Pharmaceutics Department (SEM I)

Program Specific Outcomes for M.Pharm. (Pharmaceutics):

1. Students are able to formulate and evaluate various (conventional and novel) drug delivery
   Systems to resolve bioavailability, stability and compatibility issues.
2. Students are aware of latest regulatory requirements and are trained to handle various
   equipments and instruments.
3. Students are able to acquire professional, ethically correct and self esteemed attitude.

NOVEL DRUG DELIVERY SYSTEM- MPH 102 T

CO Number	**Upon completion of the course, student shall be able to understand**
CO1	The elements of preformulation studies
CO2	The Active Pharmaceutical Ingredients and Generic drug Product development
CO3	Industrial Management and GMP Considerations
CO4	Optimization Techniques & Pilot Plant Scale Up Techniques
CO5	Stability Testing, sterilization process & packaging of dosage forms

REGULATORY AFFAIRS- MPH 104T

CO Number	**Course Outcomes: Upon completion of course students will be able to –**
CO1	Tell the concept of innovator &generic drugs, drug development process
CO2	Make use of knowledge regulatory guidance & guidelines for filing & approval process
CO3	Compose Knowledge for preparation of Dossiers and their submission to regulatory agencies in different countries
CO4	Extend Knowledge for post approval regulatory requirement for actives & drug product

CO5	Build knowledge submission of global documents in CTD/ECTD Formats
CO6	Develop knowledge of clinical trial requirement for approvals for conducting clinical trials and gain pharmacovigilance & process of monitoring in clinical trial

PHARMACEUTICS PRACTICAL I (PRACTICAL)- MPH 105P

CO Number	**Course Outcomes: Upon completion of course students will be able to –**
CO1	Operation of modern anaytical instruments
CO2	Formulation and evaluation of novel drug delivery systems
CO3	Understand formulation and process factors affecting tableting operations
CO4	Will be able to perform preformulation studies
CO5	Various equations and theories governing performance of various formulations

SEM I

Quality Assurance Department (SEM I)

Program Specific Outcomes

1. Students are well versed with latest regulatory guidelines, functions of Quality Assurance in pharmaceutical Industry and Good Documentation Practices.
2. Students are acquainted with operation of analytical instruments.
3. Students are able to acquire professional, ethically correct and self esteemed attitude.

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES - MPH101T / MPC 101T/ MQA101T/ MPL101T

CO Number	**Course Outcomes: Upon completion of course students will be able to –**
CO1	Explain the principles and relate applications of UV-VIS spectroscopy, IR spectroscopy, Spectrofluorimetry, FES-AAS
CO2	Summarize the principle and relate applications of NMR spectroscopy
CO3	Summarize the principle and relate applications of Mass spectroscopy. Utilize the knowledge of principles of spectroscopic techniques to infer the structure
CO4	Summarize the principle and relate applications of various types of liquid chromatography

CO5	Explain the principles and relate applications of Electrophoresis and X-ray crystallography
CO6	Summarize the principle and relate applications of various types of Thermal techniques DSC, TGA, DTA.

QUALITY MANAGEMENT SYSTEMS -MQA 102T

CO Number	**Course Outcomes: Upon completion of course students will be able to –**
CO1	To build the knowledge of importance of quality in pharmaceutical industry.
CO2	To outline the guidelines related to maintain quality management in pharmaceutical industry.
CO3	To select the different tools for quality improvement.
CO4	To compare the ICH guidelines for determining stability of drug and drug substances.
CO5	To make use of statistical approaches to maintain quality of drug and drug products.
CO6	To interpret the regulatory compliance through quality management

QUALITY CONTROL AND QUALITY ASSURANCE- MQA 103T

CO Number	**Course Outcomes: Upon completion of course students will be able to –**
CO1	interpret the GLP aspects in a pharmaceutical industry as per the regulatory guidelines
CO2	relate and interprete the cGMP guidelines as per regulatory bodies.
CO3	apply specifications to analytical tests for various dosage forms as per pharmacopoeias.
CO4	make use of department level and plant level documentation.
CO5	justify quality guidelines applicable to Pharmaceutical manufacturing operations and infer measures taken to comply.

