Program Outcomes:

Program outcomes are statements conveying the intent of a program of study. Specifically, program outcomes refer to what a student should know or be able to do at the end of a program. They are often seen as the knowledge and skills students will have obtained by the time they have received their intended degree.

Program Outcomes for M. Pharmacy (Pharmaceutical Analysis) Program

PO1 **Analytical Knowledge**: Develop a comprehensive understanding of a particular field or professional domain, encompassing broader and worldwide viewpoints, while demonstrating the capacity to differentiate, appraise, scrutinize, and integrate information.

PO2 **Problem Solving**: To effectively employ analytical methods and engage in discerning and reflective thinking, when addressing challenges and reaching conclusions. Discover, scrutinize, assess, and systematically employ information, leading to sound and justifiable decision-making.

PO3 **Modern Techniques**: To acquire knowledge, select and utilize suitable techniques and processes, along with relevant computer tools, while considering their practical uses.

PO4 **Regulatory Adherence**: To demonstrate comprehension and adherence to the ethical principles and regulations set forth by regulatory bodies in different countries and the Government of India, ensuring the implementation of sound laboratory practices.

PO5 **Collaborative and Multidisciplinary work**: Understand group dynamics, contribute to collaborative research, demonstrate self-management and teamwork, make unbiased decisions, and foster learning for oneself and others.

PO6 **Research Skill**: Apply advanced cognitive skills to gather information through literature review and experiments. Utilize appropriate research methodologies, techniques, and tools. Design and conduct experiments, analyze data, and demonstrate higher-order thinking. Contribute to the development of scientific knowledge in pharmaceutical sciences individually or as part of a group.

PO7 **Critical Thinking**: To enhance cognitive abilities and acquire comprehensive understanding in the creation of innovative approaches, impurity profiling, and validation protocols applicable for both routine and laboratory applications, thereby fostering critical thinking and logical reasoning.

PO8 **Environment and Sustainability**: Evaluate the environmental implications and sustainable aspects by assessing the presence of biohazardous solvents and chemicals.

PO9 **Project management abilities**: Apply efficient delegation and organizational abilities. Arrange tasks by implementing essential strategizing and implementation to adhere to set time limits.

PO10 **Ethics**: Exhibit outstanding professional, ethical, and legal conduct by adhering to the drug, pharmaceutical, and pharmacy-related laws and regulations set forth by central and state authorities.

Course Outcomes:

Course Outcomes are narrower statements that describe what students are expected to know, and be able to do at the end of each course. These relate to the skills, knowledge, and behaviour that students acquire in their enrolment through the course.

Name of the Course	Course Code	Course Outcome Code	Course Outcome Statements
Modern Pharmaceutical Analytical Techniques	MPA101T	MPA101T.1	Understand the general principles and theory of spectroscopy and its applications in Drug Analysis.
		MPA101T.2	Understand the basic instrumentation of Chromatography for identification, and characterization of compounds
		MPA101T.3	Explain Instrumentation, separation and identification of compounds by electrophoresis technique and ion selective electrodes.
		MPA101T.4	Describe the principles, instrumentation and applications of thermal techniques and X-ray Crystallography.
Advanced Pharmaceutical Analysis	MPA102T	MPA102T.1	Understand the concepts of Impurity profiling and categorize the impurities in inorganic, organic and residual solvents and elemental impurities.
		MPA102T.2	Apply appropriate knowledge about analytical skills required for the analysis of impurities in the bulk drugs and various formulations.
		MPA102T.3	Demonstrate stability testing protocols and stability testing of Phyto pharmaceuticals
		MPA102T.4	Understand the official and non-official methods to analyses the related substance, Bioassays and Immunoassays
Pharmaceutical Validation	MPA103T	MPA103T.1	Understand the concepts of calibration, qualification and validation, qualification of various pharmaceutical equipment and instruments.
		MPA103T.2	Understand Cleaning validation of equipment employed in the manufacture of pharmaceuticals and validation of utility systems.
		MPA103T.3	Understand validation of sterile and non-sterile plant and computerized system validation.
		MPA103T.4	Describe Intellectual property rights, patent filing and various aspects of TOT.
Food Analysis	MPA104T	MPA104T.1	Discuss about types and properties of carbohydrates, proteins, lipids, vitamins, food additives, pigments, finished food products and pesticides
		MPA104T.2	Describe general methods of analysis of carbohydrates, proteins, lipids, vitamins, food additives, pigments, finished food products and pesticides
		MPA104T.3	Explain various analytical techniques in the determination of carbohydrates, proteins, lipids, vitamins, food additives, pigments, finished food products and pesticides
		MPA104T.4	Elaborate on different food regulations and legislations

