1. Course Outcomes of M.Pharm First Year (Analysis)

S.No	Course Name with code	Co Number	Course Outcome
M.Pharm First Year			
1	Modern Pharmaceutical Analytical Techniques (MPA101T)	CO1	Demonstrates about UV-Visible spectroscopy, IR spectroscopy, Spectro flourimetry, Flame emission spectroscopy and Atomic absorption spectroscopy and instrumentations.
		CO2	Develops knowledge of NMR spectroscopy Quantum numbers and their role in NMR, and also principles of FT-NMR and13CNMR.
		CO3	Demonstrates the Mass Spectroscopy Principle, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation, Meta stable ions, Isotopic peaks.
		CO4	chromatography of TLC,HPLC,HPTLC,Ultra-HPLC,ION exchange chromatography,column chromatography, gas chromatography, gel chromatography.
		CO5	Explains about Paper electrophoresis, Gel electrophoresis, Capillary electrophoresis, Zone electrophoresis, Moving boundary electrophoresis, Iso-electric focusing. X ray Crystallography
		CO6	Builds knowledge about Potentiometry, Thermal Techniques, Differential Thermal Analysis (DTA),derivative differential thermal analysis (DDTA), TGA
2	Advanced Pharmaceutical Analysis	CO1	Discus-ICH Guidelines for impurities in new drug products including specification and qualification of degradant products. Classify residual solvents, Analytical Procedures, limits and report
		CO2	Summarize – Elemental impurities, classification, control, potential source and identification, analytical procedure, instrumentation & C, H, N and S analysis, Stability testing protocols.
		CO3	Evaluation and Asses the impurity profiling and degradant characterization includes Method development, stability studies, validation, accelerated stability studies and shelf life calculation, WHO and ICH guidelines.
		CO4	Explain- stability testing of phytopharmaceuticals Differentiate HPLC vs HPTLC, assess interactions and complexity.
		CO5	Discuss- biological tests and assays for Tetanus vaccine, Diphtheria vaccine, anti-haemophilic vaccine, rabiesvaccine, tetanusantitoxin, tetanus anti –serum, oxytocin, heparin, antivenom, PCR.
		CO6	Explain-basic principles , production antibodies, separation of bound and unbound drug , radio immune assay, qualification and applications.

3	Pharmaceutical Validation	CO1	Describe about Qualification and Validation, Qualification - User Requirement Specification, Design Qualification, Factory Acceptance Test (FAT)/ Site Acceptance Test (SAT), Types of Qualifications, Re-Qualification. (REMEMBER)
		CO2	Demonstrate Qualification of Manufacturing Equipments, Analytical Instruments and Laboratory equipments. (UNDERSTAND)
		CO3	Summarize the concept of Qualification of Analytical Instruments - Electronic balance, pH meter, UV-Visible spectrophotometer, FTIR, GC, HPLC, HPTLC Qualification of Glassware. (UNDERSTAND)
		CO4	Classify about Validation of utility systems. (ANALYZE)
		CO5	Explain the importance of Analytical Method Validation - General principles, Validation of analytical method as per ICH guidelines and USP. Computerized system validation. (UNDERSTAND)
		CO6	Discuss about General Principles, Types and Concepts of Intellectual Property Rights. (UNDERSTAND)
		CO7	Contrast PCT and convention patent applications, International Patenting requirement procedures and costs; Rights and responsibilities of a patentee; Practical aspects regarding maintaining of a Patent file; Patent infringement meaning and scope. Significance of transfer technology (TOT), IP and ethics-positive and negative aspects of IPP; Societal responsibility, avoiding unethical practices. (ANALYZE)
4	Food Analysis **(MPA 104T)**	CO1	Explain about Carbohydrates, Dietary fibre, Crude fibre & Chemistry. Classification of amino acids, absorption and metabolism of proteins. (UNDERSTAND)
		CO2	Enumerate about Lipids, refining of fats and oils, hydrogenation of vegetable oils. (REMEMBER)
		CO3	Demonstrate Adulteration and its types, Vitamins, Methods of analysis of Vitamins, Microbial assay of vitamins of B-series. (UNDERSTAND)
		CO4	Discuss about Food additives, Analysis of Preservatives, antioxidants, artificial sweeteners, flavours, flavour enhancers, stabilizers, thickening and jellying agents, Pigments and synthetic dyes. (UNDERSTAND)
		CO5	Characterize the general Analytical methods for milk, milk constituents and milk products like ice cream, milk powder, butter, margarine, cheese and their adulteration & fermentation products. (ANALYZE)
		CO6	Categorise Pesticide analysis & effects of pest and insects on various food, Pesticides in agriculture, Pesticide cycle, & Pesticide residues in grain, fruits, vegetables, milk and milk products. (ANALYZE)
		CO7	Illustrate BIS, Agmark, FDA and US-FDA. (UNDERSTAND)

5	Pharmaceutical Analysis Practical 1	CO1	Differentiate - Analysis of Pharmacopoeial compounds , Simultaneous estimation of multi component and their formulations by UV Vis spectrophotometer and Estimation of riboflavin/quinine sulphate by Spectrofluorometry
		CO2	Experiments based on HPLC& GC ,Impurity profiling of drug
		CO3	Estimation of sodium/potassium by flame photometry
		CO4	Assay of official compounds by different titrations
		CO5	Evaluate- Quantitative determination of hydroxyl group, amino group, and different reagents.
		CO6	Demonstrate - Calibration of glass wares, pH meter, UV-Visible spectrophotometer, FTIR spectrophotometer, GC instrument, HPLC instrument.