PRODUCT DEVELOPMENT AND TECHNOLOGY TRANSFER -MQA 104T

CO Number	**Course Outcomes: Upon completion of course students will be able to –**
CO1	Explain Principles of Drug discovery and development
CO2	Explain the concept and aspects of preformulation studies. Discuss various

	solubility enhancement techniques.
CO3	Outline Concept, Significance, design, layout of pilot plant scale up study and large scale manufacturing and analyze opportunities and challenges for New era of drug products:
CO4	Explain various types of packaging systems. Describe quality control tests for packaging materials.
CO5	Design Technology transfer and develop Documentation in technology transfer

PHARM QUALITY ASSURANCE I - MQA 105P

MQA105 P Pharmaceutical Quality Assurance Practical -I

CO Number	Course Outcomes: Upon completion of course students will be able to –
CO1	Analyse and interpret Pharmaceutical compounds and formulations by spectrometric techniques
CO2	Perform and Explain chromatography
CO3	Illustrate Quality management principles through case studies, process capability study and stability study
CO4	Perform analysis of raw materials, in-process materials and finished products as per pharmacopeia
CO5	Determine physicochemical properties of bulk drugs

Pharmacutical Chemistry Department (SEM I)

Program specific Outcome:

1. Students are able to imbibe the conceptual understanding of the Pharmaceuticaland Medicinal Chemistry
2. Students are equipped with in-depth knowledge aboutthe instruments, their applications and handling as per standard protocol of the industries.
3. Students are able to acquire professional, ethically correct and self esteemed attitude.

ADVANCED ORGANIC CHEMISTRY I -MPC102T

CO Number	**Course Outcomes: Upon completion of course students will be able to –**
CO1	Understand basic concepts of SR, CR systems and novel drug delievry systems; apply knowledge to designing of DDS.
CO2	Elaborate various strategies for rate controlled DDS
CO3	Explain concept of gastroretentive and buccal DDS

CO4	Explain Occular Drug Delivery Systems, Barriers of drug permeation, Methods to overcome them
CO5	Explain Transdermal Drug Delivery Systems: with respect to Structure of skin and barriers, Penetration enhancers, Transdermal Drug Delivery Systems, Formulation and evaluation.
CO6	Explain Protein and Peptide Delivery with respect t0 Barriers for protein delivery. Formulation and Evaluation of delivery systems of proteins and other macromolecules
CO7	Explain Vaccine delivery systems with respect to Vaccines, uptake of antigens, single shot vaccines, mucosal and transdermal delivery of vaccines.

ADVANCED MEDICINAL CHEMISTRY THEORY- MPC103T

CO Number	**Course Outcomes: Upon completion of course students will be able to –**
CO1	Discover different stages and Different techniques of drug discovery
CO2	Make use of knowledge of MOA and stereochemistry of drugs and SAR in developing drug research and also enzyme inhibitors
CO3	Utilize Various strategies to design and develop new drug like molecules for biological targets
CO4	Learn basics of Peptidomimetics and apply the concepts in designing pepdimimetic agents
CO5	Classify and make use of knowledge of Prodrugs ,resistance analog design

CHEMISTRY OF NATURAL PRODUCTS- MPC104T

CO Number	**Course Outcomes: Upon completion of course students will be able to –**
CO1	To explain and classify different types of natural compounds and their chemistry and medicinal importance
CO2	To elaborate Alkaloids, flavonoids, and steroids
CO3	To elaborate Terpenoids and Vitamins
CO4	To explain Recombinant DNA technology and drug discovery and drugs used in diabetic therapy and liver dysfunctioning
CO5	To discuss and analyse characterization of simple chemical constituents from natural source.

