

## M PHARMACY PHARMACEUTICS COURSE OUTCOMES

Course Number & Course Name	CO No	Course Outcome (CO)
<b>MPH101T</b> <b>Modern Pharmaceutical Analytical Techniques (Theory)</b>		Upon completion of this course the graduate is able to
	C101T1.	Recall the concepts of UV-VIS spectroscopy, IR spectroscopy, spectrofluorimetry, flame and atomic absorption spectroscopy(1,2,3,4)
	C101T2.	Extend the concept of NMR from basic to FT NMR and C13 NMR applications(1,2,3,4)
	C101T3.	Develop the concept of ionisation techniques and analysers in mass spectroscopy(1,2,3,4)
	C101T4.	Compare various techniques of chromatography & electrophoresis with respect to principle, instrumentation and applications(1,2,3,4)
	C101T5.	Elaborate the instrumental methods of X-ray crystallography and immunological assays(1,2,3,4)
<b>MPH102T</b> <b>Drug Delivery System (Theory)</b>		Upon completion of this course the graduate is able to
	C102T1.	Recall the basic concepts of sustained release/controlled release formulations based on the physicochemical and biological properties of drugs, polymer science, personalized medicines and telepharmacy.(2,5,6,8,9)
	C102T2.	Explain the principles and fundamentals of Rate controlled drug delivery systems(2,5,6,8,9)
	C102T3.	Develop the formulation approaches of Gastro-retentive and Buccal drug delivery systems.(2,5,6,8,9)
	C102T4.	Analyze the basic components of Ocular and Transdermal drug delivery systems(2,5,6,8,9)
	C102T5.	Explain the formulation aspects of protein and peptide delivery and to elaborate and appraise the mucosal and transdermal delivery of vaccines(2,5,6,8,9)

<b>MPH103T</b> <b>Modern</b> <b>Pharmaceutics</b> <b>(Theory)</b>	Upon completion of this course the graduate is able to	
	C103T1	Define concepts of preformulation, validation, cGMP, compression, compaction and consolidation parameters(5,6,7,9)
	C103T2	Develop validation and calibration of master plan as per the regulatory requirements(5,6,7,9)
	C103T3	Classify the policies of CGMP, layout of buildings, equipment and management of production and inventory control(5,6,7,9)
	C103T4	Explain the physics of tablet compression and distribution of forces in the process of compression(5,6,7,9)
	C103T5	Estimate the diffusion, dissolution and pharmacokinetic parameters in consolidation(5,6,7,9)
<b>MPH104T</b> <b>Regulatory Affair</b> <b>(Theory)</b>	Upon completion of this course the graduate is able to	
	C104T1	Define the concept of innovator and generic drug product development in pharmaceutical industry and to outline the filing and approval process for innovator and generic drug product(2,4,6,9)
	C104T2	Apply the regulatory guidelines required for product approval(2,4,6,9)
	C104T3	Compare the regulatory requirements of various countries and international conference on harmonization guidelines(2,4,6,9)
	C104T4	Interpret FDA guidelines on Nonclinical studies of drug development(2,4,6,9)
	C104T5	Elaborate the pharmacovigilance and process of monitoring in clinical trials(2,4,6,9)
<b>BP105T</b> <b>Pharmaceutics</b> <b>Practical I</b> <b>( Practical)</b>	Upon completion of this course the graduate is able to	
	C105P1	Recall the basic principles of analytical techniques and their instrumentation used for drug analysis.(1,2,3,6,8,9)
	C105P2	Summarize the preformulation studies and basic polymers / excipients used for various controlled/ sustained drug delivery systems.(1,2,3,6,8,9)
	C105P3	Make use of various analytical instruments for estimation of drugs in various formulations. (1,2,3,6,8,9)
	C105P4	Simplify the formulation techniqueto prepare matrix tablets, floating tablets and transdermal patches(1,2,3,6,8,9)

