.

4.8.4 T Medicinal Chemistry-IV (Theory)

Upon completion of the course student shall be able to

CO1	Classify the medicinal compound and acquire knowledge about IUPAC names along with mechanism of action of them or the class to which they belongs.
CO2	Describe about metabolism, adverse effect, therapeutic activity and recent developments of drugs.
CO3	Apply scientific knowledge about relationship between biological activity and structure of various antihistaminic, NSAIDs and Narcotics.
CO4	Outline the synthetic route for selective medicinal compounds.
CO5	Describe the Steroidal drugs, Hormones, Diagnostic agents and serotonergic agents

4.8.4 P Medicinal Chemistry-IV (Practical)

Upon completion of the course student shall be able to

CO1	Synthesize medicinally important compounds and purify them using column chromatography.
CO2	Characterize the synthesized compounds using IR and NMR spectra's.
CO3	Demonstrate the various software's for physico-chemical property prediction and understand how current drugs were developed by using pharmacophores modeling and docking technique. (CADD)

4.8.5 T Pharmacology-V (Theory)

Upon completion of the course student shall be able to

CO1	Describe important aspects, classification, mechanism of drug-drug interaction and ADRs.
CO2	Explain Basic aspects of drug safety and Pharmacovigilance in relation to monitoring and reporting of ADRs, functioning and role of hospital pharmacy and patient compliance.
CO3	Discuss of clinical trials, ethics and practice of GCP guidelines; Schedule Y, involved in clinical trials, explain the process, working and personnel involved in clinical data management.

4.8.5 P Pharmacology-V (Practical)

Upon completion of the subject student shall be able to

CO1	Demonstrate use of isolated tissue preparations for antagonistic bioassay methods.
CO2	Explain Basic aspects to carry out neurobehavioral characterization for determination of CNS activities.
CO3	Understanding various parametric and non-parametric tests used in biostatistics.
CO4	Perform statistical calculation of the given data using suitable statistical method.

4.8.6 T Natural Products: Commerce, Industry & Regulations (Theory)

Upon the completion of the course student shall be able to

CO1	Understand and explain commerce of various natural products which includes its global and local market size, demand and supply, import and export. Explain various aspects of Herbal drug industry.
CO2	Comprehend regulations and patenting of Herbal drugs in India.
CO3	Explain the toxicities of herbals and herbal-drug & herbal-food interaction.
CO4	Explain the pharmacovigilance of herbal medicines and plant allergens including classification, applications and method of preparation of allergenic extract.

4.8.7 T Quality Assurance Technique (Theory)

Upon completion of the course student shall be able to

CO1	Explain significance of quality in pharmaceutical manufacturing and role of regulatory, explain the concept of QbD.
CO2	Describe quality standards of different agencies, Significance of validation in quality assurance.
CO3	Apply cGMP, GLP and GDP while working in pharmaceutical industry.

COURSE OUTCOMES
FIRST YEAR
M. PHARMACY

M.PHARMACY FIRST YEAR

COURSE OUTCOMES

DEPARTMENT OF PHARMACEUTICS
M.Pharm -Sem I
MPAT101T: MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES

CO1	Describe the principles, instrumentation of Spectroscopy
CO2	Explain theoretically and practically principle, instrumentation, chromatographic parameters, factors affecting resolution and applications of chromatography.
CO3	Describe principles, instrumentation, applications of electrophoresis techniques.
CO4	Know about different methods and techniques of X-ray diffraction and its application.
CO5	Explain principles, instrumentation, advantages and disadvantages and applications of various thermal techniques.

MPH 102T: DRUG DELIVERY SYSTEMS

Upon completion of the course, student shall be able

CO1	Explain the various approaches for development of novel drug delivery Systems.
CO2	Enumerate the application of Dosage Forms for Personalized Medicine, Pharmacogenetics, Customized drug delivery systems, Bioelectronic Medicines, 3D printing of pharmaceuticals, and Telepharmacy.
CO3	Identify the criteria for selection of drugs and polymers for the development of delivering system.
CO4	Discuss the formulation and evaluation of Novel drug delivery systems

MPH 103T: MODERN PHARMACEUTICS

Upon completion of the course, student shall be able

CO1	Explain the elements of Preformulation studies of different dosage form
CO2	Discuss physics of tablets and its effect on pharmacokinetic parameters.
CO3	Explain the Industrial Management and GMP Considerations concepts in pharmaceutical industries
CO4	Outline the Optimization Techniques & Pilot Plant Scale Up Techniques in pharmaceutical industries.
CO5	Apply the knowledge of Stability Testing, sterilization process & packaging of dosage forms in pharmaceutical industries.

