

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)
POONA COLLEGE OF PHARMACY, PUNE
CO-PO mapping for M. Pharm. (CBCS-2019 Course PCI) (Program Code: 923)

DEPARTMENT OF PHARMACEUTICS (923-892)

Year Semester: M. Pharm. Semester I

Subject Name: Modern Pharmaceutical Analysis (Theory)

Course: PCI syllabus

Course Code: 20708

Course Outcomes
CO1: Comprehend the basic concepts of UV-Visible, IR and NMR spectroscopic techniques and Mass spectrometry,
CO2: Explain instrumentation and their functions of UV-Visible, IR and NMR spectroscopy techniques and Mass spectrometry
CO3: Apply the chromatographic and electrophoresis separation for analysis of drugs.
CO4: Describe Immunological assays and X-ray crystallographic techniques
CO5: Interpret UV-Vis, IR, NMR and Mass spectra
CO6: Select and apply suitable instrumental analytical techniques to assess purity and safety of pharmaceuticals for the benefit of society

Year Semester: M. Pharm. Semester I

Subject Name: Drug Delivery Systems (Theory)

Course: 2019 Syllabus

Course Code: 20717

Course Outcomes
CO1 : Understand concept of sustained, controlled release formulations and 3D printing in pharmaceuticals
CO2: Identify different types of rate-controlled drug delivery systems.
CO3: Compare various Gastroprotective drug delivery systems.
CO4: Describe ocular drug delivery system, barrier of drug permeation and methods to overcome barriers.
CO5: Discuss formulation and evaluation aspects of transdermal drug delivery system.
CO6: Formulate and evaluate protein and peptide drug delivery system and understand concept of vaccine.

Year Semester: M. Pharm. Semester I

Subject Name: Modern Pharmaceutics (Theory)

Course: 2019 Syllabus

Course Code: 20728

Course Outcomes
CO1: Understand concepts of pre-formulation studies of various dosage forms.
CO2: Identify the importance of API in the development of branded and generic products.
CO3: Compare the regulatory aspects associated with calibration and validation of processes and equipments.
CO4: Describe concept of cGMP and industrial management.
CO5: Know compression, compaction and consolidation parameters.
CO6: Understand optimization and pilot plant scale up techniques.

Year Semester: M. Pharm. Semester I
Subject Name: Regulatory Affairs (Theory)
Course: 2019 Syllabus
Course Code: 20739

Course Outcomes
CO1: Illustrate the concepts of innovator and generic drugs.
CO2: Identify the regulatory guidance and guidelines for filing and approval of drug products.
CO3: Design Dossiers for submission to regulatory agencies in different countries.
CO4: Assess regulatory requirements for conducting clinical trials.
CO5: Plan pharmacovigilance activities.
CO6: Discuss post approval regulatory requirements for actives and drug products.

Year Semester: M. Pharm. Semester I
Subject Name: Pharmaceutics Practical I
Course: 2019 Syllabus
Course Code: 20750

Course Outcomes
CO1: Understand dissolution of sustained and controlled release formulation.
CO2: Compare dissolution profile of prepared formulation with marketed formulation.
CO3: Estimate effect of particle size and binder concentration on dissolution of tablet.
CO4: Compute micromeritic properties of powders and granules.
CO5: Study formulation and development of transdermal patch.
CO6: Study Heckel, Higuchi and Peppas's plot.

Year Semester: M. Pharm. Semester II

Subject Name: Molecular Pharmaceutics (Nano Tech and Targeted DDS) (Theory)

Course: 2019 Syllabus

Course Code: 20763

Course Outcomes
CO1: Apply the concept of drug targeting in the treatment of various diseases.
CO2: Understand formulation and evaluation of nanoparticles and liposomes.
CO3: Compare micro capsule and micro sphere-based systems.
CO4: Study formulation and evaluation of transdermal and pulmonary systems.
CO5: Apply nucleic acid based therapeutic delivery for management of hereditary disorders and cancer.
CO6: Compute the biopharmaceutics and pharmacokinetic parameters.

Year Semester: M. Pharm. Semester II

Subject Name: Advance Pharmaceutics and Pharmacokinetics (Theory)

Course: 2019 Syllabus

Course Code: 20774

Course Outcomes
CO1: Understand basic concepts of biopharmaceutics and pharmacokinetics.
CO2: Identify raw materials to derive for various pharmacokinetic models and parameters for the effective ADME of drug molecule.
CO3: Compare biopharmaceutical studies including drug product equivalency.
CO4: Describe the evaluation of the dosage forms using biopharmaceutic and pharmacokinetic parameters.
CO5: Know potential clinical pharmacokinetic parameters.
CO6: Understand the basics of pharmacokinetic to solve the clinical pharmacokinetic problems.

Year Semester: M. Pharm. Semester II

Subject Name: Computer Aided Drug Delivery System (Theory)

Course: 2019 Syllabus

Course Code: 20785

Course Outcomes
CO1: Understand concepts of computational modeling for the drug disposition.
CO2: Identify the importance of computers in the market analysis.
CO3: Know the computers in preclinical studies
CO4: Learn artificial intelligence and robotics in drug development.
CO5: Apply various pharmaceutical techniques in pharmaceutical formulation.
CO6: Understand computer aided biopharmaceutical characterization of formulation.

Year Semester: M. Pharm. Semester II

Subject Name: Cosmetics and Cosmeceuticals (Theory)

Course: 2019 Syllabus

Course Code: 20796

Course Outcomes
CO1: Understand key ingredients used in cosmetics and cosmeceuticals.
CO2: Know key building blocks for various formulations.
CO3: Study regulatory and biological aspects for cosmeceuticals.
CO4: Identify different design of cosmeceutical products.
CO5: Understand the challenges in formulating herbal cosmetics.
CO6: Formulate and evaluate various cosmetics and cosmeceuticals.

Year Semester: M.Pharm. Semester II

Subject Name: Pharmaceutics Practical II

Course: 2019 Syllabus

Course Code: 20807

Course Outcomes
CO1: Understand dissolution improvement approach of poorly soluble drug using solid dispersion technique.
CO2: Prepare and evaluate nanocarrier systems (niosomes& liposomes).
CO3: Study preparation methods of microcapsule.
CO4: Demonstrate pharmacokinetic and IV-IVC data analysis by Winonlin software.
CO5: Describe importance of design of experiment and quality by design for pharmaceutical development.
CO6: Prepare and evaluate microspheres and spherules.

DEPARTMENT OF PHARMACEUTICAL CHEMISTRY (923-891)

Year Semester: M. Pharm. Semester I

Subject Name: Advanced Organic Chemistry - I (Theory)

Course: 2019 Syllabus

Course Code: 20716

Course Outcomes
CO1: Describe and apply retrosynthesis
CO2: Mechanize and apply various named reactions
CO3: Conceptualize the disconnection approach and develop new synthetic routes for small molecules
CO4: Employ various catalyst in organic reaction
CO5: Synthesize heterocyclic compound
CO6: Carry the synthesis of compounds by blocking competing groups

Year Semester: M. Pharm. Semester I

Subject Name: Advanced Medicinal Chemistry (Theory)

Course: 2019 Syllabus

Course Code: 20727

Course Outcomes
CO1: Explain different stages of drug discovery
CO2: Describe role of medicinal chemistry in drug research
CO3: Apply different techniques for drug discovery
CO4: Design and develop new drug like molecules for biological targets
CO5: Synthesize new peptidomimetic drugs
CO6: A detailed understanding of the processes involved in the design, development and discovery of medicinal compounds.

Year Semester: M. Pharm. Semester I

Subject Name: Chemistry of Natural Product (Theory)

Course: 2019 syllabus

Course Code: 20738

Course Outcomes
CO1: Categorize different types of natural compounds on the basis of chemistry
CO2: Describe importance of natural compounds as lead molecules for new drug development
CO3: Conceptualize rDNA technology tool for new drug discovery
CO4: Elucidate the structure of natural compounds
CO5: Isolate, purify and characterize constituents from natural source
CO6: Explain the uses of different natural products in treating the diseases

Year Semester: M. Pharm. Semester I
Subject Name: Pharmaceutical Chemistry Practical I
Course: 2019 Syllabus
Course Code: 20749

Course Outcomes
CO1: Analyze the samples by employing advanced instruments
CO2: Perform important named reactions
CO3: Characterize medicinally important compounds for their structures
CO4: Estimate the elements and groups present chemical compounds of any origin
CO5: Ascertain the physical properties of compounds
CO6: Determine the presence of degraded products

Year Semester: M. Pharm. Semester II
Subject Name: Advanced Spectral Analysis (Theory)
Course: PCI Syllabus
Course Code: 20762

Course Outcomes
CO1: Calculate absorption max using woodward fieser rules
CO2: Describe concepts of hyphenated instruments techniques, Thermal analysis and radio immunoassay
CO3: Interpret IR, NMR and Mass spectra of organic compounds
CO4: Apply analytical techniques for characterization of drugs
CO5: Apply chromatographic techniques for analysis of Pharmaceuticals
CO6: Select suitable methods of analysis for analysis of Pharmaceuticals

Year Semester: M. Pharm. Semester II

Subject Name: Advanced Organic Chemistry II (Theory)

Course: 2019 Syllabus

Course Code: 20773

Course Outcomes
CO1: Able to utilize the green synthesis approaches for drug synthesis
CO2: Understand the application peptide synthesis reaction for development of pharmaceuticals
CO3: Conceptualize the catalyst used for pharmaceutical medicinal synthesis
CO4: Should be able to understand utilization of various catalyst in organic reaction
CO5: Able to apply asymmetric and stereochemical synthetic approaches for drug development
CO6: Able to use the photochemical method for the synthesis of drugs

Year Semester: M. Pharm. Semester II

Subject Name: Computer Aided Drug Design (Theory)

Course: 2019 Syllabus

Course Code: 20784

Course Outcomes
CO1: Explain the role of CADD in drug discovery
CO2: Apply different CADD techniques in drug design
CO3: Apply different CADD techniques in drug design
CO4: Work efficiently with molecular modeling softwares
CO5: Employ in silico virtual screening protocols
CO6: Calculate molecular properties and correlate with biological activities

Year Semester: M. Pharm. Semester II

Subject Name: Pharmaceutical Process Chemistry (Theory)

Course: 2019 Syllabus

Course Code: 20795

Course Outcomes
CO1: Understand various unit operations and various reactions in process chemistry.
CO2: Apply knowledge on the development and optimization of a scale up synthetic route/s.
CO3: The pilot plant procedure for the manufacture of Active Pharmaceutical Ingredients and new chemical entities for the drug development phase.
CO4: Develop synthetic routes that are safe, cost-effective, environmentally friendly & efficient.
CO5: Analyse the outcome of organic reactions using a basic understanding of the general reactivity of functional groups and mechanism.
CO6: Evaluate the principles and applications of modern chemical instrumentation, experimental design, and data analysis.