2. Course Outcomes of M.Pharm First Year Second Semester

S.No	Course Name with code	Co Number	Course Outcome
M.Pharm First Year second semester			
1	Advanced Instrumental Analysis (MPA 201T)	CO1	Explain - basics of chromatography and principle, instrumentation, Pharmaceutical applications for HPLC, and HILIC approaches.
		CO2	Explain- size exclusion, ion exchange, affinity, ion pair chromatography for stationary phases and mobile phases, gas chromatography principle, instrumentation,derivatization, headspace, columns.
		CO3	Explain -High performance Thin Layer chromatography Principles,instrumentation, pharmaceutical applications
		CO4	Explain- principle, instrumentation, Pharmaceutical applications for Supercritical fluid chromatography, capillary electrophoresis, method development.
		CO5	Explain- principle,instrumentation, Pharmaceutical applications forMass spectroscopy, Ionization Techniques and Mass Analysers.
		CO6	Compare -principle, instrumentation, Pharmaceutical applications for NMR Spectroscopy. FT-NMR, C13 NMR, 2-D NMR, LC –NMR Hyphenations.
2	Modern Bio-Analytical (MPA202T)	CO1	Describe basics of drugs and metabolites from biological matrices, Extraction and its principles.
		CO2	Discuss Bio analytical method validation: USFDA and EMEA guidelines.
		CO3	Explain biopharmaceutical factors affecting drug bioavailability, compute dissolution and drug release testing, and demonstrate bio pharmaceutics classification system.
		CO4	Prediction of drug interaction, cytochrome P450 based drug interactions, Microsomal Assays, Toxicokinetic –toxicokinetic evaluation, LC-MS bioactivity screening and proteomics.
		CO5	Discuss cell culture techniques including equipment's, cell culture

			media, isolation of cells, subculture. Cryopreservation ,viability Assays and flow cytometry applications.
		CO6	Evaluate - Metabolite identification, protocols and sample preparation, microsomal approaches and drug product performance include bioavailability, bioequivalence and evaluation of bioequivalence studies.
3	Quality control and Quality Assurance (MPA203T)	CO1	**Review** the concepts of QAQC, GLP.GMP, ICH guidelines **(UNDERSTAND)**
		CO2	**Discuss** about cGMP guidelines according to schedule M, USFDA (inclusiveof CDER and CBER), PIC, WHO and EMEA along with CPCSEA guidelines. **(UNDERSTAND)**
		CO3	**Determine** the Analysis of raw materials, finished products, packagingmaterials, IPQC and Finished product quality control as per IP, BP, USP **(APPLY)**
		CO4	**Summarize** the Developing specification (ICH Q6 and Q3) **(UNDERSTAND)**
		CO5	**Review** the documentation in pharmaceutical industry **(UNDERSTAND)**
		CO6	**Evaluate** Manufacturing operations and controls in pharmaceutical industry **(EVALUATE)**
4	Herbal and cosmetic Analysis (MPA204T)	CO1	Develops knowledge on the herbal remedies – toxicity, Efficacy of herbal medicine products, Validation of Herbal Therapies, Pharmacodynamics and Pharmacokinetic issues. Updated Guidelines on herbal drug standardization: WHO and AYUSH.
		CO2	Builds knowledge on Adulteration and Deterioration, Sampling Procedures, Determination of Foreign Matter, DNA Finger printing techniques in identification of drugs of natural origin, heavy metals, pesticide residues, phototoxin and microbial contamination in herbal formulations. Regulatory requirements for setting herbal drug industry.
		CO3	Develops knowledge on Testing of natural products and drugs Effect of herbal medicine on clinical laboratory testing, Adulterant Screening using modern analytical instruments, Stability testing of natural products. Monographs of Herbal drugs: Study of monographs of herbal drugs and comparative study in IP, USP, Ayurvedic Pharmacopoeia, American herbal Pharmacopoeia, British herbal Pharmacopoeia, Siddha and Unani Pharmacopoeia, WHO guidelines in quality assessment of herbal drugs.
		CO4	Develops knowledge on Herbal drug-drug interaction, WHO and AYUSH guidelines for safety monitoring of natural medicine, in monitoring the safety of herbal medicines.
		CO5	Develops knowledge on Evaluation of cosmetic products-Determination of acid value, ester value, saponification value, iodine value, peroxide value, rancidity, moisture, ash, volatile matter, heavy

			metals, fineness of powder, density, viscosity of cosmetic raw materials and finished products.

		CO6	Study of quality of raw materials and general methods of analysis of raw material used in cosmetic manufacture. Indian Standard specification sampling and testing of various cosmetics in finished forms by the Bureau Indian Standards.
5	Pharmaceutical Analysis Practical II (MPA205P)	CO1	Comparison of absorption spectra by UV and Wood ward – Fiesure rule.
		CO2	Interpretation of organic compounds by FT-IR, NMR, Mass,
		CO3	Determination of purity by DSC in pharmaceuticals
		CO4	Bio molecules separation utilizing various sample preparation techniques and Quantitative analysis of components by gel electrophoresis.
		CO5	Evaluate -Bio molecules separation utilizing various sample preparation techniques and Quantitative analysis of components by HPLC techniques & Isolation of analgesics from biological fluids (Blood serum and urine)
		CO6	Describe-Protocol preparation and performance of analytical/Bio analytical method validation and BA/BE studies according to guidelines.