

## COURSE OUTCOME

Course Code & Name	Course Outcome Number	Course Outcome
101 A Mathematics (Bridge Course) Theory		This is an introductory course in mathematics. This course deals with the introduction to algebra, co-ordinate geometry, differential calculus, trigonometry, integral calculus, differential equations. Upon completion of the course the student shall be able to:
	CO1	1. Know the theory, solve the problems and understands the application of mathematical principles of algebra, co-ordinate geometry, differential calculus.
	CO2	2. Able to solve the problems of trigonometry, integral calculus, differential equations.
	CO3	3. Understands Laplace transforms and their use.
	CO4	4. Relate the mathematical tools to a broad range of situations which arise in the view of pharmacy profession.

Course Code & Name	Course Outcome Number	Course Outcome
101B Biology (Theory)		To learn and understand the components of living world, structure and functional system of plant and animal kingdom. Upon completion of the course, the student shall be able to :
	CO1	Know the classification and salient features of five kingdoms of life
	CO2	Understand the basic components of anatomy & physiology of plant.
	CO3	Know and understand the classification of animal kingdom, basic components of anatomy & physiology of animals with special reference to human body.
Course Code & Name	Course Outcome Number	Course Outcome
101C Biology (Practicals)		Upon completion of the course, the student shall be able to know:
	CO1	1. Care and use of the Microscope
	CO2	2. Microscopic study of different tissues and the primary anatomical structure of a root, stem and leaf. (Monocot & Dicot).
	CO3	3. Microscopic and macroscopic examination and identification of the types prescribed in the syllabus.
	CO4	4. Technical description of plants belonging to the families prescribed in the syllabus and referring them to their respective Families.

Course Code & Name	Course Outcome Number	Course Outcome
102 Pharmaceutical Chemistry –I (Organic-I) (Theory)		This course deals with classification and nomenclature of simple organic compounds, intermediates forming in reactions, important physical properties, reactions and methods of preparation of these compounds. The syllabus also emphasizes on mechanisms of reactions. Upon completion of the course the student shall be able to :
	CO1	1. Write the structure and properties of intermolecular forces, reactive intermediates, attacking reagents etc.,
	CO2	2. Write the reaction, name the reaction, mechanisms of reactions, and methods to prepare alkanes, alkenes, alkynes and cycloalkanes.
	CO3	3. Understand the chemistry of alcohols, ethers, alkyl halides, carbonyl compounds, carboxylic acids and acid derivatives.
	CO4	4. Understand general methods to prepare monohydric alcohols, alkyl halides, carbonyl compounds, carboxylic acids.

Course Code & Name	Course Outcome Number	Course Outcome
103 Pharmaceutical Chemistry –I (Organic-I) (Practicals)		Upon completion of the course the student shall be able to :
	CO1	1. Identify the unknown compound from the literature using melting point/ boiling point.
	CO2	2. Determine the Melting point/Boiling point of organic compounds.
	CO3	3. Identify the unknown organic compounds pertaining to phenols, amides, amines, carboxylic acids, aldehydes and ketones, hydrocarbons, nitro compounds.
	CO4	4. Synthesis of organic compounds such as benzoic acid, dibromo cinnamic acid etc.,
	CO5	5. Demonstrate various filtration and crystallization techniques.

Course Code & Name	Course Outcome Number	Course Outcome
104 Physical Pharmacy-I (Theory)		The course deals with the various physical, physicochemical properties and principle involved in dosage form formulations. Theory components of the subject help the student to get a better insight in to various areas of formulation research and development and stability studies of pharmaceuticals. Upon the completion of the course student shall be able to :

	<b>CO1</b>	1. Understand various intermolecular forces, states of matter, physicochemical properties of drug molecules in the designing the dosage form
	<b>CO2</b>	2. Know the principles of Thermodynamics, properties of solutions of electrolytes.
	<b>CO3</b>	3. Know the use of buffers in pharmaceutical and biological systems.
	<b>CO4</b>	4. Appreciate the definition of Viscosity, determination of viscosity, comparison of viscosities.

<b>Course Code &amp; Name</b>	<b>Course Outcome Number</b>	<b>Course Outcome</b>
105 Physical Pharmacy-I (Practical)		Upon the completion of the course student shall be able to :
	<b>CO1</b>	1. Determine the solubility of drugs, viscosity of liquid, density of solids.
	<b>CO2</b>	2. Determine the pKa value of salicylic acid.
	<b>CO3</b>	3. Determine the surface tension, interfacial tension, buffer capacity, optical activity, dielectric constant.
	<b>CO4</b>	4. Determine the effect of NaCl on CST of phenol-water system.

