DEPARTMENT OF PHARMACY

Program: B Pharmacy

Regulation: R16 **No. of Courses: 65**

COURSE OUTCOMES

I – I Sem	Course: English (PHR16111)
CO111.1	Achieve a higher quality of life, strength and sovereignty of a developed nation.
CO111.2	Understand that all men can come together and avert the peril.
CO111.3	Understand how Gandhi grew in introspection and maturity.
CO111.4	Able to think clearly and logically and write clearly and logically.
CO111.5	Emulate G.D.Naidu and take to practical applications.
CO111.6	Able to achieve much at a low cost and help the common man.
I – I Sem	**Course: Mathematics (PHR16112)**
CO112.1	Able to perform the Arthmatic and Geometric progressions in pharmaceutical calculations.
CO112.2	Know the basic trigonometric functions from first principles.
CO112.3	Employ volumetric titrations in quality control of pharmaceuticals.
CO112.4	Know basic calculus which is used in analytical study of their life sciences applications
CO112.5	Know integral calculus which is used in analytical study of their life sciences applications.
CO112.6	Draw lines, finding the equations for the purpose of relational study.
I – I Sem	**Course: Human Anatomy and Physiology - I (PHR16113)**
CO113.1	Recognize the various homeostatic mechanisms, cellular level organization and summarize the characteristics of different types of tissues and their location in various organs. Organize the structure and functions of skin, bones and joints of human body.
CO113.2	Understand the functioning of haemopoietic system and elements of blood.
CO113.3	Illustrate the anatomy, physiology and coordinated pathway of heart and blood vessels. Understand the importance of lymphatic system in human body.
CO113.4	Summarize the basics of dispensing and compounding of biphasic liquid dosage forms.
CO113.5	Organize the structure and functions of skin, bones and joints of human body.
CO113.6	Relate the physiology of sympathetic, parasympathetic, spinal/cranial nerves and organization of special senses.

I – I Sem	**Course: General and Dispensing Pharmacy (PHR16114)**
CO114.1	Know the history of profession of pharmacy.
CO114.2	Know the history of profession of pharmacy dispensing. Solve the pharmaceutical calculations
CO114.3	Solve the pharmaceutical calculations and summarize the basics of compounding and dispensing of powders, liquids.
CO114.4	Summarize the basics of compounding and dispensing of liquid dosage forms, Summarize the basics of dispensing and compounding of biphasic liquid dosage forms.
CO114.5	Know the preparation of suppositories and understand various pharmaceutical incompatibility.
CO114.6	Understanding principles and procedures of extraction of galenicals, tinctures, extracts etc.
I – I Sem	**Course: Pharmaceutical Organic Chemistry I (PHR16115)**
CO115.1	Understand basic concepts of mechanism and reactivity of organic molecules.
CO115.2	Remember the preparation methods and properties of alkanes, alkenes and conjugated dienes.
CO115.3	Remember the preparation methods and properties of alkyl halides and alcohols.
CO115.4	Remember the preparation methods and properties of Alcohols, ethers.
CO115.5	Discuss optical isomerism-optical activity, enantiomers, diastereoisomerism and meso compounds. Understand the fundamentals of geometric and conformational stereo chemical aspects.
CO115.6	Understand structure, mechanism and usefulness of Grignard reagent.
I – I Sem	**Course: English Lab (PHR16116)**
CO116.1	Impart listening and speaking skills through specific activities.
CO116.2	Provide confidence in participation in debates and elocution
CO116.3	Impart reading and writing skills through case writing.
CO116.4	Draft circulars, resume and career skills.
I – I Sem	**Course: Biology Lab (PHR16117)**
CO117.1	Analyze compound and simple microscope.
CO117.2	Impart techniques in section cutting, staining and mounting.
CO117.3	Perform histological studies of various parts of plants
CO117.4	Describe the floral characters of plants of different families.
I – I Sem	**Course: General and Dispensing Pharmacy Lab (PHR16118)**
CO118.1	Know the history of profession of pharmacy. Understand the basics of different