Year Semester: M. Pharm. Semester II

Subject Name: Pharmaceutical Chemistry Practical II

Course: 2019 Syllabus

Course Code: 20806

Course Outcomes
CO1: Conducts experiments using oxidation, reduction and nitration reactions
CO2: Synthesize important active pharmaceutical ingredients comparatively
CO3: Analyse the structure & purity by using advanced instrumental data
CO4: Compute different physicochemical properties
CO5: Design new medicinally important molecules by computational tools
CO6: Employ advanced synthetic techniques including microwave and parallel synthesis

DEPARTMENT OF PHARMACEUTICAL QUALITY ASSURANCE TECHNIQUES (923-896)

Year Semester: M. Pharm. Semester I

Subject Name: Quality Management Systems (Theory)

Course: 2019 Syllabus

Course Code: 20721

Course Outcomes
CO1: To understand the importance of quality and ISO management systems
CO2: To understand the tools for quality improvement
CO3: To study Quality evaluation of pharmaceuticals
CO4: To understand Stability testing of drug and drug substances
CO5: To understand the Quality evaluation of pharmaceuticals
CO6: To study the Statistical approaches for quality

Year Semester: M. Pharm. Semester I

Subject Name: Quality Control and Quality Assurance (Theory)

Course: 2019 Syllabus

Course Code: 20732

Course Outcomes
CO1: Understand the cGMP aspects in a pharmaceutical industry
CO2: To appreciate the importance of documentation
CO3: To understand the scope of quality certifications applicable to Pharmaceutical industries
CO4: To understand the responsibilities of QA & QC departments
CO5: To understand the in process quality control tests for different dosage forms
CO6: To understand manufacturing process and IPR

Year Semester: M. Pharm. Semester I

Subject Name: Product Development and Technology Transfer (Theory)

Course: 2019 Syllabus

Course Code: 20743

Course Outcomes
CO1: To understand the new product development process
CO2: To understand the necessary information to transfer technology from R&D
CO3: To understand the Pharmaceutical dosage form and their packaging requirements
CO4: To study the different principles of Drug discovery and development
CO5: To study concept of pilot plant scale up
CO6: To understand the new product development process- SUPAC and BACPAC

Year Semester: M. Pharm. Semester I

Subject Name: Pharmaceutical Quality Assurance Practical I

Course: 2019 Syllabus

Course Code: 20754

Course Outcomes
CO1: Understand the analysis of Pharmacopoeial compounds in bulk and in their formulations
CO2: To study case studies on Total Quality Management, Six sigma and CAPA
CO3: To perform preformulation studies for tablets and parenterals
CO4: To perform experiments based on HPLC, GC and other analytical instruments
CO5: To perform testing of related and foreign substances in drugs and raw materials
CO6: To perform IPQC testing of pharmaceuticals

Year Semester: M. Pharm. Semester II

Subject Name: Hazards and Safety Management (Theory)

Course: 2019 Syllabus

Course Code: 20767

Course Outcomes
CO1: Understand various environmental hazards, including air, water, soil, and chemical risks.
CO2: Explain the sources and characteristics of air-based and chemical hazards.
CO3: Apply fire prevention and protection measures in pharmaceutical industry settings.
CO4: Analyze safety regulations and assess potential risks in diverse industrial processes.
CO5: Develop comprehensive safety management plans for pharmaceutical environments.
CO6: Evaluate the effectiveness of workplace self-protective measures and safety programs.

Year Semester: M. Pharm. Semester II

Subject Name: Pharmaceutical Validation (Theory)

Course: 2019 Syllabus

Course Code: 20778

Course Outcomes
CO1: Define calibration, qualification, and validation concepts and their importance.
CO2: Apply qualification processes to various pharmaceutical equipment and instruments.
CO3: Understand the principles of process validation and documentation requirements.
CO4: Analyze and validate analytical methods in accordance with ICH guidelines and USP.
CO5: Develop strategies for cleaning validation and computerized system validation.
CO6: Evaluate the economic significance and ethical considerations of intellectual property in the pharmaceutical industry.

Year Semester: M. Pharm. Semester II

Subject Name: Audits and Regulatory Compliance (Theory)

Course: 2019 Syllabus

Course Code: 20789

Course Outcomes
CO1: Understand the cGMP Regulations and their significance in quality assurance.
CO2: Conduct audits for vendors and production departments, such as bulk pharmaceutical chemicals and packaging material vendors.
CO3: Evaluate the auditing process for microbiological laboratories, focusing on manufacturing processes, product information, and critical areas.
CO4: Develop checklists for auditing critical systems in Quality Assurance and Engineering departments, such as HVAC, water systems, and ETP.
CO5: Assess the importance of auditing in pharmaceutical industries.
CO6: Prepare comprehensive auditing reports based on the outcomes of various audits.

Year Semester: M. Pharm. Semester II

Subject Name: Pharmaceutical Manufacturing Technology (Theory)

Course: 2019 Syllabus

Course Code: 20800

Course Outcomes
CO1: Understand legal requirements and licenses for pharmaceutical manufacturing compliance.
CO2: Differentiate between aseptic and non-sterile manufacturing processes for effective production planning.
CO3: Apply principles of process planning and scheduling to develop production plans.
CO4: Analyze various packaging methods such as blister packs, bubble packs, and foil/plastic pouches in terms of their suitability for different pharmaceutical products.
CO5: Designing a pharmaceutical manufacturing facility layout involves creating a layout that adheres to Good Manufacturing Practices (GMP).
CO6: Assess the impact of Quality by design (QbD) and Process Analytical Technology (PAT) on quality improvement and cost reduction.

Year Semester: M. Pharm. Semester II

Subject Name: Pharmaceutical Quality Assurance Practical II

Course: 2019 Syllabus

Course Code: 20811

Course Outcomes
CO1: Apply different techniques like Flame photometer, HPLC, TLC, colorimetric for analysis
CO2: Apply QbD and PAT principles to a real-life pharmaceutical case study.
CO3: Evaluate the effectiveness of a method for drug analysis during the validation process.
CO4: Compare the validation requirements for different types of pharmaceutical testing equipment, such as Dissolution Testing Apparatus, Friability Apparatus, and Disintegration Tester.
CO5: Apply principles of plant layout design to both sterile and non-sterile environments.
CO6: Analyze the checklist for Bulk Pharmaceutical Chemicals vendors, tableting production, sterile production area and water for injection to ensure quality control.

DEPARTMENT OF REGULATORY AFFAIRS (923-897)

Year Semester: M. Pharm. Semester I

Subject Name: Good Regulatory Practices (Theory)

Course: 2019 Syllabus

Course Code: 20711

Course Outcomes
CO1: Discuss key regulatory and compliance elements with respect to good manufacturing practices
CO2: Describe key regulatory and compliance elements with respect to good laboratory practices
CO3: Recommend key regulatory and compliance elements with respect to good automated laboratory practices
CO4: Outline key regulatory and compliance elements with respect to good distribution practices
CO5: Plan and design appropriate quality management systems
CO 6: Outline good regulatory practices in the healthcare and related industries

Year Semester: M. Pharm. Semester I

Subject Name: Documentation and Regulatory Writing (Theory)

Course: 2019 Syllabus

Course Code: 20722

Course Outcomes
CO1: Identify various documents required in pharmaceutical industry
CO2: Outline the basics of dossier compilation and submission
CO3: Design audits for the pharmaceutical industry
CO4: Plan and implement inspections in the pharmaceutical industry
CO5: Discuss aspects of product life cycle management
CO6: Plan the follow ups after regulatory submissions and post approval document requirements

Year Semester: M. Pharm. Semester I

Subject Name: Clinical Research Regulations (Theory)

Course: 2019 Syllabus

Course Code: 20733

Course Outcomes
CO1: Describe phases of clinical trials
CO2: Prioritize ethics in clinical trials
CO3: Identify regulations governing clinical trials
CO4: Outline ICH and other guidelines related clinical research
CO5: Explain USA & EU regulations related to clinical trials
CO6: Explain Indian regulations related to clinical trials

Year Semester: M. Pharm. Semester I

Subject Name: Regulations and Legislation for Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals in India and Intellectual Property Rights

Course: 2019 Syllabus

Course Code: 20744

Course Outcomes
CO1: Describe Acts and Rules related to biological, herbals, food and nutraceuticals in India
CO2: Explain regulatory requirements and approval procedures for biological, herbals, food and nutraceuticals in India
CO3: List Indian Pharmacopoeial standards and other standards for various products
CO4: Discuss bioavailability and bioequivalence requirements
CO5: Outline different types of intellectual property rights
CO6: Design the regulatory requirements for approval process of herbals, biologicals, food and nutraceuticals in India

Year Semester: M. Pharm. Semester I

Subject Name: Regulatory Affairs Practical I

Course: 2019 Syllabus

Course Code: 20755

Course Outcomes
CO1: Write SOPs, and analytical reports
CO2: Recommend documentation for in process and finished products
CO3: Plan and prepare for clinical trial applications
CO4: Prepare regulatory requirements checklist for conducting clinical trials
CO5: Describe the procedure for registering for different Intellectual Property Rights in India
CO6: Discuss the features and applications of SUGAM portal of CDSCO

Year Semester: M. Pharm. Semester II

Subject Name: Regulatory Aspects of Drugs & Cosmetics (Theory)

Course: 2019 Syllabus

Course Code: 20768

Course Outcomes
CO1: Discuss cosmetics regulations in regulated and semi-regulated countries.
CO2: Identify various regulatory approval process and registration procedures for API and drug products in US, EU Market.
CO3: Assess regulatory considerations and legislation for import, manufacture, distribution, and sale of cosmetics in European Union & Australia.
CO4: Assess regulatory considerations for manufacturing, packaging, and labelling of pharmaceuticals in Japan
CO5: Understand regulatory submissions as per WHO and other committees across the globe
CO6: Study regulatory requirements for registration of drugs and post approval requirements for Asean countries and CIS (Commonwealth Independent States) countries.

Year Semester: M. Pharm. Semester II

Subject Name: Regulatory Aspects of Herbal & Biological (Theory)

Course: 2019 Syllabus

Course Code: 20779

Course Outcomes
CO1: Understand the regulation requirements for newly developed biologics and biosimilars.
CO2: Know the pre-clinical and clinical development considerations of biologics.
CO3: Assess the regulations, guidelines, principles, and data requirements for the development of biologics in India.
CO4: Study laws, regulations and guidance on development and approval of biologics and biosimilars in US.
CO5: Evaluation, development, regulatory approval of biologics along with their stability, safety, advertising, labelling and packing in EU
CO6. Understand Quality, safety and legislation for herbal products in India, USA and European Union

Year Semester: M. Pharm. Semester II

Subject Name: Regulatory Aspects of Medical Devices (Theory)

Course: 2019 Syllabus

Course Code: 20790

Course Outcomes
CO1: Understand classification, process of development, ethical, and quality considerations of medical devices.
CO2: Assess regulatory approval process for medical devices and IVDs in India, US, Canada, EU, Japan and ASEAN countries.
CO3: Study Quality System Regulations of Medical Devices
CO4: Understand the in vitro diagnostics, classification and approval process for European Union
CO5: Discuss registration procedures, Quality System requirements and clinical
CO6. Study USFDA - Quality System Requirements 21 CFR Part 820, labeling requirements 21 CFR Part 801

Year Semester: M. Pharm. Semester II

Subject Name: Regulatory Aspects of Food & Nutraceuticals (Theory)

Course: 2019 Syllabus

Course Code: 20801

Course Outcomes
CO1: Know the regulatory Requirements for nutraceuticals
CO2: Understand the regulation for registration and labeling of nutraceuticals and food supplements in USA and Europe
CO3: Assess global aspects, NSF Certification, NSF Standards for Food And Dietary Supplements
CO4: Understand Good Manufacturing Practices for Nutraceuticals
CO5. Understand Regulations for import, manufacture and sale of nutraceutical products in India
CO6. Compare Recommended Dietary Allowances (RDA) of Nutraceuticals in India in USA and Europe.