Pharmaceutical Analysis Practical I	MPA105PA	MPA105PA.1	Develop proficiency in the calibration of various laboratory instruments.
		MPA105PA.2	Apply the skills required to conduct assays of official compounds using both titrations and instrumental techniques.
		MPA105PA.3	Analyse the data for interpretation of functional groups.
		MPA105PA.4	Analyse specific compounds quantitatively
Pharmaceutical Analysis Practical II	MPA105PB	MPA105PB.1	Conduct pharmacopoeial compound analysis and formulation using UV Vis spectrophotometry.
		MPA105PB.2	Execute experiments utilizing High Performance Liquid Chromatography (HPLC) and Gas Chromatography (GC)
		MPA105PB.3	Analyze and quantify essential food components and characteristics.
		MPA105PB.4	Perform comprehensive food product analysis.
Seminar/ Assignment	MPA106S	MPA106S.1	Apply advanced cognitive skills to gather information through literature review and experiments.
		MPA106S.2	Showcase comprehension and adherence to ethical principles and regulations set by regulatory bodies and government authorities.
		MPA106S.3	Demonstrate self-management, teamwork, unbiased decision-making, and foster learning for themselves and others.
		MPA106S.4	Utilize suitable techniques and computer tools, considering practical uses and enhancing their technical proficiency.
		MPA106S.5	Employ analytical methods and engage in discerning and reflective thinking to address challenges and reach justifiable conclusions.
		MPA106S.6	Develop a comprehensive understanding of Pharmaceutical analytical skills incorporating worldwide viewpoints.
Advanced Instrumental Analysis	MPA201T	MPA201T.1	Understand new developments in HPLC and its practical aspects
		MPA201T.2	Explain the principle, instrumentation and applications of Biochromatography, GC and TLC
		MPA201T.3	Learn the principles and instrumentation of advanced instrumentation techniques for drug analysis and Theoretical aspects of hyphenated analytical techniques.
		MPA201T.4	Describe the analytical problem and selection of appropriate analytical tool for the quantification of chemicals and excipients.

Modern BioAnalytical Techniques	MPA202T	MPA202T.1	Describe the quantification of analyte present in the biological fluids and analyte enrichment techniques as well the instrumentation technique.
		MPA202T.2	Understand Invitro, In-situ and In-vivo methods for bioavailability. Importance and applications of pharmacokinetic and toxicokinetic studies. Explain Various types of cell cultures and their applications.
		MPA202T.3	Metabolite identification, In-vitro assay of drug metabolites & drug metabolizing enzymes
Quality Control and Quality Assurance	MPA203T	MPA203T.1	Understand the scope of quality certifications applicable to pharmaceutical industries, the responsibilities of QA & QC departments, and GLP, protocol for conduct of non-clinical trials& regulatory affairs.
		MPA203T.2	Apply skills on methods of analysis of raw materials, finished products, packaging materials, in process quality control (IPQC), and developing specification (ICH Q6 and Q3).
		MPA203T.3	Explain about various documentation in pharmaceutical industry
		MPA203T.4	Summarize about various Manufacturing operations and controls
Herbal and Cosmetic Analysis	MPA204T	MPA204T.1	Explain herbal remedies, toxicity associated with herbal remedies and regulations and assessment of herbal drugs
		MPA204T.2	Describe causes, measures and determination of adulteration and regulatory requirements for setting up of herbal drug industry
		MPA204T.3	Explain effects of herbal remedies on clinical laboratory testing, monographs, herbal drug- drug interactions and challenges in safety monitoring of herbal drugs
		MPA204T.4	Conduct evaluation of Cosmetic products and raw materials of cosmetics as per BSI standards
Pharmaceutical Analysis Practical III	MPA205PA	MPA205PA.1	Apply and interpret spectroscopic techniques.
		MPA205PA.2	Conduct analyses using differential scanning calorimetry.
		MPA205PA.3	Perform biomolecular separation and quantitative analysis.
		MPA205PA.4	Prepare and execute analytical and bioanalytical method validation protocols, and BA/BE studies.
Pharmaceutical Analysis Practical IV	MPA205PB	MPA205PB.1	Demonstrate the ability to conduct quality control tests for various dosage forms and packaging materials.
		MPA205PB.2	Identify and Test Foreign Substances.
		MPA205PB.3	Prepare Regulatory Documents.
		MPA205PB.4	Perform Cosmetic and Personal Care Product Analysis.