<b>Course Code &amp; Name</b>	<b>Course Outcome Number</b>	<b>Course Outcome</b>
106 Computer Applications and Statistical Methods (Theory)		This course deals with the introduction to types of computers, input and output devices, BASIC and C languages, Applications of computers in Pharmacy, different types of statistical methods. Upon completion of the course the student shall be able to :
	<b>CO1</b>	1. Know the various types of computers, characteristics, input and output devices, flow chart, algorithm and language.
	<b>CO2</b>	2. Know to write programming code in BASIC and C languages.
	<b>CO3</b>	3. Know branching, looping, arrays, graphs and sound, control structures.
	<b>CO4</b>	4. Know about measures of central tendency, dispersion and various types of distributions and various statistical tests eg. Correlation coefficient, regression analysis.

<b>Course Code &amp; Name</b>	<b>Course Outcome Number</b>	<b>Course Outcome</b>
201 Pharmaceu		This course is designed to impart a fundamental knowledge on the preparatory pharmacy with arts and science of preparing different

tics - I (Theory)		conventional dosage forms. Upon completion of this course the student should be able to:
	<b>CO1</b>	1. Know the history of profession of pharmacy
	<b>CO2</b>	2. Understand the basics of different types of dosage forms, packaging and labeling of pharmaceuticals, pharmaceutical incompatibilities .
	<b>CO3</b>	3. Pharmaceutical calculations, interconversions, professional way of handling the prescription.
	<b>CO4</b>	4. Preparation of various conventional dosage forms eg. Liquid orals, monophasic liquids for external use, galenicals and powders, suppositories.

Course Code & Name	Course Outcome Number	Course Outcome
202 Pharmaceutics - I (Practical)		Upon completion of this course the student should be able to:
	<b>CO1</b>	1. Understand about the principle, procedure for formulation of solutions, aromatic waters, syrups, elixirs, lotions, liniments, gargles, mouthwashes, throat paints, douches, ear drops, nasal drops, glycerites, suspensions, suppositories.
	<b>CO2</b>	2. Explain information regarding the labeling, precautions in usage, packaging procedures, labeling instructions.
	<b>CO3</b>	3. Can formulate the Pharmaceutical formulations related to theory topics.

Course Code & Name	Course Outcome Number	Course Outcome
203 Pharmaceutical Analysis-I (Theory)		This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs. This subject also deals with the monographs of inorganic drugs and pharmaceuticals. Upon completion of the course student shall be able to understand:
	<b>CO1</b>	1. Different types of analysis, weighing, computation of analytical results.
	<b>CO2</b>	2. Understand sources, limits and methods to determine effects of impurities in pharmacopoeial substances and procedures for limit tests.
	<b>CO3</b>	3. Understand the principles of volumetric and gravimetric analysis.

	<b>CO4</b>	4. Importance of Good Laboratory Practices (GLP).
	<b>CO5</b>	5. Understand the determination of moisture content, types of complexometric titrations, non aqueous titrations.
<b>Course Code &amp; Name</b>	<b>Course Outcome Number</b>	<b>Course Outcome</b>
204 Pharmaceutical Analysis-I (Practical)		Upon completion of the course student shall be able to understand:
	<b>CO1</b>	1. Performance of Limit tests for Chlorides, sulphates, iron, arsenic.
	<b>CO2</b>	2. Performance of acid base titrations for assay of ammonium chloride, boric acid, zinc oxide, sodium bicarbonate, borax.
	<b>CO3</b>	3. Performance of Redox titrations for assay of compounds like ammonium sulphate, hydrogen peroxide solution, copper sulphate.
	<b>CO4</b>	4. Conduct of complexometric titrations for assay of calcium lactate, magnesium sulphate.

<b>Course Code &amp; Name</b>	<b>Course Outcome Number</b>	<b>Course Outcome</b>
205 Environmental Studies (Theory)		Environmental Sciences is the scientific study of the environmental system and the status of its inherent or induced changes on organisms. It includes not only the study of physical and biological characters of the environment but also the social and cultural factors and the impact of man on environment. Upon completion of the course the student shall be able to:
	<b>CO1</b>	1. Understand about environmental pollution and related local, social and global issues.
	<b>CO2</b>	2. Impart basic environmental knowledge and related problems in India.
	<b>CO3</b>	3. Develop an attitude of concern for the environment through protection of bio diversity and its conservation.
	<b>CO4</b>	4. Motivate learner to participate in environment and natural resources management.
	<b>CO5</b>	5. Acquire skills to help the concerned individuals in identifying and solving environmental problems.
	<b>CO6</b>	6. Strive to attain harmony with Nature through different eco systems.