	dosage forms and importance of prescription and posology.
CO118.2	Dispensing of prescription filling.
CO118.3	Identify various types of incomplete in prescription
CO118.4	Analyse the calculation involved in prescription for gedeatrics and pedeatrics. Dispensing involved in adjustment of tonicity.
I – I Sem	**Course: Pharmaceutical Organic Chemistry I Lab (PHR16119)**
CO119.1	Dispensing of Prescription Filling.
CO119.2	Identify various types of incompletes in Prescription.
CO119.3	Analyze the calculating involved in prescription for gediatrics and paediatrics.
CO119.4	Dispensing involving adjustment of tonicity.
I – I Sem	**Course: Human Anatomy and Physiology II (PHR16121)**
CO121.1	Relate the physiology of Central nervous system with the functioning of neurons.
CO121.2	Relate the physiology of Central nervous system with the functioning of neurons.
CO121.3	ANS
CO121.4	Analyze the importance of endocrine system in body.
CO121.5	Illustrate the anatomy, physiology and coordinated pathway of Reproductive system.
CO121.6	Know basic anatomy and physiology of sense organs and its co-ordination with brain.
I – I Sem	**Course: Pharmaceutical Inorganic Chemistry (PHR16122)**
CO122.1	Classification of inorganic compounds. Understand the history of pharmacopoeia, sources and types of impurities and describe the official methods of control like limit tests.
CO122.2	Classify the gastrointestinal agents and described the methods of preparation, properties, storage, assay and uses with marketed formulations of inorganic compounds in gastrointestinal agents.
CO122.3	Acquires knowledge on Absorbents, Protectives, Anti-infectives.
CO122.4	Classify the gastrointestinal agents and described the methods of preparation, properties, storage, assay and uses with marketed formulations of inorganic compounds in gastrointestinal agents.
CO122.5	Acquires knowledge on acids, bases, buffers, buffered isotonic solutions, methods of adjusting isotonicity and major extra and intra cellular electrolytes and know the monographs of dental products.
CO122.6	Classify the miscellaneous compounds and know the monographs of inorganic compounds.
I – II Sem	**Course: Pharmaceutical Organic Chemistry II (PHR16123)**
CO123.1	Understand About Aromaticity, Chemistry and Reactions of Benzene and Its

	Derivatives. Understand the concept of hydrolysis, hydrogenation, saponification and rancidity of fatty acids & oils, polynuclear HC.
CO123.2	Remember the preparation methods and properties of Carbonyl compounds.
CO123.3	Remember the preparation methods and properties of Carboxylic acids.
CO123.4	Understand the Chemistry and Reactions Of phenols, aromatic amines and acids
CO123.5	Amines and Diazo compounds
CO123.6	Elaborate the reactions, understand their mechanisms and synthetic importance of organic naming reactions.
I – II Sem	**Physical Pharmacy – I (PHR16124)**
CO124.1	Understand the effect of solubility in designing dosage forms.
CO124.2	Identify the properties of states of matter. Understand the various physiochemical properties of drug molecules to design dosage forms.
CO124.3	Understand the principle of interfacial tension and the applications of surface-active agents in drug solubilization.
CO124.4	Understand the concepts of Interfacial Phenomenon.
CO124.5	Perceive and apply the concepts of complexation and protein binding in pharmacy.
CO124.6	Gain knowledge of pH and buffers and their use in the stabilization of pharmaceutical formulations.
I – II Sem	**Computer applications and Biostatistics (PHR16125)**
CO125.1	Illustrate the concept of number system in computers and understand different types of databases, applications of computers and databases in pharmacy.
CO125.2	Employ web technologies such as HTML, XML, CSS, programming languages, Web servers and pharmacy drug database in pharmaceutical field.
CO125.3	Appraise the applications of computers in pharmacy such as drug information services, pharmacokinetics in drug design.
CO125.4	Understand the basic aspects of statistics such as central tendency, dispersion, correlation and regression.
CO125.5	Know the statistical techniques and to apply those to solve the statistical problems
CO125.6	Explain the need of research, research designs and their applications and to explain methodological designs.
I – II Sem	**Human Anatomy and Physiology Lab (PHR16126)**
CO126.1	Recall handling of compound microscope and to outline the microscopic characteristics of various tissues.
CO126.2	Summarize the characteristics of different bones (skeletal system) & types of joints.
CO126.3	Estimate the various haematological parameters such as WBC, RBC count, Hb, ESR, bleeding, clotting time and their own blood group.
CO126.4	Determine various physical parameters such as heart rate, BP.