PHARMACEUTICAL CHEMISTRY -I : MPC 105 P

CO Number	Course Outcomes: Upon completion of course students will be able to –
CO1	Analyse and interpret Pharmaceutical compounds and formulations by spectrometric techniques
CO2	Perform and Explain chromatography
CO3	Perform synthesis, purification and characterization of compounds based on rearrangement reactions
CO4	Isolate and analyse natural compounds

Pharmacology Department (SEM I)

Program Specific Outcome (M.Pharm Pharmacology Department)

1. Students are well versed with handling and learning of all laboratory animals, surgical techniques, planning a research protocol, statistical analysis and basic instruments respectively which are required for preclinical Drug Discovery Research.
2. Students are aware of clinical, toxicological and other regulatory guidelines with respect to drug discovery research.
3. Students are able to acquire professional, ethically correct and self esteemed attitude.

ADVANCED PHARMACOLOGY-MPL 102T

CO Number	At completion of this course it is expected that students will be able to
CO1	Elaborate Pharmacokinetics aspects of drugs .
CO2	illustrate the mechanism of action of drugs with respect to receptor interactions and elicited effects
CO3	Explain the role of Neurohumoral transmission and non adrenergic non cholinergic transmission (NANC) in physiological and pathophysiological conditions.
CO4	Elaborate the pharmacology of drugs acting on CNS and its relevance in the treatment of different disease
CO5	Discuss the pharmacology of drugs acting on CVS and its relevance in the treatment of different disease
CO6	Discuss the physiological and pathophysiological role of Autocoids .

MPL103T - Pharmacological and Toxicological Screening Methods-I

CO Number	At completion of this course it is expected that students will be able to
CO1	The regulations and ethical requirement for the usage of experimental animals, good laboratory practices including of animal handling, drug administration, surgical, euthanasia techniques and experimentation on laboratory animals
CO2	To describe the various animals and breeding of laboratory animals.
CO3	To describe and design the preclinical testing methods for various biological activity including of bioassay techniques in the drug discovery process
CO4	To justify the general principles of immunoassay and testing methods
CO5	Correlate or extrapolate the invitro data to preclinical and preclinical to humans

CELLULAR AND MOLECULAR PHARMACOLOGY- MPL 104 T

CO Number	At completion of this course it is expected that students will be able to
CO1	Skill to perform animal handling, drug administration, surgical, anesthesia and euthanasia techniques.
CO2	Skill to use various softwares and techniques for data analysis
CO3	Skill to analyze and estimate the biological sample by HPLC,UV, Flame photometry or other modern analytical tools
CO4	Skill to develop qualities of critical thinking, problem solving, planning ability, sincerity, time management, use of appropriate method and professional identity in preclinical drug discovery research
CO5	Skill to use of various methods of isolation, identification and quantification of RNA, DNA, and protein samples including of fragmentation and apoptosis process

Pharmaceutic Department (SEM II)

Program Specific Outcomes for M.Pharm. (Pharmaceutics):

1. Students are able to formulate and evaluate various (conventional and novel) drug delivery

Systems to resolve bioavailability, stability and compatibility issues.

2. Students are aware of latest regulatory requirements and are trained to handle various

equipments and instruments.

3. Students are able to acquire professional, ethically correct and self esteemed attitude.

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

CO Number	Course Outcomes: Upon completion of course students will be able to –
CO1	Understand Concepts, Events involved in Targeted Drug Delivery Systems and Tumor targeting and Brain specific delivery.
CO2	Understand principles of targetting using liposomes and nanoparticles
CO3	Illustrate Types, preparation, evaluation and application of Monoclonal Antibodies, Niosomes, Aquasomes, Phytosomes,Electrosomes.
CO4	Formulating and evaluating intranasal and pulmonary DDS
CO5	Nucleic acid based therapeutic delivery system ; Explain, Illustrate Potential target diseases for gene therapy
CO6	Explain Biodistribution and Pharmacokinetics of therapeutic antisense molecules and aptamers as drugs of future.

ADVANCED BIOPHARMACEUTICS AND PHARMACOKINETICS -MPH 202T

CO Number	**Upon completion of the course, student shall be able to understand**
CO1	Explain ADME, Describe drug dissolution process
CO2	State various biopharmaceutic considerations in drug product design, describe In Vitro Drug Product Performance
CO3	Explain various concepts of pharmacokinetics, describe compartment models
CO4	Describe Bioavailabilityand Bioequivalence
CO5	Classify various Modified–Release Drug Products, Explain Targeted Drug Delivery Systems and Biotechnological Products.