<b>MPH201T</b> <b>Molecular</b> <b>Pharmaceutics</b> <b>(Nano Tech and</b> <b>Targeted</b> <b>DDS)</b> <b>(Theory)</b>	C105P5	Assess the drug release from sustained and controlled drug delivery systems and to construct drug release kinetic plots and determine similarity factor(1,2,3,6,8,9)
	Upon completion of this course the graduate is able to	
	C201T1	Define the concepts, events and biological process involved in drug targeting to tumor and brain.(1,2,4,)
	C201T2	Explain the methods of preparation and evaluation of nanoparticles and liposomes(1,2,4,)
	C201T3	Develop microspheres, Monoclonal antibodies and other multiparticulate carriers for drug delivery(1,2,4,)
	C201T4	Analyze the approaches for pulmonary and intra nasal delivery systems(1,2,4,)
	C201T5	Explain the concepts of gene therapy and liposomal gene delivery systems and to discuss the therapeutic antisense molecules and aptamers as drugs of future(1,2,4)
<b>MPH202T</b> <b>Advanced</b> <b>Biopharmaceutics</b> <b>&amp;</b> <b>Pharmacokinetics</b> <b>(Theory)</b>	Upon completion of this course the graduate is able to	
	C202T1	Define the drug absorption, mechanisms and interpret various factors affecting drug absorption and role of dosage forms.(1,2,5,6)
	C202T2	Explain the basic concepts of Biopharmaceutic considerations in drug product design(1,2,5,6)
	C202T3	Apply the pharmacokinetic models for the determination of pharmacokinetic parameters.(1,2,5,6)
	C202T4	Determine the bioavailability testing protocol of a drug and compare the bioequivalence among marketed products and to analyze the drug product performance by in-vitro, in-vivo and in-situ models.(1,2,5,6)
	C202T5	Predict pharmacokinetic and pharmacodynamic drug interactions(1,2,5,6)
<b>MPH203T</b> <b>Computer Aided</b> <b>Drug</b>	Upon completion of this course the graduate is able to	
	C203T1	Define role of QbD in Pharmaceutical development and relate the history of Computers to current Pharmaceutical Research and Development(5,6,7,9)

<b>Delivery System (Theory)</b>	C203T2	Explain about Computational Modelling Of Drug Disposition(5,6,7,9)
	C203T3	Choose and make use of optimization techniques in formulation development(5,6,7,9)
	C203T4	Analyse and understand the role of Computers in biopharmaceutical characterization, Pharmacokinetics and Pharmacodynamics and clinical development(5,6,7,9)
	C203T5	Explain the importance of Artificial Intelligence (AI), Robotics and Computational fluid Dynamics in pharmaceutical field(5,6,7,9)
<b>MPH204T Cosmetic and Cosmeceuticals (Theory)</b>	Upon completion of this course the graduate is able to	
	C204T1	Match the Indian regulatory requirements for manufacture, sale, import and labelling of cosmetics and cosmeceuticals (2,4,5,9)
	C204T2	Develop cleansing and care needs for face, eye lids, lips, body and neck(2,4,5,9)
	C204T3	Examine building blocks for different product formulations of cosmetics and cosmeceuticals(2,4,5,9)
	C204T4	Justify the cosmeceutical products for solving problems related to skin, hair, and oral cavity(2,4,5,9)
	C204T5	Elaborate the regulatory guidelines for herbal cosmetics(2,4,5,9)
<b>MPH205P Pharmaceutics Practical II</b>	Upon completion of this course the graduate is able to	
	C205P1	Recall the basic techniques for the preparation of microspheres, liposomes and solid dispersions.(1,2,3,6,8,9)
	C205P2	Compare the dissolution studies of various marketed products.(1,2,3,6,8,9)
	C205P3	Develop and evaluate the various novel drug delivery systems(1,2,3,6,8,9)
	C205P4	Test for protein drug binding characteristics, cell permeation and bioavailability of the formulations(1,2,3,6,8,9)
	C205P5	Evaluate the formulated cosmetic preparations and to design formulations by QbD and DoE concepts, use simulations for estimation of pharmacokinetics and pharmacodynamics(1,2,3,6,8,9)