I – II Sem	**Physical Pharmacy – I Lab (PHR16127)**
CO127.1	Understand the significance of physical properties such as solubility, surface tension, partition coefficient and pKa in the design of dosage forms.
CO127.2	Determine the surface tension of sample liquids by drop count and drop weight methods.
CO127.3	Estimate the HLB value and critical micellar concentration of surfactants. Explain adsorption isotherms and determine Freundlich-Langmuir constant using activated charcoal.
CO127.4	Estimate the stability constants of complexes by solubility and pH titration methods.
I – II Sem	**Computer applications Lab (PHR16128)**
CO128.1	Demonstrate and make use of MS Office, MS Word, MS Excel, MS Access and MS Power point.
CO1238.2	Understand the paradigms of program languages and be exposed to at least one language from each model, C and SQL.
CO128.3	Summarize the report and printing the report from patient database. Design a questionnaire using a word processing package to gather information about a particular disease.
CO128.4	Create HTML web page to show personal information.
II – I Sem	**Pharmaceutical Unit Operations – I (PHR16211)**
CO211.1	Understand the concepts of flow of fluids, size reduction and size separation used for manufacturing of pharmaceutical products.
CO211.2	Summarize different mechanisms of heat transfer. Compare and contrast different types of evaporation and distillation process.
CO211.3	Understand the BP207T and principle involved in operation of drying equipments.
CO211.4	Summarize the BP207T and principle of mixing equipments.
CO211.5	Understand the BP207T, principle and determine the factors influencing mixing, filtration and centrifugation.
CO211.6	Elaborate various preventive methods used for corrosion control in pharmaceutical industries.
II – I Sem	**Biochemistry (PHR1621)**
CO212.1	Remember the classification, properties, significance and metabolic reactions of carbohydrates, lipids, nucleic acids, proteins and amino acids.
CO212.2	Understand the metabolism of carbohydrates and process of electron transport and ATP formation. Appraise the causes, manifestations and diagnosis of metabolic disorders.
CO212.3	Remember the metabolism of Lipids and aminoacids.
CO212.4	Understand the causes, manifestations and diagnosis of metabolic disorders.

CO212.5	Understand the metabolism of Nucleic acid and distinguish the process of DNA replication, transcription and translation.
CO212.6	Apply the concept of catalytic activity and enzyme inhibition in design of new drugs, diagnostic and therapeutic applications of enzymes.
II – I Sem	**Physical Pharmacy -II (PHR16213)**
CO213.1	Demonstrate the suitable physical properties that contribute in designing a stable colloidal dispersion and understand the applications of colloidal dispersions.
CO213.2	Gain knowledge about different rheological or thixotropic behavior of different pharmaceutical dosage forms & deformation of solids and to demonstrate, modify & predict the designing of different pharmaceutical dosage forms.
CO213.3	Formulate and evaluate Emulsions making use of rheological and electrical properties for effective clinical management.
CO213.4	Formulate and evaluate Suspensions making use of rheological and electrical properties for effective clinical management.
CO213.5	Formulate and evaluate coarse Suspensions making use of rheological and electrical properties for effective clinical management.
CO213.6	Formulate and evaluate Colloidal Suspensions making use of rheological and electrical properties for effective clinical management.
II – I Sem	**Pharmaceutical Microbiology (PHR16214)**
CO214.1	Remember the scope of microbiology and its branches, methods of classification. Understand the structure, morphology of bacteria.
CO214.2	Gain the knowledge on various staining techniques. Understand the importance and implementation of sterilization in pharmaceutical processing and industry.
CO214.3	Understand the structure, morphology of fungi and virus.
CO214.4	Understand the importance and implementation of disinfectants in pharmaceutical industry.
CO214.5	Remember the tests used for the microbiological standardization of pharmaceuticals.
CO214.6	Remember the preservation of pharmaceutical products. Choose the cell culture technology and microbial characters for the pharmaceutical industry.
II – I Sem	**Health Education & Pathophysiology (PHR16215)**
CO215.1	Understand the process of cell injury, morphology of cell injury and cellular adaptations.
CO215.2	Describe the etiology and pathogenesis of CVS, respiratory and renal systems diseases or disorders.
CO215.3	Explain the etiopathogenesis of hematologic, endocrine, nervous, gastrointestinal, musculoskeletal diseases and Immunopathogenesis of infectious diseases.
CO215.4	Explain the etiopathogenesis of gastrointestinal, musculoskeletal diseases and Immunopathogenesis of infectious diseases.
CO215.5	Understand the principles of physical, chemical and biologic carcinogenesis.
CO215.6	Describe the etiology and pathogenesis of infectious diseases.