COMPUTER AIDED DRUG DEVELOPMENT MPH203T

CO Number	Course Outcomes: Upon completion of course students will be able to –
CO1	Relate Molecular Properties in CADD and role of CADD in drug discovery and Drug Design .
CO2	Understand And Identify Pharmacophore Features and Mapping and virtual Screening .
CO3	Analyze role of Molecular and Quantum Mechanics, energy minimization in molecular Docking and drug design.
CO4	Design the protocol of drug design using Computer Aided Drug Design(CADD) tools.

COSMETICS AND COSMECEUTICALS MPH 204 T

CO Number	Upon completion of the course, student shall be able to understand
CO1	Key ingredients used in cosmetics and cosmeceuticals
CO2	Biological aspects of conditions needing cosmetis and cosmeceuticals
CO3	Current technologies in the market
CO4	Have regulatory knowledge of cosmetics and cosmeceuticals
CO5	Regulatory and formulation knowledge of herbal cosmetics and cosmeceuticals

PHARMACEUTICS PRACTICAL II -205P

CO Number	Course Outcomes: Upon completion of course students will be able to –
CO1	formulate and perform evaluation of various types dosage forms and herbal product such as Alginate beads gelatin /albumin microspheres, liposomes/niosomes, spherules/microparticles, Creams, Shampoo and Toothpaste base,
CO2	make use of case studies of Bioavailability studies, Pharmacokinetic and IVIVC data analysis, In vitro cell studies for permeability and metabolism, Computer Simulations in Pharmacokinetics and Pharmacodynamics, Computational Modeling of Drug Disposition, Sensitivity Analysis, and Population Modeling
CO3	Design of Experiment.
CO4	Analyse Formulation data
CO5	To relate and interpret dissolution of two different marketed products /brands

M-PHARM SEM II
Quality Assurance Department

Program Specific Outcome:

1. Students are well versed with latest regulatory guidelines, functions of Quality Assurance in pharmaceutical Industry and Good Documentation Practices.
2. Students are acquainted with operation of analytical instruments.
3. Students are able to acquire professional, ethically correct and self esteemed attitude.

HAZARDS AND SAFETY MANAGEMENT - MQA201T

CO Number	**Course Outcomes:** Upon completion of course students will be able to –
CO1	Relate environmental problems among learner
CO2	Develop an attitude of concern for the industry environment
CO3	Spell knowledge ensure safety standards in pharmaceutical industry
CO4	Function to provide comprehsive knowledge on the safety management
CO5	Compose Knowledge to empower an idea to clear mechanism and management in different kinds of hazard management system and hazard

PHARM. VALIDATION- MQA 202T

CO Number	**Course Outcomes: Upon completion of course students will be able to –**
CO1	Compare Qualification, Calibration and validation & apply it according to classification
CO2	Illustrate process for qualification of some analytical and manufacturing equipments
CO3	Explain the process for validation of Utilities and qualification of some laboratory equipments
CO4	Interpret Process validation for various dosage forms and parameters for validation of analytical methods
CO5	Explain validation of cleaning process and computerized systems.
CO6	Illustrate types and regulatory procedures for Intellectual Property Rights.

AUDITS AND REGULATORY COMPLIANCE- MQA 203T

CO Number	**Course Outcomes: Upon completion of course students will be able to –**
CO1	Expalin importance of audit, its objectives and responsibilites. Choose methods for planning, management and information gathering for audit
CO2	Elaborate and apply cGMP regulations for auditing of drug industries. Define responsibilites of management, manufacturing methods and various evaluation activities for achieving quality system approch. Design audit checklists for drug industries.

CO3	Explain significance of the audit process of Granulation, tableting, coating, capsules, sterile production, packaging systems. List out aspects for vendor audits.
CO4	Examine intricacies in auditing microbiological laboratory.
CO5	List various aspects in auditing critical systems like HVAC, Water Systems, and ETP systems.