Year Semester: M. Pharm. Semester II

Subject Name: Regulatory Affairs Practical II

Course: 2019 Syllabus

Course Code: 20812

Course Outcomes
CO1: Prepare submission to FDA, EMA and MHRA using eCTD software
CO2: Compare clinical trial application requirements of US, EU and India of Biologics
CO3: Understand registration requirement comparison study in 5 emerging markets (WHO, BRICS, China and South Korea, Asean countries)
CO4: Prepare checklists for 510k and PMA for US market
CO5: Develop STED Application for Class III Devices
CO6: Develop Clinical Investigation Plan for Medical Devices

DEPARTMENT OF PHARMACEUTICAL BIOTECHNOLOGY (923-890)

Year Semester: M. Pharm. Semester I

Subject Name: Microbial and Cellular Biology (Theory)

Course: 2019 Syllabus

Course Code: 20715

Course Outcomes
CO1: Elaborate the importance of microorganisms in health and industry.
CO2: Summarize the principles of central dogma of molecular biology
CO3: Understand the basics of cell biology, cell structure and function
CO4: Elaborate cell cycle, regulation and its implications
CO5: Devise measures of microbial and cellular cultures growth and dynamics
CO6: Employ steps for prevention and management of infectious diseases.

Year Semester: M. Pharm. Semester I

Subject Name: Bioprocess Engineering and Technology (Theory)

Course: 2019 Syllabus

Course Code: 20726

Course Outcomes
CO1: Understand basics and design of fermentation technology
CO2: Scale up and scale down processing of fermentation technology
CO3: Bioprocessing of the industrially important microbial metabolites
CO4: Regulation governing the manufacturing of biological products
CO5: Understand and conduct fermentation process kinetics.
CO6: Bioprocessing of the industrially important microbial metabolites in R & D organizations.

Year Semester: M. Pharm. Semester I

Subject Name: Advanced Pharmaceutical Biotechnology (Theory)

Course: 2019 Syllabus

Course Code: 20737

Course Outcomes
CO1: Understand latest technology development in technique, tools
CO2: Identify appropriate sources of enzymes.
CO3: Understand and perform rDNA technology, gene manipulation
CO4: Understand the overview of pharmacogenomics
CO5: Learn the regulatory approval process for new drugs, biologics, devices,
CO6: Understanding the use of biotechnology tools and techniques on drug and vaccine development

Year Semester: M. Pharm. Semester I

Subject Name: Pharmaceutical Biotechnology Practical I

Course: 2019 Syllabus

Course Code: 20748

Course Outcomes
CO1: Characterize DNA and RNA
CO2: Illustrate techniques involved in DNA manipulation
CO3: Sterility test for pharmaceutical preparations
CO4: Whole cell immobilization engineering
CO5: Replica plating
CO6: Design, observe, record, compute, analyse and interpret experimental data

Year Semester: M. Pharm. Semester II

Subject Name: Protein and Protein Formulation (Theory)

Course: 2019 Syllabus

Course Code: 20761

Course Outcomes
CO1: Elaborate the methods of purification of Proteins used in lab and industry.
CO2: Summarize the principles of Peptides in drug development
CO3: Understand the basics of protein identification and characterization
CO4: Elaborate on Protein based formulations
CO5: Applications of protein engineering in drugs development protein sequencing
CO6: Promote novel applications and critical thinking

Year Semester: M. Pharm. Semester II

Subject Name: Immunotechnology (Theory)

Course: 2019 Syllabus

Course Code: 20772

Course Outcomes
CO1: Understand basics of the techniques like immunodiagnostic tests
CO2: Characterization of lymphocytes, purification of antigens and antibody proteins MABs
CO3: Understand the Health problems with immunological background, autoimmune diseases
CO4: Elaborate on approaches for the immune intervention of diseases
CO5: Understand the basics of protein identification and characterization
CO6: Understand Applications in diagnostics and Biosimillars

Year Semester: M. Pharm. Semester II

Subject Name: Bioinformatics and Computer Technology (Theory)

Course: 2019 Syllabus

Course Code: 20783

Course Outcomes
CO1: Understand the general concept behind use of computers in developing a new drugs
CO2: Elaborate on Biological concepts for bioinformatics
CO3: Understand the diversity in protein and DNA sequences
CO4: Demonstrate on the Data mining and searching biological databases
CO5: Learn the biological target searching and evaluation
CO6: Learn various techniques of in silico drug designing

Year Semester: M. Pharm. Semester II

Subject Name: Biological Evaluation of Drug Therapy (Theory)

Course: 2019 Syllabus

Course Code: 20794

Course Outcomes
CO1: Understand about the general concept of standardization of biologicals
CO2: Elaborate on significance and application of transgenic and knockout animals
CO3: Understand biological medicines in development of various diseases
CO4: Understand the overview of Biological assays and high throughput screening
CO5: Learn the biological evaluation of drugs in vitro and in vivo
CO6: Bio-medicines for diseases, therapeutics and products category

Year Semester: M. Pharm. Semester II

Subject Name: Pharmaceutical Biotechnology Practical II

Course: 2019 Syllabus

Course Code: 20805

Course Outcomes
CO1: Transformation of E. coli rDNA technology
CO2: Recombinant Protein expression and analysis
CO3: Database searching and data mining, data curation
CO4: Sequence analysis methods and tools
CO5: Gene annotation and phylogenetic analysis
CO6: RT-PCR – working, programming analysis and interpretation

DEPARTMENT OF PHARMACOLOGY (923-894)

Year Semester: M. Pharm. Semester I

Subject Name: Advanced Pharmacology I (Theory)

Course: 2019 Syllabus

Course Code: 20719

Course Outcomes
CO1: Elaborate the mechanism of drug actions at cellular and molecular level.
CO2: Summarize the pharmacological effects of drugs.
CO3: Appraise pharmacotherapy correlating the pathophysiology of diseases.
CO4: Recommend drugs for the treatment of diseases based on safety and efficacy.
CO5: Devise measures for prevention of adverse effects and drug interactions.
CO6: Employ steps for prevention and management of lifestyle diseases.

Year Semester: M. Pharm. Semester I

Subject Name: Pharmacological and Toxicological Screening Methods-I (Theory)

Course: 2019 Syllabus

Course Code: 20730

Course Outcomes
CO1: Appraise the regulations and ethical requirements for the use of experimental animals.
CO2: Describe the various animals used in the drug discovery process, good laboratory practices in maintenance and handling of experimental animals
CO3: Elaborate the screening methods involved in the drug discovery process.
CO4: Elucidate newer techniques like transgenic and alternatives to animal experimentation for preclinical studies.
CO5: Integrate and apply the learnings of preclinical screening to drug discovery process.
CO6: Appreciate and correlate the preclinical data to humans.

Year Semester: M. Pharm. Semester I

Subject Name: Cellular and Molecular Pharmacology (Theory)

Course: 2019 Syllabus

Course Code: 20741

Course Outcomes
CO1: Understand the structure and functions of cells, cell cycles and gene therapy.
CO2: Elaborate the cell signalling in molecular mechanisms of drug action.
CO3: Demonstrate the applications of molecular biology techniques in pharmacology.
CO4: Apply pharmacogenomics and proteomics techniques in pharmacology.
CO5: Justify the use of immunotherapeutics in clinical practices
CO6: Appraise the use of cell culture techniques.

Year Semester: M. Pharm. Semester I
Subject Name: Pharmacology Practical – I
Course: 2019 Syllabus
Course Code: 20752

Course Outcomes
CO1: Demonstrate effects of drugs on various systems using <i>in vivo</i> experiments.
CO2: Employ appropriate laboratory technique for preclinical studies.
CO3: Estimate drugs in formulations and biological fluids using analytical techniques.
CO4: Illustrate the molecular mechanism of action of drugs.
CO5: Relate <i>in vitro</i> , <i>ex vivo</i> and <i>in vivo</i> evaluation techniques in drug discovery process.
CO6: Analyze and interpret the preclinical data using software's.

Year Semester: M. Pharm. Semester II
Subject Name: Advanced Pharmacology II (Theory)
Course: 2019 Syllabus
Course Code: 20765

Course Outcomes
CO1: Elaborate the mechanism of drug actions at cellular and molecular level.
CO2: Summarize the pharmacological effects of drugs.
CO3: Appraise pharmacotherapy correlating the pathophysiology of diseases.
CO4: Comprehend the recent advances in treatment of diseases.
CO5: Describe measures for prevention of adverse effects and drug interactions.
CO6: Recommend drugs for the treatment of diseases based on safety and efficacy.

Year Semester: M. Pharm. Semester II

Subject Name: Pharmacological and Toxicological Screening Methods-II (Theory)

Course: 2019 Syllabus

Course Code: 20776

Course Outcomes
CO1: Explain the various types of toxicity studies.
CO2: Appreciate the ethical and regulatory requirements for toxicity testings.
CO3: Demonstrate the practical skills required to conduct the preclinical toxicity studies.
CO4: Illustrate the importance and applications of toxicokinetic studies.
CO5: Integrate and apply the regulatory toxicological studies for drug discovery process.
CO6: Relate the preclinical safety pharmacology to clinical trials.