#### II/IV B.PHARMACY 3<sup>RD</sup>& 4<sup>TH</sup> SEMESTERS

<b>Course Code &amp; Name</b>	<b>Course Outcome Number</b>	<b>Course Outcome</b>
301 Pharmaceutical		This course deals with chemistry of aromatic compounds, hetero cyclic compounds, aromatic hydrocarbons, polynuclear

Chemistry –II (Organic-II) (Theory)		aromatic hydrocarbons, intermediates forming in reactions, important physical properties, reactions and methods of preparation of these compounds. The syllabus also emphasizes on mechanisms and orientation of reactions. Upon completion of the course the student shall be able to :
	<b>CO1</b>	1. Understand stereo chemistry, geometrical isomerism, principles and nomenclature of isomers, alicyclic compounds.
	<b>CO2</b>	2. Know the chemistry of aromatic compounds, general methods of preparation and chemical reaction of amines, phenols and diazonium salts.
	<b>CO3</b>	3. Understand the chemistry, medicinal uses of polynuclear aromatic hydrocarbons such as morphine and codeine.
	<b>CO4</b>	4. Understand the chemistry, various reagents, synthesis, properties and reactions of hetero cyclic compounds.

Course Code & Name	Course Outcome Number	Course Outcome
302 Pharmaceutical Chemistry –II (Organic-II) (Practical )		Upon completion of the course the student shall be able to :
	<b>CO1</b>	1. Synthesis of certain Organic compounds Para Nitro aniline, para bromo aniline, methanamine etc.,
	<b>CO2</b>	2. Qualitative analysis of organic binary mixtures.
	<b>CO3</b>	3. Preparation of methyl orange, fluorescein.

Course Code & Name	Course Outcome Number	Course Outcome
303 Pharmaceutical Engineering-I (Theory)		This course is designed to impart a fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry. Upon completion of the course student shall be able to:
	<b>CO1</b>	1. Know various unit operations such as mixing, size reduction and separation used in Pharmaceutical industries.
	<b>CO2</b>	2. Understand the material handling techniques, concepts of flow of fluids, transportation of fluids.
	<b>CO3</b>	3. Perform various processes involved in pharmaceutical manufacturing process.
	<b>CO4</b>	4. To carry out inter conversions of units, various test to prevent environmental pollution.
	<b>CO5</b>	5. understand the importance of various materials such as iron, steel, copper, glass, aluminum etc. in plant construction , merits and demerits
	<b>CO6</b>	6. To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.

Course Code & Name	Course Outcome Number	Course Outcome
304 Pharmaceutical Microbiology (Theory)		Microbiology is the study of all organisms that are invisible to the naked eye. Microorganisms are necessary for the production of antibiotics, vaccines, vitamins, enzymes etc. Microbiology has an impact on medicine, food science, ecology, genetics, biochemistry, immunology etc. Upon completion of this course student shall be able to:
	CO1	1. Understand methods of preparation of media for bacterial, fungal cultures, identification, cultivation and preservation of various microorganisms
	CO2	2. Importance and theory of staining, sterilization in microbiology and pharmaceutical industry
	CO3	3. Understand the theory of antimicrobial action of drugs and chemicals.
	CO4	4. Understand the principles of immunology, methods of transmission of diseases, vectors.
	CO5	5. Understand the etiology, diagnosis, sources of infection, mode of transmission, immunization methods.

Course Code & Name	Course Outcome Number	Course Outcome
305 Pharmaceutical Microbiology (Practical)		Upon completion of the course student shall be able to:
	CO1	1. Isolate pure culture of micro-organisms by streak plate method.
	CO2	2. Perform Staining methods such as Simple, Grams staining and acid fast staining, negative staining, spore staining and microscopic observation.
	CO3	3. Prepare and sterilize the culture medium for bacteria and fungi.
	CO4	4. Understand the uses of different equipments and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.

Course Code & Name	Course Outcome Number	Course Outcome
306 Anatomy and Physiology (Theory)		This course is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy. Upon completion of this course the student should be able to :



	<b>CO1</b>	1. Explain the gross morphology, structure and functions of various tissues and their functions.
	<b>CO2</b>	2. Describe the various divisions of nervous system, their parts and functions.
	<b>CO3</b>	3. Identify the various tissues and organs of cardiovascular system system, composition of blood and functions.
	<b>CO4</b>	4. Understand gross anatomy and physiology of respiratory system, digestive system, urinogenital system, special senses.
	<b>CO5</b>	5. Appreciate coordinated working pattern of different organs of each system through endocrine system.