PHARMACEUTICAL MANUFACTURING TECHNOLOGY- MQA 204T

CO Number	**Course Outcomes: Upon completion of course students will be able to –**
CO1	Outline Concept, Significance, design, layout of pilot plant scale up study and large scale manufacturing and Pharmaceutical industry developments: Production planning:
CO2	Explain Aseptic process technology, Advanced sterile product manufacturing technology, Process Automation in Pharmaceutical Industry
CO3	Explain Non sterile manufacturing process technology, Advance non-sterile solid product manufacturing technology, Improved Tablet Production, Problems encountered. Coating technology
CO4	Explain Containers and closures for pharmaceuticals
CO5	Outline Quality by design (QbD) and process analytical technology (PAT) and classify Elements of QbD

PHARM QUALITY ASSURANCE II - MQA205 P

CO Number	**Course Outcomes: Upon completion of course students will be able to –**
CO1	Estimate organic and inorganic contaminants
CO2	Perform Qualification and validation exercises
CO3	Prepare audit check lists
CO4	Illustrate principle of QbD, PAT through case studies.
CO5	Design plant layout

Advanced Spectral Analysis: MPC 201T

CO Number	**Course Outcomes: Upon completion of course students will be able to –**
CO1	To make use of Woodward - Fieser rule calculating absorption maxima for 1,3–butadienes, cyclic dienes and α, β– carbonyl compounds and enones
CO2	To interpret the NMR spectra of various organic compounds

CO3	To build knowledge about Mass fragmentation rules, Fragmentation of important functional groups like alcohols, amines, carbonyl groups and alkanes
CO4	To outline theoretical and practical skills of the hyphenated instruments
CO5	To elaborate the different thermal methods of analysis along with interpretation

ADVANCED ORGANIC CHEMISTRY II -MPC202T

CO Number	**Course Outcomes: Upon completion of course students will be able to –**
CO1	Describe principles and applications of Green chemistry
CO2	Describe the concept of peptide chemistry and plan strategies for peptide synthesis
CO3	Discuss principles and methods of various Photochemical and pericyclic reactions
CO4	Explain chemistry and plan synthesis using different catalyst
CO5	Explain the concept of stereochemistry and apply CIP rules

COMPUTER AIDED DRUG DESIGN-MPC203T

CO Number	**Course Outcomes: Upon completion of course students will be able to –**
CO1	Relate Molecular Properties in CADD and role of CADD in drug discovery and Drug Design .
CO2	Understand And Identify Pharmacophore Features and Mapping and virtual Screening .
CO3	Analyze role of Molecular and Quantum Mechanics, energy minimization in molecular Docking and drug design.
CO4	Design the protocol of drug design using Computer Aided Drug Design(CADD) tools.

PHARMACEUTICAL PROCESS CHEMISTRY (MPC 204T)

CO Number	**Course Outcomes: Upon completion of course students will be able to –**
CO1	Classify various safety techniques
CO2	Discuss and relate various unit processes
CO3	Discuss and relate various unit operations in process chemistry
CO4	Illustrate unit process for different types of reactions

CO5	Explain and differenciate various reaction kinetics , reaction routes and techniques of fermentation

PHARMACEUTICAL CHEMISTRY PRACTICALS – II-MPC205P

CO Number	**Course Outcomes: Upon completion of course students will be able to –**
CO1	mesure the strength of drug by using various bioassay techniques
CO2	design, analysed and interpret the general toxicological testing protocols and report (including of acute and chronic) in preclinical research
CO3	designed various clinical documents such as clinical trial protocol, Case Report Forms, Adverse drug reaction monitoring and reporting
CO4	Skill to designed and execute the studies based on drug absorption as well as to plan alternative methods to animal toxicity testing including of in-silico based studies.
CO5	design and perfom drug mutagenicity study using mice bone-marrow chromosomal aberration test
CO6	analysed various Serum biochemical, haematological, urine analysis, functional observation tests and histological studies in various preclinical studies.

Pharmacology department:

Program Specific Outcome (M.Pharm Pharmacology Department)

1. Students are well versed with handling and learning of all laboratory animals, surgical techniques, planning a research protocol, statistical analysis and basic instruments respectively which are required for preclinical Drug Discovery Research.
2. Students are aware of clinical, toxicological and other regulatory guidelines with respect to drug discovery research.
3. Students are able to acquire professional, ethically correct and self esteemed attitude.