Year Semester: M. Pharm. Semester II

Subject Name: Principles of Drug Discovery (Theory)

Course: 2019 Syllabus

Course Code: 20787

Course Outcomes
CO1: Explain the various stages of drug discovery
CO2: Appreciate the importance of the role of genomics, proteomics and bioinformatics in drug discovery
CO3: Explain various targets for drug discovery
CO4: Explain various lead seeking method and lead optimization
CO5: Appreciate the importance of SBDD and LBDD
CO6: Apply the concept of prodrug in drug discovery and design

Year Semester: M. Pharm. Semester II

Subject Name: Clinical Research and Pharmacovigilance (Theory)

Course: 2019 Syllabus

Course Code: 20798

Course Outcomes
CO1: Explain the regulatory requirements for conducting clinical trial
CO2: Interpret the types of clinical trial designs
CO3: Categorize the responsibilities of key players involved in clinical trials
CO4: Formulate safety monitoring, reporting and close-out activities
CO5: Describe the principles of Pharmacovigilance
CO6: Assess the adverse drug reaction reporting systems in community and communication in Pharmacovigilance

Year Semester: M. Pharm. Semester II

Subject Name: Pharmacology Practical - II

Course: 2019 Syllabus

Course Code: 20809

Course Outcomes
CO1: Evaluate the effects of agonists and antagonists on isolated tissue experiments
CO2: Understand the various phases of drug discovery
CO3: Analyze the effect of drugs on CVS.
CO4: Demonstrate the practical skills required to conduct the preclinical toxicity studies.
CO5: Sensibilise the society about ADR monitoring
CO6: Appreciate correlation of pharmacology with molecular docking studies

DEPARTMENT OF PHARMACOGNOSY (923-893)

Year Semester: M. Pharm. Semester I

Subject Name: Advanced Pharmacognosy-1 (Theory)

Course: 2019 Syllabus

Course Code: 20718

Course Outcomes
CO1: Explain the advances in the cultivation and production of drugs.
CO2: Explain various phytopharmaceuticals and their source, their utilization, and medicinal values.
CO3: Comprehend various nutraceutical herbs and their benefits.
CO4: Outline drugs of marine origin.
CO5: Describe recent advances in research of marine drugs.
CO6: Understand the pharmacovigilance of drugs of natural origin.

Year Semester: M. Pharm. Semester I

Subject Name: Phytochemistry (Theory)

Course: 2019 Syllabus

Course Code: 20729

Course Outcomes
CO1: Understand the separation of the active constituents obtained from natural sources by the different methods of separation. (Chromatography).
CO2: Identify and understand the different methods to evaluate these components and learn the concept to deal with the side effects of some components (if any).
CO3: Outline the Herbal Drug discovery and development.
CO4: Explain the Optimization of Lead compounds Demonstrate the complete management of extraction, Isolation, and Phytochemical analysis of Natural Products
CO5: Outline the Phytochemical documentation
CO6: Outline the Phytochemical documentation

Year Semester: M. Pharm. Semester I

Subject Name: Industrial Pharmacognostical Technology (Theory)

Course: 2019 Syllabus

Course Code: 20740

Course Outcomes
CO1: Understand the separation of the active constituents obtained from natural sources by the different methods of separation. (Chromatography).
CO2: Identify and understand the different methods to evaluate these components and learn the concept to deal with the side effects of some components (if any).
CO3: Outline the Herbal Drug discovery and development.
CO4: Explain the Optimization of Lead compounds
CO5: Demonstrate the complete management of extraction, Isolation, and Phytochemical analysis of Natural products
CO6: Outline the Phytochemical documentation

Year Semester: M. Pharm. Semester I

Subject Name: Pharmacognosy Practical- I

Course: 2019 Syllabus

Course Code: 20751

Course Outcomes
CO1: Understand the spectroscopical methods of analysis of pharmacopoeial compounds of natural origin and their formulations.
CO2: Understand and explain various chromatographic methods of analysis.
CO3: Demonstrate methods of extraction.
CO4: Interpret monograph analysis.
CO5: Formulate and standardize different dosage form.
CO6: Developing the fingerprint of selected medicinal plants extracts.

Year Semester: M. Pharm. Semester II

Subject Name: Medicinal Plant Biotechnology (Theory)

Course: 2019 Syllabus

Course Code: 20764

Course Outcomes
CO1: Understand the concept of plant genetic engineering and molecular biology.
CO2: Demonstrate the plant tissue culture techniques for the production of Genetically modified plants.
CO3: Explain the hairy root culture for the production of different primary and secondary metabolites
CO4: Elaborate Plant fermentation technology.
CO5: Differentiate methods of cloning and their applications
CO6: Apply the concept of PCR in plant genome analysis.

Year Semester: M. Pharm. Semester II

Subject Name: Advanced Pharmacognosy –II (Theory)

Course: 2019 Syllabus

Course Code: 20775

Course Outcomes
CO1: Validation of Herbal remedies
CO2: Illustrate the methods for the detection of adulterants.
CO3: outline the techniques available for evaluation of herbal drugs
CO4: Elaborate methods for biological screening of herbal drugs.
CO5: Understand the concept of ethnobotany and ethnopharmacology.
CO6: Create the analytical profile of some herbal drugs

Year Semester: M. Pharm. Semester II

Subject Name: Indian Systems of Medicine (Theory)

Course: 2019 Syllabus

Course Code: 20786

Course Outcomes
CO1: Understand basic principle of various Indian system of medicine.
CO2: Explain the clinical research of traditional medicine
CO3: Illustrate c GMP of the traditional system of medicine.
CO4: Elaborate Formulation development and standardization of various traditional formulations.
CO5: Describe the Safety monitoring of herbal medicines and Quality control and quality assurance concepts involved in the traditional system of medicine.
CO6: Differentiate the concepts of AYUSH, ISM, CCRAS, CCRS, CCRH, and CCRU.

Year Semester: M. Pharm. Semester II

Subject Name: Herbal Cosmetics (Theory)

Course: 2019 Syllabus

Course Code: 20797

Course Outcomes
CO1: Understand the basic principles of herbal cosmetics.
CO2: Explain Regulatory Provisions related to the manufacturing of cosmetics including and Import, Export policies of Herbal/natural cosmetics.
CO3: Describe Raw product analysis and Herbal cosmeceutical development and standardization.
CO4: Elaborate on Possible interactions between chemicals and Herbs.
CO5: Illustrate concepts of Quality control and quality assurance of herbal cosmetics
CO6: Classify Toxicological and allergen screening techniques.

Year Semester: M. Pharm. Semester II

Subject Name: Pharmacognosy Practical I

Course: 2019 Syllabus

Course Code: 20808

Course Outcomes
CO1: Demonstrate isolation of nucleic acid, DNA and RNA.
CO2: Explain Immobilization techniques.
CO3: Illustrate and establish different types of culture.
CO4: Estimate phytoconstituent quantitatively.
CO5: Prepare and standardize different dosage form of Indian system of medicine
CO6: Formulate and evaluate various cosmetic preparation

DEPARTMENT OF INDUSTRIAL PHARMACY (923-888)

Year Semester: M. Pharm. Semester I

Subject Name: Pharmaceutical Formulation Development (Theory)

Course: 2019 Syllabus

Course Code: 20713

Course Outcomes
CO1: Understand concepts of pre-formulation studies of various dosage forms.
CO2: Identify the role of pharmaceutical additives in formulation development.
CO3: Compare in vitro and in vivo correlation.
CO4: Describe concept of design of experiment in product development.
CO5: Know concept of solubility and methods to enhance solubility.
CO6: Understand stability protocols, report and ICH guidelines.

Year Semester: M. Pharm. Semester I

Subject Name: Novel Drug Delivery System (Theory)

Course: 2019 Syllabus

Course Code: 20724

Course Outcomes
CO1: Understand concept of sustained and controlled release dosage forms.
CO2: Study different types of drug delivery systems.
CO3: Know formulation and characterization of transdermal drug delivery system.
CO4: Describe concept of drug targeting and specialized pharmaceuticals.
CO5: Understand the application of biotechnology in drug delivery system and new trends personalized medicines.
CO6: Formulate and evaluate protein and peptide drug delivery system and understand concept of vaccine.

Year Semester: M. Pharm. Semester I
Subject Name: Intellectual Property Rights (Theory)
Course: 2019 Syllabus
Course Code: 20735

Course Outcomes
CO1: Understand regulatory audit process.
CO2: Study regulatory guidelines of drug and drug product.
CO3: Compare different regulatory agencies.
CO4: Describe regulatory requirement for contract research organization.
CO5: Know trademark, patent, IPR and types of IPR.
CO6: Study regulations associated with biosimilars.

Year Semester: M. Pharm. Semester I
Subject Name: Industrial Pharmacy Practical I
Course: 2019 Syllabus
Course Code: 20746

Course Outcomes
CO1: Demonstrate data analysis by UV and HPLC analysis.
CO2: Learn to quantify the drug from different spectroscopic methods.
CO3: Understand the different approaches to find out the solubility and stability of different dosage forms.
CO4: Study formulation and development of various dosage forms including tablets, capsules and liposomes, TDDS and semisolid dosage forms.
CO5: Understand dissolution improvement approach of poorly soluble drug using solid dispersion technique.
CO6: Learn to carry out electrophoresis of various peptide drug delivery system.

Year Semester: M. Pharm. Semester II

Subject Name: Advanced Biopharmaceutics & Pharmacokinetics (Theory)

Course: 2019 Syllabus

Course Code: 20759

Course Outcomes
CO1: Understand the various mechanisms of absorption of drug.
CO2: Identify the physiological, physicochemical and dosage form-related factors affecting drug absorption from different dosage forms
CO3: Design a dosage form on the basis of biopharmaceutical considerations and to understand its effect on <i>In Vitro</i> Drug Product Performance
CO4: Study different various pharmacokinetic models and their significance in interpreting various pharmacokinetic parameters
CO5: Establish <i>in vitro-in vivo</i> correlation for different drug products and Design protocols for bioavailability and bioequivalence studies
CO6: Understand the pharmacokinetic basis of modified-release and targeted drug delivery.

Year Semester: M. Pharm. Semester II

Subject Name: Scale Up and Technology Transfer (Theory)

Course: 2019 Syllabus

Course Code: 20770

Course Outcomes
CO1: Understand the basics of Pilot plant design and Analyze layout designing of various pharmaceutical manufacturing facility
CO2: Importance of Technology transfer from R & D to pilot plant to plant scale and process scale up for various dosage forms
CO3: Familiarize with the scope, importance, and types of validation
CO4: Impart theoretical knowledge and training to perform validation/qualification of pharmaceutical process, facility, and utilities.
CO5: Understand the various Process validation for pharmaceutical manufacturing
CO6: Familiarize with Industrial safety: Hazards

Year Semester: M. Pharm. Semester II

Subject Name: Pharmaceutical Production Technology (Theory)

Course: 2019 Syllabus

Course Code: 20781

Course Outcomes
CO1: Understand the manufacturing technologies of tablet, Capsules, Parenteral and disperse systems
CO2: Understand and analyze the design and functioning of equipment's and processes employed in pharmaceutical manufacturing of tablet, Capsules, Parenteral and disperse systems
CO3: Understand the principles and applications of advanced technologies like Lyophilization, Spray drying, pelletization, spheronizers, marumerisers, etc.
CO4: Perform the troubleshooting / problems encountered during manufacture of pharmaceutical Products
CO5: Learn Packaging Technology with various packaging materials, machinery, labeling, package printing for different dosage forms
CO6: Study various air handling systems and water treatment process techniques and its maintenance required in pharmaceutical manufacturing.