<b>Course Code&amp; Name</b>	<b>Course Outcome Number</b>	<b>Course Outcome</b>
307 Anatomy and Physiology (Practical)		Upon completion of the course the student shall be able to :
	<b>CO1</b>	1. Study the nervous system, the endocrine system, human heart, human respiratory system, human eye, human brain using specimen, models.
	<b>CO2</b>	2. Determine blood pressure, blood group, bleeding time, clotting time, RBC count, WBC count, Hb content, ESR.
	<b>CO3</b>	3. Study of Histology slides of different tissues epithelial and connective tissue , muscular and nervous tissue

<b>Course Code&amp; Name</b>	<b>Course Outcome Number</b>	<b>Course Outcome</b>
401 Pharmaceutical Chemistry–III (Medicinal-I) (Theory)		This course is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class. Upon completion of the course the student shall be able to :
	<b>CO1</b>	1. Understand the chemistry of drugs with respect to their pharmacological activity
	<b>CO2</b>	2. Understand the History, nomenclature, classification, drug metabolic pathways, adverse effect and therapeutic value of sulphonamides and anti infective agents.
	<b>CO3</b>	3. know the history, classification of antibiotics, penicillins, cephalosporins, tetracyclines, macrolides.
	<b>CO4</b>	4. Write the chemical synthesis , mechanism of action, SAR, therapeutic uses of antimalarials, anthelmintics, anti amoebics, antifungal, antileprotics, anti virals and anti cancer drugs.



Course Code & Name	Course Outcome Number	Course Outcome
402 Physical Pharmacy-II (Theory)		The course deals with the various physical, physicochemical properties and principle involved in dosage forms, formulations. Theory and practical components of the subject help the student to get a better insight in to various areas of formulation research and development and stability studies of pharmaceuticals. Upon the completion of the course student shall be able to :
	CO1	1. Understand various physicochemical properties such as solution and distribution phenomena of drug molecules in the designing the dosage form.
	CO2	2. Know the principles of chemical kinetics, rheology, rates and order of reactions & to use them in assigning expiry date for Formulation.
	CO3	3. Demonstrate interfacial phenomena and electrical properties of interfaces.
	CO4	4. Understand theories of colloidal systems, theory of theology and coarse dispersions.

Course Code & Name	Course Outcome Number	Course Outcome
403 Physical Pharmacy-II (Practical)		Upon the completion of the course student shall be able to :
	CO1	1. Determine particle size using sieving method, microscopic method.
	CO2	2. Determine particle size distribution using sieving method, microscopic method
	CO3	3. Determine the angle of repose and influence of lubricant on angle of repose.
	CO4	4. Determine the first order rate constant, HLB value, globule size.
	CO5	5. Perform Accelerated stability testing of tablet formulations.

Course Code & Name	Course Outcome Number	Course Outcome
404 Applied Bio Chemistry & Clinical Pathology (Theory)		Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells. The scope of the subject is providing biochemical facts and the principles to understand metabolism of nutrient molecules in physiological and pathological conditions. Upon completion of course student shall be able to :
	CO1	1. Understand the classification of, structure, role of enzymes, importance of enzyme inhibitors in design of new drugs,

		therapeutic and diagnostic applications of enzymes.
	<b>CO2</b>	2. Understand the metabolism and bio chemistry of important nutrient molecules, methods used in qualitative and quantitative analysis of different constituents in physiological and pathological conditions.
	<b>CO3</b>	3. Understand the metabolism of carbohydrates, proteins, amino acids.

<b>Course Code&amp; Name</b>	<b>Course Outcome Number</b>	<b>Course Outcome</b>
405 Applied Bio Chemistry & Clinical Pathology (Practical)		Upon completion of course student shall be able to :
	<b>CO1</b>	1. Perform Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch)
	<b>CO2</b>	2. Qualitative analysis of Proteins (albumin, gelatine, peptone, Casein)
	<b>CO3</b>	3. Qualitative analysis of urine for normal and abnormal constituents such as glucose, creatinine.
	<b>CO4</b>	4. Estimation of blood creatinine, glucose
	<b>CO5</b>	5. Qualitative analysis of amino acids (Glycine, sucrose, starch).

<b>Course Code&amp; Name</b>	<b>Course Outcome Number</b>	<b>Course Outcome</b>
406 Forensic Pharmacy (Theory)		This course is designed to impart basic knowledge on several important legislations related to the profession of pharmacy in India. Upon completion of the course, the student shall be able to understand:
	<b>CO1</b>	1. The evolution of Pharmaceutical, drug legislations and their implications in the development of profession of pharmacy.
	<b>CO2</b>	2. Various Indian pharmaceutical Acts and Laws.
	<b>CO3</b>	3. The regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
	<b>CO4</b>	4. The code of ethics during the pharmaceutical practice

<b>Course Code&amp; Name</b>	<b>Course Outcome Number</b>	<b>Course Outcome</b>
407 English & Communication Skills		This course will prepare the young pharmacy student to interact effectively with doctors, nurses, dentists, physiotherapists and other health workers. At the end of this course the student will get the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business. Upon completion of the

		course the student shall be able to:
	<b>CO1</b>	1. Understand the behavioral needs for a Pharmacist to function effectively in the areas of pharmaceutical operation
	<b>CO2</b>	2. Communicate effectively through verbal and non verbal skills. (Verbal and Non Verbal)
	<b>CO3</b>	3. Effectively communicate as a team player.
	<b>CO4</b>	4. Develop speaking/Writing skills.
	<b>CO5</b>	5. Through enhanced vocabulary, presentation skills and accent modulation, able to Develop Leadership qualities .