<b>MPH301T Research Methodology and Biostatistics (Common for all specializations) (Theory)</b>	Upon completion of this course the graduate is able to	
	C301TI	Recall the principles of research methodology such as study design and various design strategies.(1,2,3,4,8)
	C301T2	Understand the significance of sample size and infer data using biostatistical tools(1,2,3,4,8)
	C301T3	Comprehend the values of clinical ethics, its significance designing experiments.(1,2,3,4,8)
	C301T4	Describe the CPCSEA regulations for experimental facilities on lab animals.(1,2,3,4,8)
	C301T5	Discuss origins and fundamental principles of research methodologies.(1,2,3,4,8)
<b>Project Work (Common for all specializations)</b>	Upon completion of this course the graduate is able to	
	PW1	Organize literature review and integrate the objective of the research work(1,2,3,4,5,6,7,8,11)
	PW2	Attribute resources required to perform the research.(1,2,3,4,5,6,7,8,11)
	PW3	Implement the concepts of experimental procedures.(1,2,3,4,5,6,7,8,11)
	PW4	Illustrate the experimental data by statistical analysis.(1,2,3,4,5,6,7,8,11)
	PW5	Report the findings of the research work.(1,2,3,4,5,6,7,8,11)

### M. PHARMACY PHARMACEUTICAL ANALYSIS

Upon completion of this course the graduate is able to		
MPA101T Modern Pharmaceutical Analytical Techniques	C101T1	Recall the concepts of UV-VIS spectroscopy, IR spectroscopy, spectrofluorimetry , flame and atomic absorption spectroscopy(1,2,3,4)
	C101T2	Extend the concept of NMR from basic to FT NMR and C13 NMR applications(1,2,3,4)
	C101T3	Develop the concept of ionization techniques and analysers in mass spectroscopy (1,2,3,4)
	C101T4	Compare various techniques of chromatography with respective to principle, instrumentation and applications. (1,2,3,4)
	C101T5	Elaborate the instrumental methods of electrophoresis and X- ray crystallography & thermal techniques and potentiometry(1,2,3,4)
MPA102T Advanced Pharmaceutical Analysis	Upon completion of this course the graduate is able to	
	C102T1	List the types of impurities in drug substance , new drug product and residual solvents as per ICH guidelines (2,5,6,8,9)
	C102T2	Illustrate the identification of elemental impurities, analytical procedures and C,H, N, S analysis (2,5,6,8,9)
	C102T3	Examine impurity profiling and degradant characterization as per ICH and WHO guidelines (2,5,6,8,9)
	C102T4	Assess the stability testing of phytopharmaceuticals as per the regulatory requirements by HPLC/HPTLC (2,5,6,8,9)
C102T5	Evaluate the biological vaccines, antitoxins anti serum as per pharmacopoeia by immune assay procedures. (2,5,6,8,9)	
MPA103T Pharmaceutical Validation	Upon completion of this course the graduate is able to	
	C103T1	Define validation and qualification studies of equipments (5,6,7,9)
	C103T2	Outline the qualification of glass ware and analytical instruments like FTIR,GC,HPLC,HPTLC,UV, pH(5,6,7,9)
	C103T3	Develop knowledge regarding validation of utility systems and cleaning validation (5,6,7,9)
	C103T4	Prioritize the concept of analytical method validation, computerized system validation (5,6,7,9)
C103T5	Maximise the knowledge on general principles of Intellectual property (5,6,7,9)	

MPA104T Food Analysis	Upon completion of this course the graduate is able to	
	C104T1	Recall the concepts of carbohydrates and proteins, their processing digestion absorption and metabolism (2,4,6,9)
	C104T2	Compare and analyse different food constituents of lipids and vitamins (2,4,6,9)
	C104T3	Identify food additives and to understand different techniques in determination of food additives (2,4,6,9)
	C104T4	Analyse finished products of milk and fermentation Products (2,4,6,9)
	C104T5	Estimate the concentration of pesticide level in finished food products and to improve knowledge on legislation regulations like BIS, Agmark, FDA (2,4,6,9)
MPA105P Pharmaceutical Analysis Practical I	Upon completion of this course the graduate is able to	
	C105P1	Recall the assay of official compounds by different titrations (1,2,3,8,6,9)
	C105P2	Illustrate the calibration/Validation of different analytical instruments with their compliance (1,2,3,8,6,9)
	C105P3	Analyse the pharmacopoeial compounds and their formulations by Chromatographic and Spectroscopic techniques (1,2,3,8,6,9)
	C105P4	Interpret the impurities and residual solvents by Impurity profiling of drugs (1,2,3,8,6,9)
	C105P5	Estimate the Physico-chemical properties and to determine the constituents of food products (1,2,3,8,6,9)
MPA201T Advanced Instrumental Analysis	Upon completion of this course the graduate is able to	
	C201T1	How the HPLC is applied for the analysis of enantiomers and the chiral compounds (1,2,4)
	C201T2	Summarise the different chromatographic techniques and applications in pharmaceutical industry (1,2,4)
	C201T3	Outline the instrumentation and method development using CE-MS and SFC for the analysis of pharmaceutical compounds (1,2,4)
	C201T4	Prioritise the study of applying latest ionization techniques and analysers in MS/MS systems (1,2,4)