Year Semester: M. Pharm. Semester II

Subject Name: Entrepreneurship Management (Theory)

Course: 2019 Syllabus

Course Code: 20792

Course Outcomes
CO1: Understand the scope of entrepreneurship in pharmaceutical business and role of enterprise in national and global economy.
CO2: Study the concepts of entrepreneurial competency
CO3: Understand the concept of growth strategies and networking
CO4: Understand the concept of enterprise selection, market assessment, enterprise feasibility study, SWOT Analysis, etc
CO5: Know about the Joint venture, co-ordination and feasibility study
CO6: Focus on the new project proposal to find its feasibility as new enterprise project

Year Semester: M. Pharm. Semester II

Subject Name: Industrial Pharmacy Practical II

Course: 2019 Syllabus

Course Code: 20803

Course Outcomes
CO1: Understand dissolution improvement approach of poorly soluble drug using solid dispersion technique.
CO2: Compare dissolution profile of prepared formulation with marketed formulation.
CO3: Demonstrate pharmacokinetic and IV-IVC data analysis by Winonlin software.
CO4: Study formulation and development of various dosage forms including tablets, capsules, suspensions, emulsions, injections, enteric coated tablets
CO5: Demonstrate freeze dryer and develop freeze dried formulation
CO6: Demonstrate Spray dryer and develop spray dried formulation

DEPARTMENT OF PHARMACEUTICAL BIOTECHNOLOGY (923-890)

Year Semester: M. Pharm. Semester I

Subject Name: Microbial and Cellular Biology (Theory)

Course: 2019 Syllabus

Course Code: 20715

Course Outcomes
CO1: Elaborate the importance of microorganisms in health and industry.
CO2: Summarize the principles of central dogma of molecular biology
CO3: Understand the basics of cell biology, cell structure and function
CO4: Elaborate cell cycle, regulation and its implications
CO5: Devise measures of microbial and cellular cultures growth and dynamics
CO6: Employ steps for prevention and management of infectious diseases.

Year Semester: M. Pharm. Semester I

Subject Name: Bioprocess Engineering and Technology (Theory)

Course: 2019 Syllabus

Course Code: 20726

Course Outcomes
CO1: Understand basics and design of fermentation technology
CO2: Scale up and scale down processing of fermentation technology
CO3: Bioprocessing of the industrially important microbial metabolites
CO4: Regulation governing the manufacturing of biological products
CO5: Understand and conduct fermentation process kinetics.
CO6: Bioprocessing of the industrially important microbial metabolites in R & D organizations.

Year Semester: M. Pharm. Semester I

Subject Name: Advanced Pharmaceutical Biotechnology (Theory)

Course: 2019 Syllabus

Course Code: 20737

Course Outcomes
CO1: Understand latest technology development in technique, tools
CO2: Identify appropriate sources of enzymes.
CO3: Understand and perform rDNA technology, gene manipulation
CO4: Understand the overview of pharmacogenomics
CO5: Learn the regulatory approval process for new drugs, biologics, devices,
CO6: Understanding the use of biotechnology tools and techniques on drug and vaccine development

Year Semester: M. Pharm. Semester I

Subject Name: Pharmaceutical Biotechnology Practical I

Course: 2019 Syllabus

Course Code: 20748

Course Outcomes
CO1: Characterize DNA and RNA
CO2: Illustrate techniques involved in DNA manipulation
CO3: Sterility test for pharmaceutical preparations
CO4: Whole cell immobilization engineering
CO5: Replica plating
CO6: Design, observe, record, compute, analyse and interpret experimental data

Year Semester: M. Pharm. Semester II

Subject Name: Protein and Protein Formulation (Theory)

Course: 2019 Syllabus

Course Code: 20761

Course Outcomes
CO1: Elaborate the methods of purification of Proteins used in lab and industry.
CO2: Summarize the principles of Peptides in drug development
CO3: Understand the basics of protein identification and characterization
CO4: Elaborate on Protein based formulations
CO5: Applications of protein engineering in drugs development protein sequencing
CO6: Promote novel applications and critical thinking

Year Semester: M. Pharm. Semester II

Subject Name: Immunotechnology (Theory)

Course: 2019 Syllabus

Course Code: 20772

Course Outcomes
CO1: Understand basics of the techniques like immunodiagnostic tests
CO2: Characterization of lymphocytes, purification of antigens and antibody proteins MABs
CO3: Understand the Health problems with immunological background, autoimmune diseases
CO4: Elaborate on approaches for the immune intervention of diseases
CO5: Understand the basics of protein identification and characterization
CO6: Understand Applications in diagnostics and Biosimillars

Year Semester: M. Pharm. Semester II

Subject Name: Bioinformatics and Computer Technology (Theory)

Course: 2019 Syllabus

Course Code: 20783

Course Outcomes
CO1: Understand the general concept behind use of computers in developing a new drugs
CO2: Elaborate on Biological concepts for bioinformatics
CO3: Understand the diversity in protein and DNA sequences
CO4: Demonstrate on the Data mining and searching biological databases
CO5: Learn the biological target searching and evaluation
CO6: Learn various techniques of in silico drug designing

Year Semester: M. Pharm. Semester II

Subject Name: Biological Evaluation of Drug Therapy (Theory)

Course: 2019 Syllabus

Course Code: 20794

Course Outcomes
CO1: Understand about the general concept of standardization of biologicals
CO2: Elaborate on significance and application of transgenic and knockout animals
CO3: Understand biological medicines in development of various diseases
CO4: Understand the overview of Biological assays and high throughput screening
CO5: Learn the biological evaluation of drugs in vitro and in vivo
CO6: Bio-medicines for diseases, therapeutics and products category

Year Semester: M. Pharm. Semester II

Subject Name: Pharmaceutical Biotechnology Practical II

Course: 2019 Syllabus

Course Code: 20805

Course Outcomes
CO1: Transformation of E. coli rDNA technology
CO2: Recombinant Protein expression and analysis
CO3: Database searching and data mining, data curation
CO4: Sequence analysis methods and tools
CO5: Gene anotation and phylogenetic analysis
CO6: RT-PCR – working, programming analysis and interpretation

DEPARTMENT OF PHARMACOLOGY (923-894)

Year Semester: M. Pharm. Semester I

Subject Name: Advanced Pharmacology I (Theory)

Course: 2019 Syllabus

Course Code: 20719

Course Outcomes
CO1: Elaborate the mechanism of drug actions at cellular and molecular level.
CO2: Summarize the pharmacological effects of drugs.
CO3: Appraise pharmacotherapy correlating the pathophysiology of diseases.
CO4: Recommend drugs for the treatment of diseases based on safety and efficacy.
CO5: Devise measures for prevention of adverse effects and drug interactions.
CO6: Employ steps for prevention and management of lifestyle diseases.

Year Semester: M. Pharm. Semester I

Subject Name: Pharmacological and Toxicological Screening Methods-I (Theory)

Course: 2019 Syllabus

Course Code: 20730

Course Outcomes
CO1: Appraise the regulations and ethical requirements for the use of experimental animals.
CO2: Describe the various animals used in the drug discovery process, good laboratory practices in maintenance and handling of experimental animals
CO3: Elaborate the screening methods involved in the drug discovery process.
CO4: Elucidate newer techniques like transgenic and alternatives to animal experimentation for preclinical studies.
CO5: Integrate and apply the learnings of preclinical screening to drug discovery process.
CO6: Appreciate and correlate the preclinical data to humans.

Year Semester: M. Pharm. Semester I

Subject Name: Cellular and Molecular Pharmacology (Theory)

Course: 2019 Syllabus

Course Code: 20741

Course Outcomes
CO1: Understand the structure and functions of cells, cell cycles and gene therapy.
CO2: Elaborate the cell signalling in molecular mechanisms of drug action.
CO3: Demonstrate the applications of molecular biology techniques in pharmacology.
CO4: Apply pharmacogenomics and proteomics techniques in pharmacology.
CO5: Justify the use of immunotherapeutics in clinical practices
CO6: Appraise the use of cell culture techniques.

Year Semester: M. Pharm. Semester I

Subject Name: Pharmacology Practical – I

Course: 2019 Syllabus

Course Code: 20752

Course Outcomes
CO1: Demonstrate effects of drugs on various systems using <i>in vivo</i> experiments.
CO2: Employ appropriate laboratory technique for preclinical studies.
CO3: Estimate drugs in formulations and biological fluids using analytical techniques.
CO4: Illustrate the molecular mechanism of action of drugs.
CO5: Relate <i>in vitro</i> , <i>ex vivo</i> and <i>in vivo</i> evaluation techniques in drug discovery process.
CO6: Analyze and interpret the preclinical data using software's.

Year Semester: M. Pharm. Semester II

Subject Name: Advanced Pharmacology II (Theory)

Course: 2019 Syllabus

Course Code: 20765

Course Outcomes
CO1: Elaborate the mechanism of drug actions at cellular and molecular level.
CO2: Summarize the pharmacological effects of drugs.
CO3: Appraise pharmacotherapy correlating the pathophysiology of diseases.
CO4: Comprehend the recent advances in treatment of diseases.
CO5: Describe measures for prevention of adverse effects and drug interactions.
CO6: Recommend drugs for the treatment of diseases based on safety and efficacy.

Year Semester: M. Pharm. Semester II

Subject Name: Pharmacological and Toxicological Screening Methods-II (Theory)

Course: 2019 Syllabus

Course Code: 20776

Course Outcomes
CO1: Explain the various types of toxicity studies.
CO2: Appreciate the ethical and regulatory requirements for toxicity testings.
CO3: Demonstrate the practical skills required to conduct the preclinical toxicity studies.
CO4: Illustrate the importance and applications of toxicokinetic studies.
CO5: Integrate and apply the regulatory toxicological studies for drug discovery process.
CO6: Relate the preclinical safety pharmacology to clinical trials.

Year Semester: M. Pharm. Semester II

Subject Name: Principles of Drug Discovery (Theory)

Course: 2019 Syllabus

Course Code: 20787

Course Outcomes
CO1: Explain the various stages of drug discovery
CO2: Appreciate the importance of the role of genomics, proteomics and bioinformatics in drug discovery
CO3: Explain various targets for drug discovery
CO4: Explain various lead seeking method and lead optimization
CO5: Appreciate the importance of SBDD and LBDD
CO6: Apply the concept of prodrug in drug discovery and design

Year Semester: M. Pharm. Semester II

Subject Name: Clinical Research and Pharmacovigilance (Theory)

Course: 2019 Syllabus

Course Code: 20798

Course Outcomes
CO1: Explain the regulatory requirements for conducting clinical trial
CO2: Interpret the types of clinical trial designs
CO3: Categorize the responsibilities of key players involved in clinical trials
CO4: Formulate safety monitoring, reporting and close-out activities
CO5: Describe the principles of Pharmacovigilance
CO6: Assess the adverse drug reaction reporting systems in community and communication in Pharmacovigilance

Year Semester: M. Pharm. Semester II

Subject Name: Pharmacology Practical - II

Course: 2019 Syllabus

Course Code: 20809

Course Outcomes
CO1: Evaluate the effects of agonists and antagonists on isolated tissue experiments
CO2: Understand the various phases of drug discovery
CO3: Analyze the effect of drugs on CVS.
CO4: Demonstrate the practical skills required to conduct the preclinical toxicity studies.
CO5: Sensibilise the society about ADR monitoring
CO6: Appreciate correlation of pharmacology with molecular docking studies

DEPARTMENT OF PHARMACOGNOSY (923-893)

Year Semester: M. Pharm. Semester I

Subject Name: Advanced Pharmacognosy-1 (Theory)

Course: 2019 Syllabus

Course Code: 20718

Course Outcomes
CO1: Explain the advances in the cultivation and production of drugs.
CO2: Explain various phytopharmaceuticals and their source, their utilization, and medicinal values.
CO3: Comprehend various nutraceutical herbs and their benefits.
CO4: Outline drugs of marine origin.
CO5: Describe recent advances in research of marine drugs.
CO6: Understand the pharmacovigilance of drugs of natural origin.