### III/IV B.PHARMACY 5<sup>TH</sup>& 6<sup>TH</sup> SEMESTERS

Course Code& Name	Course Outcome Number	Course Outcome
501 Pharmaceutical chemistry-IV (Medicinal-II) (Theory)		This course is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class. Upon completion of the course the student shall be able to :
	<b>CO1</b>	1. Understand the chemistry, QSAR, drug designing of drugs with respect to their pharmacological activity
	<b>CO2</b>	2. Understand the drug metabolic pathways, adverse effect and therapeutic value of anesthetics, anti psychotics, anti depressants, anti anxiety agents.
	<b>CO3</b>	3. Know the Structural Activity Relationship of drugs affecting adrenergic and cholinergic mechanisms.
	<b>CO4</b>	4. Understand the mechanism of action, classification, SAR of cardiovascular agents, hypoglycaemics, opioid analgesics, diuretics, antihistaminic.

Course Code& Name	Course Outcome Number	Course Outcome
502 Pharmaceutical chemistry-IV (Medicinal-II) (Practical)		Upon completion of the course the student shall be able to :
	<b>CO1</b>	1. Synthesize the list of APIs mentioned in the syllabus.
	<b>CO2</b>	2. Able to purify the synthesized APIs by recrystallisation.
	<b>CO3</b>	3. Can do Assay of drugs present in capsules/tablets/suspensions/injections/ ointments mentioned in the syllabus.

Course Code & Name	Course Outcome Number	Course Outcome
503 Pharmaceutics-II (Dosage Form Technology Including Cosmetics) (Theory)		Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product. Upon completion of the course the student shall be able to :
	CO1	1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
	CO2	2. Know various principles to be followed in development of pharmaceutical dosage forms such as liquid orals, tablets, capsules, ophthalmics, aerosols.
	CO3	3. Know to formulate various pharmaceutical dosage forms such as solid, liquid and semisolid dosage forms, cosmetics and evaluate them for their quality.

Course Code & Name	Course Outcome Number	Course Outcome
504 Pharmaceutics-II (Dosage Form Technology Including Cosmetics) (Practical)		Upon completion of this course the student shall be able to :
	CO1	1. Preparation and evaluation of various solid dosage forms such as liquid orals, tablets, capsules
	CO2	2. Prepare and evaluate various injectable dosage forms.
	CO3	3. Prepare and evaluate various semi solid dosage forms such as creams, jellies.
	CO4	4. Preparation of certain types of Cosmetics mentioned in syllabus.

Course Code & Name	Course Outcome Number	Course Outcome
505 Pharmacognosy-I (Theory)		This course involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties. Upon completion of the course, the student shall be able to :
	CO1	1. To know the history and development of Pharmacognosy, techniques in the cultivation, production and collection of crude drugs.
	CO2	2. To know the collection, processing, storage and factors influencing the cultivation of crude drugs, their uses and chemical nature.
	CO3	3. To Know the evaluation techniques, quality control tests for the herbal drugs.
	CO4	4. To carry out the systematic microscopic and morphological evaluation of crude drugs.

Course Code & Name	Course Outcome Number	Course Outcome
506 Pharmacognosy-I (Practical)		Upon completion of the course, the student shall be able to :
	CO1	1. Analysis of crude drugs by cellular structures, chemical tests.
	CO2	2. Identification, Isolation , detection and extraction of active principles from crude drugs.
	CO3	3. Determination of Leaf constants and extractive value of crude drugs.

Course Code & Name	Course Outcome Number	Course Outcome
507 Pharmacology-I (Theory)		The main purpose of this course is to understand what drugs do to the living organisms and how their effects can be applied to therapeutics. The subject covers the information about the drugs acting on CNS, ANS, GIT and their mechanism of action, physiological and biochemical effects (pharmacodynamics) as well as absorption, distribution, metabolism and excretion (pharmacokinetics) along with the adverse effects, clinical uses, interactions, doses, contraindications and routes of administration of different classes of drugs. Upon completion of this course the student shall be able to :
	CO1	1. Understand the pharmacological and pharmacodynamic actions of different categories of drugs.
	CO2	2. Explain the mechanism of drug action on autonomic and central nervous systems.
	CO3	3. Know the basic pharmacological knowledge in the treatment of various diseases related to epilepsy, parkinsonism etc.,
	CO4	4. Know the pharmacology of drugs acting on Gastro intestinal system.
	CO5	5. Know the Pharmacology of local anesthetics and diuretics.