Seminar/ Assignment	MPA206S	MPA206S.1	Apply advanced cognitive skills to gather information through literature review and experiments.
		MPA206S.2	Showcase comprehension and adherence to ethical principles and regulations set by regulatory bodies and government authorities.
		MPA206S.3	Demonstrate self-management, teamwork, unbiased decision-making, and foster learning for themselves and others.
		MPA206S.4	Utilize suitable techniques and computer tools, considering practical uses and enhancing their technical proficiency.
		MPA206S.5	Employ analytical methods and engage in discerning and reflective thinking to address challenges and reach justifiable conclusions.
		MPA206S.6	Develop a comprehensive understanding of Pharmaceutical analytical skills incorporating worldwide viewpoints.
Research Methodology and Biostatistics*	MRM301T	MRM301T.1	Explain qualitative and quantitative aspects of clinical study design
		MRM301T.2	Interpret Various Biostatistical methods in Modern Analytical & Bioanalytical Techniques
		MRM301T.3	Describe various ethical guidelines for biomedical research.
		MRM301T.4	Enumerate various CPCSEA guidelines for laboratory animal facility.
		MRM301T.5	Discuss the principals of Declaration of Helsinki for Medical Research.
		MRM301T.6	Understand Research writing and Review of Literature
Journal Club	MRM302S	MRM302S.1	Understanding and debating current topics of active interest in their field
		MRM302S.2	Apply skills to use search engines for selection of scientific articles of their interest
		MRM302S.3	Analyze the critical thinking skills in appraisal of the scientific literature
		MRM302S.4	Create a scientific report on the critically appraised article
		MRM302S.5	Evaluate detailed knowledge of a specific area of research including the literature published in that area, its underlying concepts, theories and assumptions.
		MRM302S.6	Apply ability to write various types of manuscripts

Discussion and Presentation	MRM303S	MRM303S.1	Discuss the Good Laboratory practices followed in Pharmaceutical Industry
		MRM303S.2	Extraction of drugs and analysis of biological sample.
		MRM303S.3	Role of Advanced instrumentation in characterization of degradants and impurities
		MRM303S.4	Good documentation practices followed in Pharmaceutical Industry
		MRM303S.5	Importance of Intellectual property rights for pharmaceutical R&D
		MRM303S.6	Analyze and Demonstrate problem solving skills and apply theoretical knowledge
Research Work and Colloquium	MRM304S	MRM304S.1	Demonstrate the UV absorption spectra of various functional groups by Woodward Fiesure rule
		MRM304S.2	Demonstrate the extraction of drugs and metabolites from biological matrix Protein precipitation and Liquid -Liquid Extraction
		MRM304S.3	Demonstration and Analysis of pesticide residues on food products
		MRM304S.4	Development of Stability indicating HPLC analytical method for drug substance
		MRM304S.5	Simultaneous estimation of multi-component containing formulation using spectroscopy and chromatography
		MRM304S.6	Characterization of unknown compounds using FTIR, NMR and Mass Spectrometry.
Journal Club	MRM401P	MRM401P.1	Understanding and debating current topics of active interest in their field
		MRM401P.2	Apply skills to use search engines for selection of scientific articles of their interest
		MRM401P.3	Analyze the critical thinking skills in appraisal of the scientific literature
		MRM401P.4	Create a scientific report on the critically appraised article
		MRM401P.5	Evaluate detailed knowledge of a specific area of research including the literature published in that area, its underlying concepts, theories and assumptions.
		MRM401P.6	Apply ability to write various types of manuscripts

Discussion and Presentation	MRM403P	MRM403P.1	Discuss the Good Laboratory practices followed in Pharmaceutical Industry
		MRM403P.2	Extraction of drugs and analysis of biological sample.
		MRM403P.3	Role of Advanced instrumentation in characterization of degradants and impurities
		MRM403P.4	Good documentation practices followed in Pharmaceutical Industry
		MRM403P.5	Importance of Intellectual property rights for pharmaceutical R&D
		MRM403P.6	Analyze and Demonstrate problem solving skills and apply theoretical knowledge
Research Work and Colloquium	MRM404P	MRM404P.1	Demonstrate the UV absorption spectra of various functional groups by Woodward Fiesure rule
		MRM404P.2	Demonstrate the extraction of drugs and metabolites from biological matrix Protein precipitation and Liquid -Liquid Extraction
		MRM404P.3	Demonstration and Analysis of pesticide residues on food products
		MRM404P.4	Development of Stability indicating HPLC analytical method for drug substance
		MRM404P.5	Simultaneous estimation of multi-component containing formulation using spectroscopy and chromatography
		MRM404P.6	Characterization of unknown compounds using FTIR, NMR and Mass Spectrometry.