Year Semester: M. Pharm. Semester I
Subject Name: Phytochemistry (Theory)
Course: 2019 Syllabus
Course Code: 20729

Course Outcomes
CO1: Understand the separation of the active constituents obtained from natural sources by the different methods of separation. (Chromatography).
CO2: Identify and understand the different methods to evaluate these components and learn the concept to deal with the side effects of some components (if any).
CO3: Outline the Herbal Drug discovery and development.
CO4: Explain the Optimization of Lead compounds Demonstrate the complete management of extraction, Isolation, and Phytochemical analysis of Natural Products
CO5: Outline the Phytochemical documentation
CO6: Outline the Phytochemical documentation

Year Semester: M. Pharm. Semester I
Subject Name: Industrial Pharmacognostical Technology (Theory)
Course: 2019 Syllabus
Course Code: 20740

Course Outcomes
CO1: Understand the separation of the active constituents obtained from natural sources by the different methods of separation. (Chromatography).
CO2: Identify and understand the different methods to evaluate these components and learn the concept to deal with the side effects of some components (if any).
CO3: Outline the Herbal Drug discovery and development.
CO4: Explain the Optimization of Lead compounds
CO5: Demonstrate the complete management of extraction, Isolation, and Phytochemical analysis of Natural products
CO6: Outline the Phytochemical documentation

Year Semester: M. Pharm. Semester I
Subject Name: Pharmacognosy Practical- I
Course: 2019 Syllabus
Course Code: 20751

Course Outcomes
CO1: Understand the spectroscopical methods of analysis of pharmacopoeial compounds of natural origin and their formulations.
CO2: Understand and explain various chromatographic methods of analysis.
CO3: Demonstrate methods of extraction.
CO4: Interpret monograph analysis.
CO5: Formulate and standardize different dosage form.
CO6: Developing the fingerprint of selected medicinal plants extracts.

Year Semester: M. Pharm. Semester II
Subject Name: Medicinal Plant Biotechnology (Theory)
Course: 2019 Syllabus
Course Code: 20764

Course Outcomes
CO1: Understand the concept of plant genetic engineering and molecular biology.
CO2: Demonstrate the plant tissue culture techniques for the production of Genetically modified plants.
CO3: Explain the hairy root culture for the production of different primary and secondary metabolites
CO4: Elaborate Plant fermentation technology.
CO5: Differentiate methods of cloning and their applications
CO6: Apply the concept of PCR in plant genome analysis.

Year Semester: M. Pharm. Semester II

Subject Name: Advanced Pharmacognosy –II (Theory)

Course: 2019 Syllabus

Course Code: 20775

Course Outcomes
CO1:Validation of Herbal remedies
CO2: Illustrate the methods for the detection of adulterants.
CO3:outline the techniques available for evaluation of herbal drugs
CO4: Elaborate methods for biological screening of herbal drugs.
CO5: Understand the concept of ethnobotany and ethnopharmacology.
CO6:Create the analytical profile of some herbal drugs

Year Semester: M. Pharm. Semester II

Subject Name: Indian Systems of Medicine (Theory)

Course: 2019 Syllabus

Course Code: 20786

Course Outcomes
CO1: Understand basic principle of various Indian system of medicine.
CO2: Explain the clinical research of traditional medicine
CO3: Illustrate c GMP of the traditional system of medicine.
CO4: Elaborate Formulation development and standardization of various traditional formulations.
CO5: Describe the Safety monitoring of herbal medicines and Quality control and quality assurance concepts involved in the traditional system of medicine.
CO6: Differentiate the concepts of AYUSH, ISM, CCRAS, CCRS, CCRH, and CCRU.

Year Semester: M. Pharm. Semester II

Subject Name: Herbal Cosmetics (Theory)

Course: 2019 Syllabus

Course Code: 20797

Course Outcomes
CO1: Understand the basic principles of herbal cosmetics.
CO2: Explain Regulatory Provisions related to the manufacturing of cosmetics including and Import, Export policies of Herbal/natural cosmetics.
CO3: Describe Raw product analysis and Herbal cosmeceutical development and standardization.
CO4: Elaborate on Possible interactions between chemicals and Herbs.
CO5: Illustrate concepts of Quality control and quality assurance of herbal cosmetics
CO6: Classify Toxicological and allergen screening techniques.

Year Semester: M. Pharm. Semester II

Subject Name: Pharmacognosy Practical I

Course: 2019 Syllabus

Course Code: 20808

Course Outcomes
CO1: Demonstrate isolation of nucleic acid, DNA and RNA.
CO2: Explain Immobilization techniques.
CO3: Illustrate and establish different types of culture.
CO4: Estimate phytoconstituent quantitatively.
CO5: Prepare and standardize different dosage form of Indian system of medicine
CO6: Formulate and evaluate various cosmetic preparation

DEPARTMENT OF INDUSTRIAL PHARMACY (923-888)

Year Semester: M. Pharm. Semester I

Subject Name: Pharmaceutical Formulation Development (Theory)

Course: 2019 Syllabus

Course Code: 20713

Course Outcomes
CO1: Understand concepts of pre-formulation studies of various dosage forms.
CO2: Identify the role of pharmaceutical additives in formulation development.
CO3: Compare in vitro and in vivo correlation.
CO4: Describe concept of design of experiment in product development.
CO5: Know concept of solubility and methods to enhance solubility.
CO6: Understand stability protocols, report and ICH guidelines.

Year Semester: M. Pharm. Semester I

Subject Name: Novel Drug Delivery System (Theory)

Course: 2019 Syllabus

Course Code: 20724

Course Outcomes
CO1: Understand concept of sustained and controlled release dosage forms.
CO2: Study different types of drug delivery systems.
CO3: Know formulation and characterization of transdermal drug delivery system.
CO4: Describe concept of drug targeting and specialized pharmaceuticals.
CO5: Understand the application of biotechnology in drug delivery system and new trends personalized medicines.
CO6: Formulate and evaluate protein and peptide drug delivery system and understand concept of vaccine.

Year Semester: M. Pharm. Semester I

Subject Name: Intellectual Property Rights (Theory)

Course: 2019 Syllabus

Course Code: 20735

Course Outcomes
CO1: Understand regulatory audit process.
CO2: Study regulatory guidelines of drug and drug product.
CO3: Compare different regulatory agencies.
CO4: Describe regulatory requirement for contract research organization.
CO5: Know trademark, patent, IPR and types of IPR.
CO6: Study regulations associated with biosimilars.

Year Semester: M. Pharm. Semester I

Subject Name: Industrial Pharmacy Practical I

Course: 2019 Syllabus

Course Code: 20746

Course Outcomes
CO1: Demonstrate data analysis by UV and HPLC analysis.
CO2: Learn to quantify the drug from different spectroscopic methods.
CO3: Understand the different approaches to find out the solubility and stability of different dosage forms.
CO4: Study formulation and development of various dosage forms including tablets, capsules and liposomes, TDDS and semisolid dosage forms.
CO5: Understand dissolution improvement approach of poorly soluble drug using solid dispersion technique.
CO6: Learn to carry out electrophoresis of various peptide drug delivery system.

Year Semester: M. Pharm. Semester II

Subject Name: Advanced Biopharmaceutics & Pharmacokinetics (Theory)

Course: 2019 Syllabus

Course Code: 20759

Course Outcomes
CO1: Understand the various mechanisms of absorption of drug.
CO2: Identify the physiological, physicochemical and dosage form-related factors affecting drug absorption from different dosage forms
CO3: Design a dosage form on the basis of biopharmaceutical considerations and to understand its effect on <i>In Vitro</i> Drug Product Performance
CO4: Study different various pharmacokinetic models and their significance in interpreting various pharmacokinetic parameters
CO5: Establish <i>in vitro-in vivo</i> correlation for different drug products and Design protocols for bioavailability and bioequivalence studies
CO6: Understand the pharmacokinetic basis of modified-release and targeted drug delivery.

Year Semester: M. Pharm. Semester II

Subject Name: Scale Up and Technology Transfer (Theory)

Course: 2019 Syllabus

Course Code: 20770

Course Outcomes
CO1: Understand the basics of Pilot plant design and Analyze layout designing of various pharmaceutical manufacturing facility
CO2: Importance of Technology transfer from R & D to pilot plant to plant scale and process scale up for various dosage forms
CO3: Familiarize with the scope, importance, and types of validation
CO4: Impart theoretical knowledge and training to perform validation/qualification of pharmaceutical process, facility, and utilities.
CO5: Understand the various Process validation for pharmaceutical manufacturing
CO6: Familiarize with Industrial safety: Hazards

Year Semester: M. Pharm. Semester II

Subject Name: Pharmaceutical Production Technology (Theory)

Course: 2019 Syllabus

Course Code: 20781

Course Outcomes
CO1: Understand the manufacturing technologies of tablet, Capsules, Parenteral and disperse systems
CO2: Understand and analyze the design and functioning of equipment's and processes employed in pharmaceutical manufacturing of tablet, Capsules, Parenteral and disperse systems
CO3: Understand the principles and applications of advanced technologies like Lyophilization, Spray drying, pelletization, spheronizers, marumerisers, etc.
CO4: Perform the troubleshooting / problems encountered during manufacture of pharmaceutical Products
CO5: Learn Packaging Technology with various packaging materials, machinery, labeling, package printing for different dosage forms
CO6: Study various air handling systems and water treatment process techniques and its maintenance required in pharmaceutical manufacturing.