Course Code & Name	Course Outcome Number	Course Outcome
601 Pharmaceutical Engineering-II (Theory)		This course is designed to impart a fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry. Upon completion of the course student shall be able:
	CO1	1. To know theory of extraction, equipments used in leaching of solids.

	<b>CO2</b>	2. To know the concept of heat flow, construction, operation and application of heat exchangers and finned tubes.
	<b>CO3</b>	3. Understand theory of evaporation, heat and material balance, capacity of multiple effect evaporators.
	<b>CO4</b>	4. To know theory of distillation of binary miscible, design of equipment for different distillation methods.
	<b>CO5</b>	5. To know the theory of crystallization, material and energy balances in crystallization, operation and application of various types of crystallizers.
	<b>CO6</b>	6. To know the theory of filtration, types of centrifuges their theory, equipment and applications.

<b>Course Code&amp; Name</b>	<b>Course Outcome Number</b>	<b>Course Outcome</b>
602 Pharmaceutical Engineering-II (Practicals)		Upon completion of the course student shall be able to:
	<b>CO1</b>	1. Determine the efficiency of steam distillation.
	<b>CO2</b>	2. Verify the laws of size reduction using ball mill , disintegration mill and size separation by sieving methods.
	<b>CO3</b>	3. Determine humidity of air from wet and dry bulb temperatures, with use of Dew point method.
	<b>CO4</b>	4. Understand factors affecting rate of filtration, effect of filter aids.
	<b>CO5</b>	5. Construction of drying rate curves for calcium carbonate, sand.

<b>Course Code&amp; Name</b>	<b>Course Outcome Number</b>	<b>Course Outcome</b>
603 Pharmaceutical Biotechnology (Theory)		Biotechnology has a long promise to revolutionize the biological sciences and technology. Scientific application of biotechnology in the field of genetic engineering, medicine and fermentation technology makes the subject interesting. Biotechnology is leading to new biological revolutions in diagnosis, prevention and cure of diseases, new and cheaper pharmaceutical drugs. It is basically a research-based course. Upon completion of this course student shall be able to:
	<b>CO1</b>	1. Understand procedures for extraction and purification of antibiotics, enzymes, solvents etc.,
	<b>CO2</b>	2. Understand the sterility testing procedures for dosage forms, surgical dressings, sutures etc.,
	<b>CO3</b>	3. Know the Extraction and purification of animal products such as insulin, pancreatin, pepsin, blood products.
	<b>CO4</b>	4. Appreciate the microbial conversion of steroids, enzymes immobilization and knowledge about rDNA technology in making of human insulin, vaccines etc.,

Course Code & Name	Course Outcome Number	Course Outcome
604 Pharmaceutical Biotechnology (Practicals )		Upon completion of this course student shall be able to:
	CO1	Test for sterility of sterile water for injection, bentonite powder, talcum powder, microbial testing of sterile and non sterile products.
	CO2	Perform the effect of temperature, pH, salt concentration on growth of micro organisms
	CO3	Perform microbiological assay of tetracycline, streptomycin, oxytetracycline, benzyl penicillin.
	CO4	Effect of temperature on the growth of micro Organisms

Course Code & Name	Course Outcome Number	Course Outcome
605 Hospital And Clinical Pharmacy (Theory)		In the changing scenario of pharmacy practice in India, for successful practice of Hospital Pharmacy, the students are required to learn various skills like drug distribution, drug information, and therapeutic drug monitoring for improved patient care. In community pharmacy, students will be learning various skills such as dispensing of drugs, responding to minor ailments by providing suitable safe medication, patient counseling for improved patient care in the community set up. Upon completion of the course, the student shall be able to :
	CO1	1. Know Organization, personnel, of PTC, various drug distribution methods in a hospital for out patients and in patients.
	CO2	2. Obtain medication history interview and counsel the patients and Appreciate the concept of Rational drug therapy
	CO3	3. Understands the manufacturing and quality control procedures for sterile products in hospital pharmacy.
	CO4	4. Understands methods of overcoming and handling of incompatible prescriptions.
	CO5	5. Know the handling of prescription, posology and factoring affecting dose selection.
	CO6	6. Can calculate the doses for infants and children.
	CO7	7. Can identify physical chemical and therapeutic incompatibilities of prescriptions.
	CO8	8. Know about drug interaction, adverse drug reactions, teratogenicity and drug induced diseases.
	CO9	9. Knows about the clinical pharmacy aspects of diseases such as peptic ulcer, diabetes, hypertension etc.
	CO10	10. Knows about the preparation, revision of hospital formulary.