MPH 104T: REGULATORY AFFAIRS

Upon the completion of the course student shall be able to

CO1	Discuss the Concepts of innovator and generic drugs, drug development Process.
CO2	Explain the Regulatory guidance and guidelines for filing and approval Process including Post approval regulatory requirements for actives and drug products.
CO3	Explain preparation of Dossiers and their submission e-formats to regulatory agencies across the globe.
CO4	Outline Clinical trials requirements for approvals for conducting clinical trials.
CO5	Relate Pharmacovigilance and process of monitoring in clinical trials.

MPH 105P: PHARMACEUTICS PRACTICALS - I

Upon the completion of the course student shall be able to

CO1	Estimate pharmacopeial compounds and their formulations by UV Visible spectrophotometer, HPLC, Gas Chromatography, flame photometry, fluorimetry
CO2	Perform In –vitro dissolution of novel drug delivery systems like controlled release or sustained release marketed formulation.
CO3	Formulate and evaluate novel drug delivery systems like sustained release matrix tablets, Mucoadhesive tablets and Trans dermal patches
CO4	Perform the Preformulation studies of tablet dosage form.
CO5	Determine the effect of process variables and excipients on tablet dosage form

M.PHARMACY SEM-II -DEPARTMENT OF PHARMACEUTICS

MPH 201T: MOLECULAR PHARMACEUTICS (NANO TECHNOLOGY & TARGETED DDS) (NTDS)

Upon completion of the course student shall be able to understand

CO1	Explain the various approaches for development of novel drug delivery Systems.
CO2	Identify the criteria for selection of drugs for the development of delivering system.
CO3	Identify the criteria for selection of Polymer for the development of delivering system.
CO4	Discuss the formulation and evaluation of Novel drug delivery systems

MPH 202T: ADVANCED BIOPHARMACEUTICS & PHARMACOKINETICS

Upon completion of this course it is expected that students will be able to understand,

CO1	Explain the basic concepts in biopharmaceutics and pharmacokinetics.
CO2	Make use of raw data to derive the pharmacokinetic models and parameters the best describe the process of drug Absorption, Distribution, Metabolism and Elimination.
CO3	Outline critical evaluation of biopharmaceutics studies involving drug Product equivalency.
CO4	Design and evaluate the dosage regimens of the drugs using pharmacokinetic and biopharmaceutics parameters.
CO5	Discuss the potential clinical pharmacokinetic problems and application of basics of pharmacokinetic.

MPH 203T : COMPUTER AIDED DRUG DEVELOPMENT

At the end of the course, the students will be able to

CO1	Describe history and role of computers in Pharmaceutical research and preclinical development
CO2	Explain drug disposition modeling techniques
CO3	Express the importance of computer in market analysis, biopharmaceutical characterization, Pharmacokinetic and dynamics and clinical development
CO4	Describe pharmaceutical application, advantages, disadvantages, current challenges and future scope of artificial intelligence and robotics
CO5	Describe pharmaceutical application, advantages, disadvantages, current challenges and future scope of computational fluid dynamics.

MPH 204T: COSMETICS AND COSMECEUTICALS

Upon the completion of the course student shall be able to

CO1	Utilize knowledge of regulatory aspects and biological aspects as a fundamental need for development of cosmetics and cosmeceuticals .
CO2	Explain the formulation building blocks for different product formulations of cosmetics and cosmeceuticals.
CO3	Discuss the current technologies in the market.
CO4	Make use of Scientific knowledge to develop cosmetics and cosmeceuticals with desired safety, stability and efficacy.

MPH 205P: PHARMACEUTICS PRACTICALS – II

Upon the completion of the course student shall be able to

CO1	Formulate and evaluate various Novel drug delivery system like Alginate beads, gelatin or albumin microsphere ,Spherules, Liposomes or Niosomes,
CO2	Apply the dissolution studies in comparing the marketed products and solubility studies
CO3	Perform the computational modeling using various software and analyze the data accordingly.
CO4	Perform the In vitro In vivo studies related to ADME
CO5	Develop and evaluate different dosage form.