Year Semester: M. Pharm. Semester II

Subject Name: Entrepreneurship Management (Theory)

Course: 2019 Syllabus

Course Code: 20792

Course Outcomes
CO1: Understand the scope of entrepreneurship in pharmaceutical business and role of enterprise in national and global economy.
CO2: Study the concepts of entrepreneurial competency
CO3: Understand the concept of growth strategies and networking
CO4: Understand the concept of enterprise selection, market assessment, enterprise feasibility study, SWOT Analysis, etc
CO5: Know about the Joint venture, co-ordination and feasibility study
CO6: Focus on the new project proposal to find its feasibility as new enterprise project

Year Semester: M. Pharm. Semester II

Subject Name: Industrial Pharmacy Practical II

Course: 2019 Syllabus

Course Code: 20803

Course Outcomes
CO1: Understand dissolution improvement approach of poorly soluble drug using solid dispersion technique.
CO2: Compare dissolution profile of prepared formulation with marketed formulation.
CO3: Demonstrate pharmacokinetic and IV-IVC data analysis by Winonlin software.
CO4: Study formulation and development of various dosage forms including tablets, capsules, suspensions, emulsions, injections, enteric coated tablets
CO5: Demonstrate freeze dryer and develop freeze dried formulation
CO6: Demonstrate Spray dryer and develop spray dried formulation

DEPARTMENT OF PHARMACEUTICAL BIOTECHNOLOGY (923-890)

Year Semester: M. Pharm. Semester I

Subject Name: Microbial and Cellular Biology (Theory)

Course: 2019 Syllabus

Course Code: 20715

Course Outcomes
CO1: Elaborate the importance of microorganisms in health and industry.
CO2: Summarize the principles of central dogma of molecular biology
CO3: Understand the basics of cell biology, cell structure and function
CO4: Elaborate cell cycle, regulation and its implications
CO5: Devise measures of microbial and cellular cultures growth and dynamics
CO6: Employ steps for prevention and management of infectious diseases.

Year Semester: M. Pharm. Semester I

Subject Name: Bioprocess Engineering and Technology (Theory)

Course: 2019 Syllabus

Course Code: 20726

Course Outcomes
CO1: Understand basics and design of fermentation technology
CO2: Scale up and scale down processing of fermentation technology
CO3: Bioprocessing of the industrially important microbial metabolites
CO4: Regulation governing the manufacturing of biological products
CO5: Understand and conduct fermentation process kinetics.
CO6: Bioprocessing of the industrially important microbial metabolites in R & D organizations.

Year Semester: M. Pharm. Semester I

Subject Name: Advanced Pharmaceutical Biotechnology (Theory)

Course: 2019 Syllabus

Course Code: 20737

Course Outcomes
CO1: Understand latest technology development in technique, tools
CO2: Identify appropriate sources of enzymes.
CO3: Understand and perform rDNA technology, gene manipulation
CO4: Understand the overview of pharmacogenomics
CO5: Learn the regulatory approval process for new drugs, biologics, devices,
CO6: Understanding the use of biotechnology tools and techniques on drug and vaccine development

Year Semester: M. Pharm. Semester I

Subject Name: Pharmaceutical Biotechnology Practical I

Course: 2019 Syllabus

Course Code: 20748

Course Outcomes
CO1: Characterize DNA and RNA
CO2: Illustrate techniques involved in DNA manipulation
CO3: Sterility test for pharmaceutical preparations
CO4: Whole cell immobilization engineering
CO5: Replica plating
CO6: Design, observe, record, compute, analyse and interpret experimental data

Year Semester: M. Pharm. Semester II

Subject Name: Protein and Protein Formulation (Theory)

Course: 2019 Syllabus

Course Code: 20761

Course Outcomes
CO1: Elaborate the methods of purification of Proteins used in lab and industry.
CO2: Summarize the principles of Peptides in drug development
CO3: Understand the basics of protein identification and characterization
CO4: Elaborate on Protein based formulations
CO5: Applications of protein engineering in drugs development protein sequencing
CO6: Promote novel applications and critical thinking

Year Semester: M. Pharm. Semester II

Subject Name: Immunotechnology (Theory)

Course: 2019 Syllabus

Course Code: 20772

Course Outcomes
CO1: Understand basics of the techniques like immunodiagnostic tests
CO2: Characterization of lymphocytes, purification of antigens and antibody proteins MABs
CO3: Understand the Health problems with immunological background, autoimmune diseases
CO4: Elaborate on approaches for the immune intervention of diseases
CO5: Understand the basics of protein identification and characterization
CO6: Understand Applications in diagnostics and Biosimillars

Year Semester: M. Pharm. Semester II

Subject Name: Bioinformatics and Computer Technology (Theory)

Course: 2019 Syllabus

Course Code: 20783

Course Outcomes
CO1: Understand the general concept behind use of computers in developing a new drugs
CO2: Elaborate on Biological concepts for bioinformatics
CO3: Understand the diversity in protein and DNA sequences
CO4: Demonstrate on the Data mining and searching biological databases
CO5: Learn the biological target searching and evaluation
CO6: Learn various techniques of in silico drug designing

Year Semester: M. Pharm. Semester II

Subject Name: Biological Evaluation of Drug Therapy (Theory)

Course: 2019 Syllabus

Course Code: 20794

Course Outcomes
CO1: Understand about the general concept of standardization of biologicals
CO2: Elaborate on significance and application of transgenic and knockout animals
CO3: Understand biological medicines in development of various diseases
CO4: Understand the overview of Biological assays and high throughput screening
CO5: Learn the biological evaluation of drugs in vitro and in vivo
CO6: Bio-medicines for diseases, therapeutics and products category

Year Semester: M. Pharm. Semester II

Subject Name: Pharmaceutical Biotechnology Practical II

Course: 2019 Syllabus

Course Code: 20805

Course Outcomes
CO1: Transformation of E. coli rDNA technology
CO2: Recombinant Protein expression and analysis
CO3: Database searching and data mining, data curation
CO4: Sequence analysis methods and tools
CO5: Gene anotation and phylogenetic analysis
CO6: RT-PCR – working, programming analysis and interpretation

DEPARTMENT OF PHARMACOLOGY (923-894)

Year Semester: M. Pharm. Semester I

Subject Name: Advanced Pharmacology I (Theory)

Course: 2019 Syllabus

Course Code: 20719

Course Outcomes
CO1: Elaborate the mechanism of drug actions at cellular and molecular level.
CO2: Summarize the pharmacological effects of drugs.
CO3: Appraise pharmacotherapy correlating the pathophysiology of diseases.
CO4: Recommend drugs for the treatment of diseases based on safety and efficacy.
CO5: Devise measures for prevention of adverse effects and drug interactions.
CO6: Employ steps for prevention and management of lifestyle diseases.

Year Semester: M. Pharm. Semester I

Subject Name: Pharmacological and Toxicological Screening Methods-I (Theory)

Course: 2019 Syllabus

Course Code: 20730

Course Outcomes
CO1: Appraise the regulations and ethical requirements for the use of experimental animals.
CO2: Describe the various animals used in the drug discovery process, good laboratory practices in maintenance and handling of experimental animals
CO3: Elaborate the screening methods involved in the drug discovery process.
CO4: Elucidate newer techniques like transgenic and alternatives to animal experimentation for preclinical studies.
CO5: Integrate and apply the learnings of preclinical screening to drug discovery process.
CO6: Appreciate and correlate the preclinical data to humans.

Year Semester: M. Pharm. Semester I

Subject Name: Cellular and Molecular Pharmacology (Theory)

Course: 2019 Syllabus

Course Code: 20741

Course Outcomes
CO1: Understand the structure and functions of cells, cell cycles and gene therapy.
CO2: Elaborate the cell signalling in molecular mechanisms of drug action.
CO3: Demonstrate the applications of molecular biology techniques in pharmacology.
CO4: Apply pharmacogenomics and proteomics techniques in pharmacology.
CO5: Justify the use of immunotherapeutics in clinical practices
CO6: Appraise the use of cell culture techniques.

Year Semester: M. Pharm. Semester I

Subject Name: Pharmacology Practical – I

Course: 2019 Syllabus

Course Code: 20752

Course Outcomes
CO1: Demonstrate effects of drugs on various systems using <i>in vivo</i> experiments.
CO2: Employ appropriate laboratory technique for preclinical studies.
CO3: Estimate drugs in formulations and biological fluids using analytical techniques.
CO4: Illustrate the molecular mechanism of action of drugs.
CO5: Relate <i>in vitro</i> , <i>ex vivo</i> and <i>in vivo</i> evaluation techniques in drug discovery process.
CO6: Analyze and interpret the preclinical data using software's.

Year Semester: M. Pharm. Semester II

Subject Name: Advanced Pharmacology II (Theory)

Course: 2019 Syllabus

Course Code: 20765

Course Outcomes
CO1: Elaborate the mechanism of drug actions at cellular and molecular level.
CO2: Summarize the pharmacological effects of drugs.
CO3: Appraise pharmacotherapy correlating the pathophysiology of diseases.
CO4: Comprehend the recent advances in treatment of diseases.
CO5: Describe measures for prevention of adverse effects and drug interactions.
CO6: Recommend drugs for the treatment of diseases based on safety and efficacy.

Year Semester: M. Pharm. Semester II

Subject Name: Pharmacological and Toxicological Screening Methods-II (Theory)

Course: 2019 Syllabus

Course Code: 20776

Course Outcomes
CO1: Explain the various types of toxicity studies.
CO2: Appreciate the ethical and regulatory requirements for toxicity testings.
CO3: Demonstrate the practical skills required to conduct the preclinical toxicity studies.
CO4: Illustrate the importance and applications of toxicokinetic studies.
CO5: Integrate and apply the regulatory toxicological studies for drug discovery process.
CO6: Relate the preclinical safety pharmacology to clinical trials.

Year Semester: M. Pharm. Semester II

Subject Name: Principles of Drug Discovery (Theory)

Course: 2019 Syllabus

Course Code: 20787

Course Outcomes
CO1: Explain the various stages of drug discovery
CO2: Appreciate the importance of the role of genomics, proteomics and bioinformatics in drug discovery
CO3: Explain various targets for drug discovery
CO4: Explain various lead seeking method and lead optimization
CO5: Appreciate the importance of SBDD and LBDD
CO6: Apply the concept of prodrug in drug discovery and design

Year Semester: M. Pharm. Semester II

Subject Name: Clinical Research and Pharmacovigilance (Theory)

Course: 2019 Syllabus

Course Code: 20798

Course Outcomes
CO1: Explain the regulatory requirements for conducting clinical trial
CO2: Interpret the types of clinical trial designs
CO3: Categorize the responsibilities of key players involved in clinical trials
CO4: Formulate safety monitoring, reporting and close-out activities
CO5: Describe the principles of Pharmacovigilance
CO6: Assess the adverse drug reaction reporting systems in community and communication in Pharmacovigilance

Year Semester: M. Pharm. Semester II

Subject Name: Pharmacology Practical - II

Course: 2019 Syllabus

Course Code: 20809

Course Outcomes
CO1: Evaluate the effects of agonists and antagonists on isolated tissue experiments
CO2: Understand the various phases of drug discovery
CO3: Analyze the effect of drugs on CVS.
CO4: Demonstrate the practical skills required to conduct the preclinical toxicity studies.
CO5: Sensibilise the society about ADR monitoring
CO6: Appreciate correlation of pharmacology with molecular docking studies

DEPARTMENT OF PHARMACOGNOSY (923-893)

Year Semester: M. Pharm. Semester I

Subject Name: Advanced Pharmacognosy-1 (Theory)

Course: 2019 Syllabus

Course Code: 20718

Course Outcomes
CO1: Explain the advances in the cultivation and production of drugs.
CO2: Explain various phytopharmaceuticals and their source, their utilization, and medicinal values.
CO3: Comprehend various nutraceutical herbs and their benefits.
CO4: Outline drugs of marine origin.
CO5: Describe recent advances in research of marine drugs.
CO6: Understand the pharmacovigilance of drugs of natural origin.