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606 Hospital And Clinical Pharmacy (Practical )		Upon completion of the course, the student shall be able to :
	CO1	1. Learn various skills like drug dispensing procedures.
	CO2	2. Know about various measures and weights.
	CO3	4. Can prepare and dispense drugs and responding to minor ailments by providing suitable safe medication
	CO4	4. Patient counseling for improved patient care in the community

Course Code & Name	Course Outcome Number	Course Outcome
607 Seminar		Upon completion of the course, the student shall be able to :
	CO1	Generate the topic for the presentation
	CO2	Collect the information from the relevant sources such as journals, e sources, reference books etc.,
	CO3	Assemble the information into a more realistic draft and conclude the contents.
	CO4	Prepare the presentation and explain it to the Audience.

#### IV/IV B.PHARMACY 7<sup>TH</sup>& 8<sup>TH</sup> SEMESTERS

Course Code & Name	Course Outcome Number	Course Outcome
701 Pharmaceutics-III (Biopharmaceutics, Pharmacokinetics & New Drug Delivery Systems) (Theory)		This course is designed to impart knowledge and skills necessary for dose calculations, dose adjustments and to apply Biopharmaceutics theories in practical problem solving. Basic theoretical discussions of the principles of Biopharmaceutics and pharmacokinetics are provided to help the students' to clarify the concepts. New Drug Delivery Systems are designed to impart basic knowledge on the area of novel drug delivery systems. Upon completion of the course student shall be able to:
	CO1	1. Understand the basic concepts in biopharmaceutics and pharmacokinetics.
	CO2	2. Use plasma data and derive the pharmacokinetic parameters to describe the process of drug absorption, distribution, metabolism and elimination.
	CO3	3. Critically evaluate biopharmaceutical studies involving drug product equivalency.
	CO4	4. Design and evaluate dosage regimens of the drugs using pharmacokinetic and biopharmaceutical parameters.
	CO5	5. Detect potential clinical pharmacokinetic problems and

		apply basic pharmacokinetic principles to solve them
	<b>CO6</b>	6. To understand various approaches for development of novel drug delivery systems.
	<b>CO7</b>	7. To understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems, their formulation and evaluation.

<b>Course Code &amp; Name</b>	<b>Course Outcome Number</b>	<b>Course Outcome</b>
702 Pharmaceutics-III (Biopharmaceutics, Pharmacokinetics & New Drug Delivery Systems) (Practical)		Upon completion of the course student shall be able to:
	<b>CO1</b>	1. Understand the concept of bioavailability and bioequivalence of drug products and their significance.
	<b>CO2</b>	2. Calculate various pharmacokinetic parameters, their significance and applications.
	<b>CO3</b>	3. Determination of bioavailability of various brands of given drug.
	<b>CO4</b>	4. Dissolution rate testing and analysis of data of various solid dosage forms.
	<b>CO5</b>	5. Enhancement of dissolution rate of poorly soluble drugs by solid dispersion technique

<b>Course Code &amp; Name</b>	<b>Course Outcome Number</b>	<b>Course Outcome</b>
703 Pharmacology-II (Theory )		This course is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on respiratory system, chemotherapy and drugs acting on endocrine system. Upon completion of this course the student should be able to:
	<b>CO1</b>	1. Understands the pharmacology and mechanism of drug action and its relevance in the treatment of various diseases of cardio vascular system, respiratory system, endocrine system.
	<b>CO2</b>	2. Comprehend the principles of toxicology and treatment for various types of poisoning.
	<b>CO3</b>	3. Know the principles of chemotherapy in treatment of tuberculosis, leprosy and cancer.

<b>Course Code &amp; Name</b>	<b>Course Outcome Number</b>	<b>Course Outcome</b>
704 Pharmacology-II (Practicals )		Upon completion of this course the student should be able to:
	<b>CO1</b>	1. Handle the basic equipment used in experimental

		pharmacology.
	<b>CO2</b>	2. Concentration response curve of acetylcholine
	<b>CO3</b>	3. Effect of neostigmine, pancuronium on dose response curve of acetylcholine
	<b>CO4</b>	4. Study of mydriatic & meiotic effects on rabbit eye
	<b>CO5</b>	5. Effect of various drugs and electrolytes on isolated frog's heart.

<b>Course Code &amp; Name</b>	<b>Course Outcome Number</b>	<b>Course Outcome</b>
705 Pharmaceutical Analysis –II (Theory)		This course deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart a fundamental knowledge on the principles and instrumentation of spectroscopic and chromatographic techniques. This course also emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing. Upon completion of the course the student shall be able to :
	<b>CO1</b>	1. Understands the instrumentation and analytical concepts of spectrophotometry, potentiometry, conductometry, nephelometry.
	<b>CO2</b>	2. Understands the instrumentation and analytical concepts of various types chromatography such as column chromatography, gas chromatography, high performance liquid chromatography
	<b>CO3</b>	3. Understands instrumentation and applications of differential thermal analysis, mass spectroscopy, X-ray diffraction.