II – I Sem	**Pharmaceutical Biochemistry Lab (PHR16216)**
CO216.1	Remember the qualitative analysis of carbohydrates and proteins.
CO216.2	Understand the principle and clinical significance of blood glucose. Identify the amount of reducing sugars by DNSA method
CO216.3	Determine the effect of temperature and substrate concentration on salivary amylase activity.
CO216.4	Examine the constituents present in Urine and their clinical significance.
II – I Sem	**Physical Pharmacy – II Lab (PHR16217)**
CO217.1	Determine the flow properties of powders and interpret the characteristics of powders.
CO217.2	Asses the rheology of fluids by using viscometers. Evaluate the stability of coarse dispersions.
CO217.3	Distinguish the rate constants as per the chemical reaction.
CO217.4	Interpret the shelf life of a given formulation by accelerated stability studies.
II – I Sem	**Pharmaceutical Microbiology Lab (PHR16218)**
CO218.1	Recall different techniques of sterilization. Interpret the results of microbial testing
CO218.2	Demonstrate various staining methods – simple, gram staining and acid fast staining.
CO218.3	Test for possible microbial contaminants. Estimate the microbiological assay of antibiotics.
CO218.4	Estimate the motility in the given sample. Choose the correct method to evaluate the microbes to be tested.
II – II Sem	**Course: Pharmaceutical Unit Operations - II (PHR16221)**
CO221.1	Summarize different mechanisms of heat transfer and illustrate the equipments used in transfer of heat.
CO221.2	Compare and contrast different types of equipments used in evaporation.
CO221.3	Elaborate the process, types and equipment of distillation.
CO221.4	Understand the theory and principle involved in operation of drying equipments.
CO221.5	Understand the concepts of size reduction used for manufacturing of pharmaceutical products.
CO221.6	Summarize the theory and principle of mixing equipments.
II – II Sem	**Course: Pharmaceutical Analysis – I (PHR16222)**
CO222.1	Understand the physiochemical concepts of analysis and gain knowledge of sources of errors and minimizing techniques.

CO222.2	Analyze the techniques of acid-base titrations and non-aqueous titrations.
CO222.3	Employ volumetric titrations in quality control of pharmaceuticals.
CO222.4	Analyze the techniques of gravimetry in quality control of pharmaceuticals.
CO222.5	Analyze the techniques of redox titrations and develop analytical skills.
CO222.6	Understand the moisture content in drugs that can be determined by KFR titration.
II – II Sem	**Course: Pharmacognosy – I (PHR16223)**
CO223.1	Recall the history, scope and development of pharmacognosy.
CO223.2	Remember different sources, classification and quality control of crude drugs.
CO223.3	Illustrate about cultivation, collection, processing and storage of crude drugs. Understand the factors affecting the production of crude drugs along with its hybridization.
CO223.4	Provide enough knowledge to identify adulterants from genuine products.
CO223.5	Understand the pharmacognostic study of Carbohydrates.
CO223.6	Remember the pharmacognostic study of Lipids.
II – II Sem	**Course: Medicinal Chemistry - I (PHR16224)**
CO224.1	Understand the nomenclature, properties and methods of preparation of heterocyclic compounds. Identify preparation, properties, medicinal uses and other applications of five membered heterocyclic compounds.
CO224.2	Understand the physicochemical properties, steric aspects of drugs and their metabolic pathways in relation to biological action.
CO224.3	Categorize the drugs acting on Central nervous system based on their mechanism of action, understand their SAR and clinical uses.
CO224.4	Categorize the drugs acting on Autonomous nervous system based on their mechanism of action, understand their SAR, synthesis and clinical uses.
CO224.5	Categorize the general anesthetics, Narcotic analgesics based on their mechanism of action, understand their and clinical uses.
CO224.6	Categorize the anti-diabetics and Local anesthetics based on their mechanism of action, understand their SAR, synthesis and clinical uses.
II – II Sem	**Course: Pharmacology – I (PHR16225)**
CO225.1	Define the fundamental concepts of pharmacology and pharmacokinetics of drugs.
CO225.2	Describe organization, function, and neurohumoral transmission of peripheral nervous system. Employ the knowledge to study the pharmacological actions of drugs acting on peripheral nervous system.
CO225.3	Describe neurohumoral transmission of the central nervous system with reference to Excitatory and Inhibitory neurotransmitters and apply the basics in studying the pharmacological actions of drugs acting on the central nervous system.
CO225.4	Obtain the knowledge on pharmacology of Anaesthetics.