	C201T5	Maximize the knowledge about different types of NMR techniques like FTNMR, C13 NMR, 1-D & 2-D NMR, NOESY & COSY and hyphenated techniques (1,2,4)
MPA202T Modern Bio-Analytical Techniques	Upon completion of this course the graduate is able to	
	C202T1	Select various extraction procedures for the biological sample preparation , to develop bio-analytical method development and its validation according to USFDA and EMEA guidelines (2,4,5)
	C202T2	Illustrate Bio pharmaceutical considerations and outline the Biopharmaceutics classification system unit (2,4,5)
	C202T3	Develop the basic concept of pharmacokinetic and toxicokinetic evaluation in preclinical studies. (2,4,5)
	C202T4	Classify various cell culture techniques and study of cell viability assays (2,4,5)
	C202T5	Evaluate the metabolites and drug metabolizing enzyme and to predict drug product bioequivalence Studies (2,4,5)
MPA203T Quality Control and Quality Assurance	Upon completion of this course the graduate is able to	
	C2023T1	Recall the concept and evolution of QC&QA and outline the GLP, GMP guidelines (5,6,7,9)
	C203T2	Summarize c GMP guidelines, CPCSEA guidelines (5,6,7,9)
	C203T3	Analyze the raw materials, finished products and packaging materials as per IP, BP, USP . ICH Q6 and Q3 guidelines (5,6,7,9)
	C203T4	Perceive the importance of documentation in pharmaceutical industries (5,6,7,9)
	C203T5	Create an awareness on different manufacturing operations and control, starting from sanitation till packaging in the pharmaceutical industry (5,6,7,9)
MPA204T Herbal and Cosmetic Analysis	Upon completion of this course the graduate is able to	
	C204T1	Compare herbals with conventional drugs and to outline the products validation, standardization as per WHO and AYUSH guidelines (2,5,4,9)
	C204T2	Identify adulteration/ substitution and impurities by standardised procedures in herbal formulations as per regulatory requirements (2,5,4,9)
	C204T3	Make use of monographs of Herbal drugs and testing of natural products and drugs (2,5,4,9)



MPA205P Pharmaceutical Analysis Practical II	C204T4	Assess the challenges in monitoring the safety of herbal medicines (2,5,4,9)
	C204T5	Evaluate cosmetic products for various physico chemical parameters (2,5,4,9)
	Upon completion of this course the graduate is able to	
	C205P1	Recall and compare the absorption spectra by UV and wood ward fiesure rules and To interpret the spectra and identify the organic compounds by FT-IR, NMR, MS (1,2,3,8,6,9)
	C205P2	Develop various sample preparation techniques for biomolecules separation and their quantitative analysis by electrophoresis , DSC and HPLC techniques (1,2,3,8,6,9)
	C205P3	Plan the protocols for the conduct of analytical/Bio analytical method validation and BA/BE Studies as per guidelines and to prepare master formula record, Batch manufacturing record (1,2,3,8,6,9)
	C205P4	Analyze the raw materials, packaging materials and related substances in pharmaceuticals as per official Monographs (1,2,3,8,6,9)
C205P5	Determine the physico-chemical parameters in various marketed cosmetic products (lipsticks, hair oil, hair dye, shampoo, hair creams, oils and depilatories(1,2,3,8,6,9)	