Year Semester: M. Pharm. Semester I

Subject Name: Phytochemistry (Theory)

Course: 2019 Syllabus

Course Code: 20729

Course Outcomes
CO1: Understand the separation of the active constituents obtained from natural sources by the different methods of separation. (Chromatography).
CO2: Identify and understand the different methods to evaluate these components and learn the concept to deal with the side effects of some components (if any).
CO3: Outline the Herbal Drug discovery and development.
CO4: Explain the Optimization of Lead compounds Demonstrate the complete management of extraction, Isolation, and Phytochemical analysis of Natural Products
CO5: Outline the Phytochemical documentation
CO6: Outline the Phytochemical documentation

Year Semester: M. Pharm. Semester I

Subject Name: Industrial Pharmacognostical Technology (Theory)

Course: 2019 Syllabus

Course Code: 20740

Course Outcomes
CO1: Understand the separation of the active constituents obtained from natural sources by the different methods of separation. (Chromatography).
CO2: Identify and understand the different methods to evaluate these components and learn the concept to deal with the side effects of some components (if any).
CO3: Outline the Herbal Drug discovery and development.
CO4: Explain the Optimization of Lead compounds
CO5: Demonstrate the complete management of extraction, Isolation, and Phytochemical analysis of Natural products
CO6: Outline the Phytochemical documentation

Year Semester: M. Pharm. Semester I

Subject Name: Pharmacognosy Practical- I

Course: 2019 Syllabus

Course Code: 20751

Course Outcomes
CO1: Understand the spectroscopical methods of analysis of pharmacopoeial compounds of natural origin and their formulations.
CO2: Understand and explain various chromatographic methods of analysis.
CO3: Demonstrate methods of extraction.
CO4: Interpret monograph analysis.
CO5: Formulate and standardize different dosage form.
CO6: Developing the fingerprint of selected medicinal plants extracts.

Year Semester: M. Pharm. Semester II

Subject Name: Medicinal Plant Biotechnology (Theory)

Course: 2019 Syllabus

Course Code: 20764

Course Outcomes
CO1: Understand the concept of plant genetic engineering and molecular biology.
CO2: Demonstrate the plant tissue culture techniques for the production of Genetically modified plants.
CO3: Explain the hairy root culture for the production of different primary and secondary metabolites
CO4: Elaborate Plant fermentation technology.
CO5: Differentiate methods of cloning and their applications
CO6: Apply the concept of PCR in plant genome analysis.

Year Semester: M. Pharm. Semester II

Subject Name: Advanced Pharmacognosy –II (Theory)

Course: 2019 Syllabus

Course Code: 20775

Course Outcomes
CO1: Validation of Herbal remedies
CO2: Illustrate the methods for the detection of adulterants.
CO3: outline the techniques available for evaluation of herbal drugs
CO4: Elaborate methods for biological screening of herbal drugs.
CO5: Understand the concept of ethnobotany and ethnopharmacology.
CO6: Create the analytical profile of some herbal drugs

Year Semester: M. Pharm. Semester II

Subject Name: Indian Systems of Medicine (Theory)

Course: 2019 Syllabus

Course Code: 20786

Course Outcomes
CO1: Understand basic principle of various Indian system of medicine.
CO2: Explain the clinical research of traditional medicine
CO3: Illustrate c GMP of the traditional system of medicine.
CO4: Elaborate Formulation development and standardization of various traditional formulations.
CO5: Describe the Safety monitoring of herbal medicines and Quality control and quality assurance concepts involved in the traditional system of medicine.
CO6: Differentiate the concepts of AYUSH, ISM, CCRAS, CCRS, CCRH, and CCRU.

Year Semester: M. Pharm. Semester II

Subject Name: Herbal Cosmetics (Theory)

Course: 2019 Syllabus

Course Code: 20797

Course Outcomes
CO1: Understand the basic principles of herbal cosmetics.
CO2: Explain Regulatory Provisions related to the manufacturing of cosmetics including and Import, Export policies of Herbal/natural cosmetics.
CO3: Describe Raw product analysis and Herbal cosmeceutical development and standardization.
CO4: Elaborate on Possible interactions between chemicals and Herbs.
CO5: Illustrate concepts of Quality control and quality assurance of herbal cosmetics
CO6: Classify Toxicological and allergen screening techniques.

Year Semester: M. Pharm. Semester II

Subject Name: Pharmacognosy Practical I

Course: 2019 Syllabus

Course Code: 20808

Course Outcomes
CO1: Demonstrate isolation of nucleic acid, DNA and RNA.
CO2: Explain Immobilization techniques.
CO3: Illustrate and establish different types of culture.
CO4: Estimate phytoconstituent quantitatively.
CO5: Prepare and standardize different dosage form of Indian system of medicine
CO6: Formulate and evaluate various cosmetic preparation

DEPARTMENT OF INDUSTRIAL PHARMACY (923-888)

Year Semester: M. Pharm. Semester I

Subject Name: Pharmaceutical Formulation Development (Theory)

Course: 2019 Syllabus

Course Code: 20713

Course Outcomes
CO1: Understand concepts of pre-formulation studies of various dosage forms.
CO2: Identify the role of pharmaceutical additives in formulation development.
CO3: Compare in vitro and in vivo correlation.
CO4: Describe concept of design of experiment in product development.
CO5: Know concept of solubility and methods to enhance solubility.
CO6: Understand stability protocols, report and ICH guidelines.

Year Semester: M. Pharm. Semester I

Subject Name: Novel Drug Delivery System (Theory)

Course: 2019 Syllabus

Course Code: 20724

Course Outcomes
CO1: Understand concept of sustained and controlled release dosage forms.
CO2: Study different types of drug delivery systems.
CO3: Know formulation and characterization of transdermal drug delivery system.
CO4: Describe concept of drug targeting and specialized pharmaceuticals.
CO5: Understand the application of biotechnology in drug delivery system and new trends personalized medicines.
CO6: Formulate and evaluate protein and peptide drug delivery system and understand concept of vaccine.

Year Semester: M. Pharm. Semester I

Subject Name: Intellectual Property Rights (Theory)

Course: 2019 Syllabus

Course Code: 20735

Course Outcomes
CO1: Understand regulatory audit process.
CO2: Study regulatory guidelines of drug and drug product.
CO3: Compare different regulatory agencies.
CO4: Describe regulatory requirement for contract research organization.
CO5: Know trademark, patent, IPR and types of IPR.
CO6: Study regulations associated with biosimilars.

Year Semester: M. Pharm. Semester I

Subject Name: Industrial Pharmacy Practical I

Course: 2019 Syllabus

Course Code: 20746

Course Outcomes	
CO1:	Demonstrate data analysis by UV and HPLC analysis.
CO2:	Learn to quantify the drug from different spectroscopic methods.
CO3:	Understand the different approaches to find out the solubility and stability of different dosage forms.
CO4:	Study formulation and development of various dosage forms including tablets, capsules and liposomes, TDDS and semisolid dosage forms.
CO5:	Understand dissolution improvement approach of poorly soluble drug using solid dispersion technique.
CO6:	Learn to carry out electrophoresis of various peptide drug delivery system.

Year Semester: M. Pharm. Semester II

Subject Name: Advanced Biopharmaceutics & Pharmacokinetics (Theory)

Course: 2019 Syllabus

Course Code: 20759

Course Outcomes	
CO1:	Understand the various mechanisms of absorption of drug.
CO2:	Identify the physiological, physicochemical and dosage form-related factors affecting drug absorption from different dosage forms
CO3:	Design a dosage form on the basis of biopharmaceutical considerations and to understand its effect on <i>In Vitro</i> Drug Product Performance
CO4:	Study different various pharmacokinetic models and their significance in interpreting various pharmacokinetic parameters
CO5:	Establish <i>in vitro-in vivo</i> correlation for different drug products and Design protocols for bioavailability and bioequivalence studies
CO6:	Understand the pharmacokinetic basis of modified-release and targeted drug delivery.

Year Semester: M. Pharm. Semester II

Subject Name: Scale Up and Technology Transfer (Theory)

Course: 2019 Syllabus

Course Code: 20770

Course Outcomes
CO1: Understand the basics of Pilot plant design and Analyze layout designing of various pharmaceutical manufacturing facility
CO2: Importance of Technology transfer from R & D to pilot plant to plant scale and process scale up for various dosage forms
CO3: Familiarize with the scope, importance, and types of validation
CO4: Impart theoretical knowledge and training to perform validation/qualification of pharmaceutical process, facility, and utilities.
CO5: Understand the various Process validation for pharmaceutical manufacturing
CO6: Familiarize with Industrial safety: Hazards

Year Semester: M. Pharm. Semester II

Subject Name: Pharmaceutical Production Technology (Theory)

Course: 2019 Syllabus

Course Code: 20781

Course Outcomes
CO1: Understand the manufacturing technologies of tablet, Capsules, Parenteral and disperse systems
CO2: Understand and analyze the design and functioning of equipment's and processes employed in pharmaceutical manufacturing of tablet, Capsules, Parenteral and disperse systems
CO3: Understand the principles and applications of advanced technologies like Lyophilization, Spray drying, pelletization, spheronizers, marumerisers, etc.
CO4: Perform the troubleshooting / problems encountered during manufacture of pharmaceutical Products
CO5: Learn Packaging Technology with various packaging materials, machinery, labeling, package printing for different dosage forms
CO6: Study various air handling systems and water treatment process techniques and its maintenance required in pharmaceutical manufacturing.

Year Semester: M. Pharm. Semester II

Subject Name: Entrepreneurship Management (Theory)

Course: 2019 Syllabus

Course Code: 20792

Course Outcomes
CO1: Understand the scope of entrepreneurship in pharmaceutical business and role of enterprise in national and global economy.
CO2: Study the concepts of entrepreneurial competency
CO3: Understand the concept of growth strategies and networking
CO4: Understand the concept of enterprise selection, market assessment, enterprise feasibility study, SWOT Analysis, etc
CO5: Know about the Joint venture, co-ordination and feasibility study
CO6: Focus on the new project proposal to find its feasibility as new enterprise project

Year Semester: M. Pharm. Semester II

Subject Name: Industrial Pharmacy Practical II

Course: 2019 Syllabus

Course Code: 20803

Course Outcomes
CO1: Understand dissolution improvement approach of poorly soluble drug using solid dispersion technique.
CO2: Compare dissolution profile of prepared formulation with marketed formulation.
CO3: Demonstrate pharmacokinetic and IV-IVC data analysis by Winonlin software.
CO4: Study formulation and development of various dosage forms including tablets, capsules, suspensions, emulsions, injections, enteric coated tablets
CO5: Demonstrate freeze dryer and develop freeze dried formulation
CO6: Demonstrate Spray dryer and develop spray dried formulation