ADVANCED PHARMACOLOGY-II-MPL201T

CO Number	**Course Outcomes: Upon completion of course students will be able to –**
CO1	Elaborate the pharmacology of drugs acting on endocrine system and its relevance in the treatment of different disease.
CO2	Justify the significance of chronopharmacology in various diseases.

CO3	Classify drugs acting on GIT with respect to mechanism of action and its relevance in the treatment .
CO4	Discuss in detail Chemotherapy in infectious diseases and disorders of immune origin.
CO5	Relate the role of Free radicals and antioxidants in various diseases. .
CO6	Discuss Recent Advances in Treatment of Alzheimer's disease, Parkinson's disease, Cancer, Diabetes mellitus.

PHARMACOLOGICAL AND TOXICOLOGICAL SCREENING METHODS-MPL202T

CO Number	**Course Outcomes: Upon completion of course students will be able to –**
CO1	Remember the importance of ethical and various regulatory requirements for toxicity studies.
CO2	Explain and designed the various types of general toxicity studies.
CO3	Discuss the IND and Safety pharmacology studies
CO4	Discribe the toxicokinetic evaluation in preclinical studies
CO5	Summaried various alternative methods to animal toxicity testing
CO6	Compare and designed various reproductive toxicity and carcinogenicity studies in preclinical testing.

Principles of Drug Discovery MPL 203T

CO Number	Course Outcomes: Upon completion of course students will be able to –
CO1	Explain the various stages of drug discovery including role of genomics, proteomics, bioinformatics and newer targets/technology
CO2	Relate data obtained from combinatorial chemistry, HTS and in silico techniques to Lead identification
CO3	Elaborate on the importance of computer aided drug design/molecular docking in drug discovery
CO4	Evaluate the utility of various classical targets and biomarkers in a Drug discovery program
CO5	Explain the various approaches for Rational drug design
CO6	Discuss basic terms and general considerations for a range of *in vitro* assays/screening methods

Clinical Research and Pharmacovigilance MPL 204T

CO Number	Course Outcomes: Upon completion of course students will be able to –
CO1	Explain the regulatory requirements for conducting clinical trial
CO2	Compare and explain the types of clinical trial designs, different responsibilities of key players involved in clinical trials
CO3	Design various clinical documents such as protocol, IB, Case Report Forms, Clinical Study Report
CO4	Assess and interpret adverse drug reactions in context of Pharmacovigilance
CO5	Discuss ADR reporting tools and methods used in Pharmacovigilance.
CO6	Perceive the importance of Pharmacoepidemiology, pharmacoeconomics, safety pharmacology

MPL 205P) Pharmacology Practical-II

CO Number	Course Outcomes: Upon completion of course students will be able to –
CO1	Skill to mesure the strength of drug by using various bioassay techniques
CO2	Skill to design, analysed and interpret the general toxicological testing protocols and report (including of acute and chronic) in preclinical research
CO3	Skill to designed various clinical documents such as clinical trial protocol, Case Report Forms, Adverse drug reaction monitoring and reporting
CO4	Skill to designed and execute the studies based on drug absorption as well as to plan alternative methods to animal toxicity testing including of in-silico based studies.
CO5	Skill to design and perfom drug mutagenicity study using mice bone-marrow chromosomal aberration test
CO6	Skill to analysed various Serum biochemical, haematological, urine analysis, functional observation tests and histological studies in various preclinical studies.

M.PHARM

SEM III

MRM 301T: Research Methodology and Biostatistics

CO Number	**Course Outcomes: Upon completion of course students will be able to –**
CO1	Discuss the various aspects of research methodology such as literature survey, sampling methods, report writing etc.
CO2	Compare the various statistical techniques and their applications
CO3	Choose the appropriate parametric/ non parametric tests as per the data, solve manually as well as using statistical software.
CO4	Elaborate with examples the ethics involved in medical research.
CO5	Interpret the guidelines of CPCSEA for laboratory animal facilities and basic principles of medical research
CO6	Discuss the principles and importance of Helsinki