CO225.5	Apply the basics in studying the pharmacological actions of anti-epileptics, Lithium compounds.
CO225.6	Describe organization, functions of Gastro-intestinal system and employ the knowledge tostudy the pharmacological actions of drugs acting on Gastro-intestinal system.
II – II Sem	**Course: Pharmaceutical Unit Operations - I (PHR16226)**
CO226.1	Determine overall heat transfer coefficient by heat exchanger and calculate the efficiency of steam distillation.
CO226.2	Demonstrate various staining methods – simple, gram staining and acid fast staining.
CO226.3	Demonstrate and explain about the construction, working and applications of pharmaceutical equipments such as colloid mill, planetary mixer, fluidized bed dryer and freeze dryer.
CO226.4	Estimate the process variables of filtration, evaporation and infer the same.
II – II Sem	**Course: Pharmaceutical Analysis - I (PHR16227)**
CO227.1	Understand the principles of identification of impurity in given sample by performing limit tests.
CO227.2	Able to prepare and standardize solutions of different concentrations.
CO227.3	Determine percentage purity of [pharmaceutical drugs by various volumetric analytical titrations.
CO227.4	Determine normality of pharmaceutical drugs by electro analytical methods.
II – II Sem	**Course: Pharmacognosy – I (PHR16228)**
CO228.1	Remember different morphological and microscopical characteristic features of crude drugs.
CO228.2	Analyze crude drugs as per regulatory guidelines.
CO228.3	Evaluate the crude drugs by quantitative evaluation methods.
CO228.4	Understand the cellular structure of crude drugs.
II – II Sem	**Course: Pharmacognosy - II (PHR16311)**
CO311.1	Summarize the pharmacognistic study of secondary metabolites like Glycosides.
CO3112	Summarize the pharmacognistic study of secondary metabolites like Alkaloids.
CO311.3	Summarize the pharmacognistic study of secondary metabolites like Volatile oils.
CO311.4	Summarize the pharmacognistic study of Enzymes.
CO311.5	Outline the metabolic pathway in higher plants and their biogenetic studies.
CO311.6	Understand the pharmacognostic study of Fibres.

III – I Sem	**Course: Medicinal Chemistry - II (PHR16312)**
CO312.1	Categorize the anti tubercular and anti infective drugs based on their mechanism of action, understand their SAR, synthesis and clinical uses.
CO312.2	Categorize the anti malarials, ani fungals based on their mechanism of action, understand their SAR, synthesis and clinical uses.
CO312.3	Categorize the anti virals based on their mechanism of action, understand their SAR, synthesis and clinical uses.
CO312.4	Categorize the antibiotics based on their mechanism of action, understand their SAR, synthesis and clinical uses.
CO312.5	Remember the chemistry, SAR, biological importance and clinical uses of water soluble vitamins.
CO312.6	Remember the chemistry, SAR, biological importance and clinical uses of fat soluble vitamins.
III – I Sem	**Course: Pharmaceutical Technology - I (PHR16313)**
CO313.1	Know the importance of preformulation studies, excipients in the development and stability of dosage forms.
CO313.2	Understand the manufacturing techniques, formulation and evaluation methods of Liquid oral preparations.
CO313.3	Understand the manufacturing techniques, formulation and evaluation methods of Semi solid preparations.
CO313.4	Understand the manufacturing techniques, formulation and evaluation methods of Aerosols and Ophthalamic preparations.
CO313.5	Summarize formulation, manufacturing and evaluation of skin cosmetic preparations.
CO313.6	Summarize formulation, manufacturing and evaluation of dental cosmetic preparations.
III – I Sem	**Course: Environmental sciences (PHR16314)**
CO314.1	Remember the natural renewable sources.
CO314.2	Acquire knowledge about various types of non- renewable resources and understand the role of an individual in conservation of natural resources.
CO314.3	Impart basic knowledge about various ecosystems on earth.
CO314.4	Motivate the learner to participate in environment protection.
CO314.5	Acquire knowledge on different types of Pollution.
CO314.6	Understand the sources, causes and prevention of pollution.
III – I Sem	**Course: Pharmaceutical Management (PHR16315)**
CO315.1	Understand business organization and functions.
CO315.2	Understand production management, organization, planning layout and product

	development.
CO315.3	Understand principles, contribution and quality concepts of work flow.
CO315.4	Classify different types of sales promotion and Know the skills required for sales promotion.
CO315.5	Understand structure, manufacturing of products in pharmaceutical industry.
CO315.6	Understand types of insurance and its governance in pharmacy profession.
III – I Sem	**Course: Medicinal chemistry - I (PHR16316)**
CO316.1	Remember the wide variety of the crude drugs and their sources by morphological and microscopic characteristics.
CO316.2	Exercise the isolation and detective principles of crude drugs,
CO316.3	Predict the crude drug by performing chromatographic techniques.
CO316.4	Analyze crude drugs by chemical tests.
III – I Sem	**Course: Pharmacognosy - II (PHR16317)**
CO317.1	Synthesize, characterize and purify various medicinal compounds and intermediates.
CO317.2	Analyze the selected drugs present in dosage forms and to determine the assay by using various analytical techniques.
CO317.3	Prepare drugs and determine melting point or boiling point for prepared drugs.
CO317.4	Interpret the functional groups of compounds by qualitative analysis.
III – I Sem	**Course: Pharmaceutical Technology – I (PHR16318)**
CO318.1	Able to formulate skills of preparing syrups, elixirs, Linctus, solutions and semisolids.
CO318.2	Assess the preformulation studies of drugs and interpret the characteristics of drugs. Gain the knowledge on formulation and evaluation of tablets, capsules, containers.
CO318.3	Gain the knowledge on formulation and evaluation of injections and ophthalmics.
CO318.4	Prepare and evaluate cosmetics such as lipstick, cold cream and shampoo.
III – II Sem	**Course: Pharmaceutical Technology - II (PHR16321)**
CO321.1	Understand the manufacturing techniques, formulation and evaluation methods of Capsules.
CO321.2	Understand the manufacturing techniques of microencapsulation.
CO321.3	Understand the manufacturing techniques, formulation and evaluation methods of Tablets.
CO321.4	Understand the manufacturing process and techniques of tablet coating.
CO321.5	Gain the knowledge on manufacturing techniques, formulation and evaluation