<b>Course Code &amp; Name</b>	<b>Course Outcome Number</b>	<b>Course Outcome</b>
706 Pharmaceutical Analysis –II (Practical)		Upon completion of the course the student shall be able to perform:
	<b>CO1</b>	1. Estimation of absorption maximum for various drugs
	<b>CO2</b>	2. Colorimetric estimation of various drugs
	<b>CO3</b>	3. Estimation of various drugs using UV spectrophotometer
	<b>CO4</b>	4. Identification of compounds using chromatography

Course Code & Name	Course Outcome Number	Course Outcome
707 Industrial Management And Pharmaceutical Marketing		The course aim is to provide an understanding of marketing concepts and techniques and the application of the same in the pharmaceutical industry. Upon completion of the course the student shall be able to:
	<b>CO1</b>	1. Know the elements of organization and functions of management.
	<b>CO2</b>	2. Have knowledge related to production planning, distribution policies, personnel management and sales organization.
	<b>CO3</b>	3. Understands basic concepts of industrial accountancy.
	<b>CO4</b>	4. Have a knowledge on regulatory issues such as ICH guidelines, NDA and ANDA filing procedures.

Course Code & Name	Course Outcome Number	Course Outcome
708 Project	<b>CO1</b>	Generate the topic for the project.
	<b>CO2</b>	Collect the information from the relevant sources and carry out lab oriented works.
	<b>CO3</b>	Assemble the results of experiments carried out and arrange the information into a more realistic draft ethically and conclude the contents.
	<b>CO4</b>	Prepare the thesis presentation and explain the outcomes of the work to the evaluators.

Course Code & Name	Course Outcome Number	Course Outcome
801 Pharmaceutical chemistry –V ( Natural Products)- (Theory)		The course involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties. Upon completion of the course, the student shall be able to :
	<b>CO1</b>	Know the chemistry, sources and uses of carbohydrates and glycosides.
	<b>CO2</b>	Understand the chemistry, biological significance, methods of extraction, isolation and properties of fats, oils, terpenes.

	<b>CO3</b>	Know the classification, general methods of extraction, chemical structures of alkaloids.
	<b>CO4</b>	Know the nomenclature, chemistry, synthesis and properties of steroids, hormones and vitamins.

<b>Course Code &amp; Name</b>	<b>Course Outcome Number</b>	<b>Course Outcome</b>
802 Pharmaceutical chemistry –V ( Natural Products)- (Practicals)		Upon completion of the course, the student shall be able to
	<b>CO1</b>	Determine acid value, saponification value, ester value, iodine value of oils.
	<b>CO2</b>	Isolation of casein from milk and piperine from pepper powder.
	<b>CO3</b>	Estimation of ephedrine, quinine sulphate.
	<b>CO4</b>	Qualitative analysis of natural products.

<b>Course Code &amp; Name</b>	<b>Course Outcome Number</b>	<b>Course Outcome</b>
803 Pharmacognosy- II (Theory)		The main purpose of subject is to impart the students the knowledge of how the secondary metabolites are produced in the crude drugs, how to isolate and identify and produce them industrially. Also this subject involves the study of producing the plants and phytochemicals through plant tissue culture, drug interactions and basic principles of traditional system of medicine.  Upon completion of the course, the student shall be able :
	<b>CO1</b>	1. To know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents such as glucosides, alkaloids, volatile oils.
	<b>CO2</b>	2. To understand the preparation and development plant tissue culture and their applications.
	<b>CO3</b>	3. To understand the sources, chemical constituents, pharmacological actions of various ayurvedic drugs.
	<b>CO4</b>	4. To carryout systematic pharmacognostic study of lipids.

Course Code & Name	Course Outcome Number	Course Outcome
804 Pharmacognosy- II (Practicals)		Upon completion of the course, the student shall be able to :
	CO1	1. Study of Morphology and transverse section of the crude drugs as per syllabus
	CO2	2. Identification of powdered crude drugs based on their microscopical characters
	CO3	3. Identification powdered crude drugs in their mixtures based on microscopical characters.
	CO4	4. Morphology of crude drugs as per syllabus.

Course Code & Name	Course Outcome Number	Course Outcome
805 Good Manufacturing Practices and Validation (Theory)		This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It covers the important aspects like cGMP, QC tests, documentation, quality certifications and regulatory affairs. Upon completion of the course student shall be able to:
	CO1	1. Understand the concepts and philosophy of cGMP aspects in a pharmaceutical industry.
	CO2	2. Appreciate the importance of validation and calibration of analytical instruments.
	CO3	3. Understand the scope of quality certifications such as GLP, ISO that are applicable to pharmaceutical industries.
	CO4	4. Understand the responsibilities of QA & QC departments.