DEPARTMENT OF QUALITY ASSURANCE

M.PHARMACY SEM-I

MPAT101T: MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES

Upon the completion of the course student shall be able to

CO1	Describe the principles, instrumentation of Spectroscopy
CO2	Explain theoretically and practically principle, instrumentation, chromatographic parameters, factors affecting resolution and applications of chromatography.
CO3	Describe principles, instrumentation, applications of electrophoresis techniques.
CO4	Know about different methods and techniques of X-ray diffraction and its application.
CO5	Explain principles, instrumentation, advantages and disadvantages and applications of various thermal techniques.

MQA 102T: QUALITY MANAGEMENT SYSTEM

Upon completion of the course student shall be able to

CO1	Discuss the importance of Quality, tools to improve the quality and analyze the issues in Quality.
CO2	Discuss the Total Quality Management, Quality systems.
CO3	Describe the Drug Stability and Risk Management Guidelines.
CO4	Design the Statistical approaches and benchmarking for quality

MQA 103T: QUALITY CONTROL AND QUALITY ASSURANCE

Upon completion of the course student shall be able to

CO1	Describe the cGMP, GLP aspects in pharmaceutical industry
CO2	Explain manufacturing operations and controls in pharmaceutical industries.
CO3	Explain the different types of documentation and its importance in pharmaceutical industry.
CO4	Express the role of QA and QC department

MQA 104T: PRODUCT DEVELOPMENT AND TECHNOLOGY TRANSFER

Upon completion of the course student shall be able to

CO1	Describe the new product development process.
CO2	Design the pilot plant study protocols.
CO3	Explain Preformulation studies parameters, methods to improve solubility.
CO4	Elucidate information to transfer technology of current products between various manufacturing places

MQA 105P: QUALITY ASSURANCE PRACTICAL

Upon completion of the course student shall be able to

CO1	Handle sophisticated instruments like UV - Visible spectrophotometer, Flame photometer, Fluorimeter and HPLC
CO2	Perform pre formulation studies, IPQC and finished product quality control test for tablets, capsules, parenterals, semisolid dosage form and packaging materials.
CO3	Describe and apply quality management systems like six sigma, out of Specification, out of trend, corrective and preventive action and deviations.

DEPARTMENT OF QUALITY ASSURANCE

MPHARMACY -SEM-II

MQA 201T: HAZARDS AND SAFETY MANAGEMENT

Upon the completion of the course student shall be able to

CO1	Understand the environment and its allied problems
CO2	Define and execute the compliance of safety standards and safety management in industry
CO3	Design Novel concepts for management of Hazard Management System as per industry standards and requirements.
CO4	Describe the methods of hazard assessment, procedures and methodology to create awareness amongst people and workers in industry.

MQA 202T: PHARMACEUTICAL VALIDATION

Upon the completion of the course student shall be able to

CO1	Understand and apply the concepts of calibration, qualification and validation of Analytical methods.
CO2	Perform the qualification of various equipments and instruments.
CO3	Design the SOP's and Perform the Process validation of different dosage forms
CO4	Understand and perform the Validation of analytical method for estimation of drugs.
CO5	Describe and perform the Cleaning validation of equipments employed in the manufacture of pharmaceuticals

MQA203T: AUDITS AND REGULATORY COMPLIANCE

At the end of the course, the students will be able to

CO1	Describe the importance of auditing
CO2	Explain the different methods of auditing.
CO3	Efficiently carry out audit process and prepare audit report
CO4	Prepare audit checklist

MQA 204T: PHARMACEUTICAL MANUFACTURING TECHNOLOGY

Upon the completion of the course student shall be able to

CO1	Understand the Regulatory and legal aspects required to set up a pharmaceutical industry.
CO2	Understand and apply the principles and practices of Aseptic Process Technology, Non-sterile Manufacturing Technology and Packaging Technology.
CO3	Understand and apply the novel concepts of QbD and PAT in the design of experiments in Formulation development and Analytical method development.
CO4	Remain up-to-date about the FDA initiatives on PAT and QbD.

MQA 205P: QUALITY ASSURANCE PRACTICAL

Upon the completion of the course student shall be able to

CO1	Understand and apply different analytical methods for estimation of residue, impurities and contaminants in Drug Products and Environment.
CO2	Perform the Qualification of manufacturing equipment used in industry.
CO3	Perform validation of Analytical methods for Drugs, Processing Area and Equipment.
CO4	Preparation and Documentation of checklists required during Manufacturing of various dosage forms and their manufacturing area.