	methods of Parenteral preparations.
CO321.6	Appraise the science of packaging materials.
III – II Sem	**Course: Pharmaceutical Biotechnology (PHR16322)**
CO322.1	Assess the general requirements of fermentative production and biotechnological production of pharmaceuticals.
CO322.2	Understand the fermentative production of pharmaceuticals.
CO322.3	Understand the steps involved in development of biosensors, recombinant products and concepts of immunology. Outline the production parameters important in pharmaceutical product development using principles of biotechnology.
CO322.4	Elaborate on microbial genetics, biotransformation of products. Understand the various immunological products and its manufacturing process.
CO322.5	Understand the technology and applications of enzymes.
CO322.6	Understand the various blood products and its manufacturing, storage process.
III – II Sem	**Course: Pharmacology – II (PHR16323)**
CO323.1	Assess the general requirements of fermentative production and biotechnological production of pharmaceuticals.
CO323.2	Employ the knowledge to study the pharmacological actions of anticoagulants and drugs acting on urinary system.
CO323.3	Employ the knowledge to study the pharmacological actions of drugs acting on endocrine system.
CO323.4	Gain the knowledge on pharmacology of autocoids and related drugs.
CO323.5	Describe organization, function, of Respiratory system and employ the knowledge to study the pharmacological actions of drugs acting on Respiratory system.
CO323.6	Understand the principles of chemotherapy and illustrate the pharmacology of antibiotics and anti neoplastic agents.
III – II Sem	**Course: Medicinal Chemistry – III (PHR16324)**
CO324.1	Apply modern techniques like Quantitative Structure Activity Relationship (QSAR), Prodrug concept, Combinatorial Chemistry and Computer Aided Drug Design (CADD) in rational drug design.
CO324.2	Apply modern techniques like molecular modeling and docking studies in rational drug design.
CO324.3	Categorize the steroidal anti-inflammatory agents based on their mechanism of action, understand their SAR, synthesis and uses.
CO324.4	Categorize the anti-arrythmic drugs and cardiac glycosides based on their mechanism of action, understand their SAR, synthesis and clinical uses.
CO324.5	Categorize the drugs acting on Cardiovascular system based on their mechanism of action, understand their SAR, synthesis and clinical uses.
CO324.6	Categorize the Diuretics and anihypaerlipidemics based on their mechanism of

	action, understand their SAR, synthesis and uses.
III – II Sem	**Course: Regulatory Affairs, IPR & Patents (PHR16325)**
CO325.1	Understand the regulatory guidelines involved in preformulation studies.
CO325.2	Understand the regulatory guidelines involved in manufacturing, validation of equipment, products and materials.
CO325.3	Understand the regulatory guidelines involved in packaging materials.
CO325.4	Assimilate the process of clinical trials and pharmacovigilance as well as to understand obligations of GCP in clinical trials.
CO325.5	Understand IPR and patents with examples.
CO325.6	Understand patenting laws and regulations.
III – II Sem	**Course: Pharmaceutical Technology - II (PHR16326)**
CO326.1	Assess the preformulation studies of drugs and interpret the characteristics of drugs.
CO326.2	Gain the knowledge on formulation and evaluation of tablets, capsules, containers.
CO326.3	Gain the knowledge on formulation and evaluation of injections and ophthalmics.
CO326.4	Evaluate the packaging guidelines according to pharmacoepial tests.
III – II Sem	**Course: Pharmaceutical Bioechnology - II (PHR16327)**
CO327.1	Isolate antibiotic producing microorganism from soil. Determine MIC of the given antibiotic.
CO327.2	Perform Production of pharmaceuticals by fermentation techniques.
CO327.3	Evaluate Sterility testing of Pharmaceutical products and find the measures for storage of blood products.
CO327.4	Demonstrate extraction of DNA and RNA.
III – I Sem	**Course: Pharmacology (PHR16328)**
CO328.1	Recall the dose calculations in pharmacological experiments, and to relate the antiallergic activity / anti-ulcer activity in rat models.
CO328.2	Demonstrate of effect of drugs on gastrointestinal motility and the effect of agonist/antagonists on guinea pig ileum. Construct serum biochemical parameters by using semi auto analyzer.
CO328.3	Analyze effect of saline purgative on frog intestine, insulin hypoglycemic effect and test for pyrogens using rabbit method.
CO328.4	Predict the pharmacokinetic parameters and adapt the biostatistics methods in experimental pharmacology. Evaluate acute oral toxicity (LD50), acute skin irritation / corrosion and acute eye irritation / corrosion of a test substance C608.6 Predict the pharmacokinetic parameters and adapt the biostatistics methods in experimental pharmacology.

IV – I Sem	**Course: Pharmaceutical Analysis - II (PHR16411)**
CO411.1	Understand principle, operation and applications of UV visible, IR, NMR and mass spectrophotometer.
CO411.2	Understand the principle and procedure involved in NMR and mass spectrophotometer.
CO411.3	Gain knowledge on characterization and estimation of drugs by thermal techniques and X-ray diffraction techniques.
CO411.4	Elaborate various principles, theory and instruments employed for the characterization and analysis of drugs by using chromatographic techniques.
CO411.5	Create protocol for analysis of pharmaceutical substances by spectroscopic techniques.
CO411.6	Understand the principle, operation and applications of chromatographic and LC-MS techniques.
IV– I Sem	**Course: Pharmaceutical Analysis - II (PHR16412)**
CO412.1	Understand basic concepts of absorption of drugs in body.
CO412.2	Understand basic concepts of distribution of drugs in body.
CO412.3	Understand basic concepts of elimination of drugs in body.
CO412.4	Understand the application of pharmacokinetic models in design of dosage form.
CO412.5	Able to design multiple dosage regimens based on clinical pharmacokinetic parameters for maximizing patient compliance and therapeutic effectiveness.
CO412.6	Define and explain the principles and importance of drug products as they are bioavailable and bioequivalent as well as to outline the results by using the hyphenated tools to interpret the results.
IV – I Sem	**Course: Chemistry of Natural Products (PHR16413)**
CO413.1	Understand structures, features, stabilities and uses of Carbohydrates.
CO413.2	Understand structures, features, stabilities and uses of proteins and amino acids.
CO413.3	Understand structures, features, stabilities and uses of Lipids, purines and Xanthine derivatives.
CO413.4	Understand structures, features, stabilities and uses of Terpenes.
CO413.5	Understand structures, features, stabilities and uses of Alkaloids.
CO413.6	Understand structures, features, stabilities and uses of Vitamins and Steroids.
IV – I Sem	**Course: Hospital & Community Pharmacy (PHR16414)**
CO414.1	Understand Hospital Pharmacy organisation structure, Budget preparation and implementation hospital formulary, organization of drug store, purchase and inventory control, patient counseling, role of pharmacist in community health care and education.

CO413.2	Understand the pharmacy procedural manual, drug distribution, dispensing to outpatients, in-patients and ambulatory patient dispensing of ancillary and controlled substances, Drug Information Center.
CO414.3	Understand Prescription filling, drug profile, patient medication profile, cases on drug interaction and adverse reactions and idiosyncracy.
CO414.4	Understand Community pharmacy role and relationship, professional responsibilities and prescribed medication order.
CO414.5	Understand communication with prescribers and patients, Rational use of common OTC medications.
CO414.6	Understand Family planning, First aid, Participation in primary health programs, Smoking cessation, Screening programs, Nutrition, Responding to common ailments and Community pharmacy management and Home Medicines Review (HMR).
IV– I Sem	**Course: Pharmaceutical Jurisprudence (PHR16415)**
CO415.1	Understand Pharmaceutical Legislations, Drugs & Pharmaceutical Industry, Pharmaceutical Education and Pharmaceutical ethics & policy.
CO415.2	Understand rules prescribed order, Pharmacy act, Drugs (Price control) order.
CO415.3	Understand rules, schedules of Drugs and Cosmetics Act.
CO415.4	Understand procedures under medicinal and toilet preparations act and Narcotic Drugs & Psychotropic Substances Act.
CO415.5	Understand the rules and procedures under drugs and magic remedies.
CO415.6	Understand the salient features of GATT policy, Prevention of Cruelty to animals Act, Factory act and Pharmaceutical Policy.
IV – I Sem	**Course: Pharmaceutical Analysis - II (PHR16416)**
CO416.1	Interpret IR Spectra.
CO416.2	Estimate the assay of drugs by UV- spectrophotometry and Colorimetric method.
CO416.3	Isolate mixture of compounds by suitable chromatography techniques.
CO416.4	Demonstrate HPLC, Column chromatography and Gel electrophoresis.
IV—I Sem	**Course: Biopharmaceutics And Pharmacokinetics (PHR16417)**
CO417.1	Estimate of various pharmacokinetic parameters for plasma and urinary excretion studies.
CO417.2	Analyze biological specimens for drug content and estimation its pharmacokinetic parameters.
CO417.3	Analyze In-vitro evaluation of different dosage forms for drug release.
CO417.4	Apply the Statistical treatment for pharmaceutical data.
IV—I Sem	**Course: Chemistry of Natural Products (PHR16418)**
CO418.1	Identify alkaloids, steroids, steroidal glycosides and cardiac glycosides by specific

	tests.
CO418.2	Extract drugs from plants and animal sources.
CO418.3	Identify natural products by TLC.
CO418.4	Demonstrate Volatile oil production by steam distillation.
IV—II Sem	**Course: Bioassays & Toxicology (PHR16421)**
CO421.1	Gain knowledge on bioassays and its applications, its importance and need in the present context.
CO421.2	Understand Principles and procedures involved in bioassays and their limitations.
CO421.3	Grasp knowledge on scope, principles, mechanisms and risk assessment.
CO421.4	Overview on acute, sub-acute and chronic toxicity studies, carcinogenicity and chemical carcinogenesis in humans.
CO421.5	Acquire knowledge on toxic responses of target organs, poisoning and its treatment strategies.
CO421.6	Understand the intoxication produced by various toxicants.
IV—II Sem	**Course: Clinical Pharmacy, Therapeutics and Pharmacovigilance (PHR16422)**
CO422.1	Understand several concepts of essential drug list, Rational drug therapy, medication errors and patient drug compliance.
CO422.2	Understand the concept of Pharmacoeconomics, Pharmacoepidemiology, Pharmacovigilance, Therapeutic drug monitoring and Total Parental Nutrition.
CO422.3	Understand the drug therapy of above diseases.
CO422.4	Understand the drug therapy of above Endocrine disorders.
CO422.5	Acquire knowledge on the concept of Pharmacovigilance.
CO422.6	Understand the importance of Pharmacovigilance role in Clinical practice.
IV—II Sem	**Course: Controlled Release and Novel Drug Delivery Systems (PHR16423)**
CO423.1	Understand Factors to be considered, principles and regulatory considerations involved in controlled drug delivery systems.
CO423.2	Understand fundamentals, Dissoultion Contolled, Diffusion Controlled, Ion Exchange Resins, Osmotic based systems, pH Independent Systems and altered density systems.
CO423.3	Understand fundamentals, types of TDDS, Materials Employed and Evaluation of TDDS.
CO423.4	Understand mechanism of bioadhesion, mucoadhesive materials, formulation and evaluation of mucoadhesive-based systems.
CO423.5	Understand fundamentals and applications, formulation and evaluation of Liposomes, Resealed Erythrocytes and Nano particles.
CO423.6	Understand classification, study of biodegradable polymers & hydrogels.

IV-II Sem	**Course: Quality Assurance, GMP & GLP (PHR16424)**
CO424.1	Understand Concept of Quality assurance, philosophy of GMP, CGMP and GLP.
CO424.2	Understand GMP requirements for the production of pharmaceuticals.
CO424.3	Understand selection, purchase specifications, maintenance, clean in place, sterilize in place.
CO424.4	Acquire knowledge on documentation in production of pharmaceuticals.
CO424.5	Acquire knowledge on GLP requirements.
CO424.6	Understand handling of returned goods, recovered materials and reprocessing. Complaints and recalls, evaluation of complaints, recall procedures, related records and documents.
IV—II Sem	**Course: Bioassays & Toxicology (PHR16425)**
CO425.1	Analyze the potency of test sample using a suitable isolated tissue.
CO425.2	Calculate the PA2 value of Atropine using Acetyl Choline as an agonist on rat Ileum.
CO425.3	Determine of toxic responses of drugs.
CO425.4	Demonstrate on Test for Pyrogens.
IV—II Sem	**Course: Bioassays & Toxicology (PHR16426)**
CO426.1	Analyze the potency of test sample using a suitable isolated tissue.
CO426.2	Calculate the PA2 value of Atropine using Acetyl Choline as an agonist on rat Ileum.
CO426.3	Determine of toxic responses of drugs.
CO426.4	Demonstrate on Test for Pyrogens.
IV – II Sem	**Project Work**
CO427.1	Define the fundamentals, carry out the literature review on the proposed research work and identify the problem.
CO427.2	Develop the research hypothesis.
CO427.3	Summarise the requirements in the proposed research.
CO427.4	Take part in research experiments and documented.
CO427.5	Evaluate the work done by applying statistic tools.
CO427.6	Appraise societal application and appreciation.