M.PHARMACY PROGRAMME

PHARMACEUTICAL ANALYSIS

M.PHARMACY PROGRAMME – PHARMACEUTICAL ANALYSIS

PROGRAMME OUTCOMES (PO's)	
PO 1	**Analytical Knowledge:** Acquire knowledge on various chromatographic and spectroscopic techniques and differentiate with volumetric analysis.
PO 2	**Analytical Reasoning:** To categorize assumptions and disclose the data according to guidelines.
PO 3	**Problem Solving:** To utilize the principles of analytical techniques with clear and critical thinking, while solving problems and making decisions. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.
PO 4	**Modern Techniques:** To learn, choose and apply appropriate hyphenated methods and procedures and related computing tools with thoughtfulness of their applications.
PO 5	**Experimental Ethics:** To believe and follow ethics and guidelines specified by the regulatory authorities of various countries and Government of India for good laboratory practice.
PO 6	**Interdisciplinary Commitment:** To acquire skill oriented practical ability and utilize the needs of pharmacy in all other programmes to emerge as potent researcher.
PO 7	**Professional Identity:** To be committed and responsible person to play a proactive role with loyalty to community and to empower society.
PO 8	**Statistical Skills:** To apply and evaluate quantitative metrics to gain safety data on dosage and also to compare the effectiveness among different marketed formulations.
PO 9	**Rational Flexibility:** To engage in critical and logical thinking and to gain an overall knowledge in developing newer methods, impurity profiling and validation protocols those are useful in routine and laboratory purpose.
PO 10	**Environment and Sustainability:** To understand the level of biohazardous solvents and chemicals in relation to environmental contexts and sustainable development.
PO 11	**Lifelong Learning:** Understand and apply the concepts in day to day life activities for the benefit of self and for the welfare of society.

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PROGRAMME EDUCATIONAL OBJECTIVES (PEO's)	
PEO1	**Erudition:** Program encompasses the students with profound functional knowledge in core subjects of pharmaceutical Analysis. This enables students to understand the basics of analytical methods to test the drug molecules. This will also enable students to learn the basic theory of analytical tools.
PEO2	**Substantive skills:** To provide students with a strong foundation of analytical aspects such as handling of instruments, principles, method development, method validation, testing of samples and report the results accurately.
PEO3	**Breadth:** To train students to understand different hyphenated techniques and apply them practically. To train the students to understand different bio-analytical methods and analyze the bio-analytical samples.
PEO4	**Analytical skills:** Implementation of innovative teaching learning methodologies with visual aids/ computer aided tools empowers the students in understanding the concepts with clarity and transparency. Students are trained in handling of software's to report the results in a transparent manner.
PEO5	**Personal Attribute:** To inculcate in students professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach and an ability to relate Pharmaceutical and Health care issues to broader social context.

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PROGRAMME SPECIFIC OUTCOMES (PSO's)	
PSO1	To deal with various hyphenated instrumental techniques for identification, characterization and quantification of drugs.
PSO2	To provide studies on drug bioavailability, pharmacodynamics, cell culture techniques and ensure the efficacy and safety use of herbal medicine according to AYUSH guidelines.
PSO3	To understand calibration, validation methodologies and their applications in industry.
PSO4	To determine the assay of drugs by spectroscopical and chromatographical methods and preservatives in food and food products.
PSO5	To understand quality assurance aspects of pharmaceutical industries such as cGMP, documentation, certification, GLP and other regulatory guidelines.
PSO6	To create a talent pool by involving students in research projects under the guidance of faculty and for publishing their research work.
PSO7	To impart knowledge about extraction and separation of drugs from biological samples by different analytical techniques.
PSO8	To deal with detection of impurities in pharmaceutical formulations and development of protocol for stability testing of products.

Programme	**:**	I/II M.Pharmacy
Semester/Year of Study	**:**	1st Semester
Branch	**:**	**Pharmaceutical Analysis**
Course Name	**:**	Modern Pharmaceutical Analytical Techniques
Course code	**:**	21S01101 T (Theory)

C101.1	To recall selected instrumental analytical techniques (spectroscopic, chromatographic, electrochemical methods) and relate with volumetric analysis.
C101.2	To gain knowledge on interaction of EMR with matter, affinity of matter with stationary phase and mobile phase, physical and chemical changes of matter on heating, potential differences in different aqueous and organic solution.
C101.3	To build the analytical understanding in the level of ion, atom, group and molecular structure of organic and inorganic compounds with different functional groups and their applications in pharmacy.
C101.4	To categorize different organic and inorganic compounds using suitable spectroscopy, chromatography, electrophoresis, thermal and immuno assay.
C101.5	To elaborate principle, theory and instruments employed for the analysis of drugs.
C101.6	To maximize knowledge of electrophoresis, immunological, thermal and X-Ray crystallographic techniques.

Programme	**:**	I/II M.Pharmacy
Semester/Year of Study	**:**	1st Semester
Branch	**:**	**Pharmaceutical Analysis**
Course Name	**:**	Advanced Pharmaceutical Analysis
Course code	**:**	21S07101 T (Theory)

C102.1	To learn the impurity and stability studies in API'S and new drug products.
C102.2	To understand the classification and quantification procedures as ICH.
C102.3	To illustrate the identification of elemental impurities, analytical procedures, instrumentation, C, H, N & S analysis and stability testing protocols as per ICH.
C102.4	To explain impurity profiling, degradant characterization as per ICH and WHO and also stability guidelines for biological products as per ICH.
C102.5	To evaluate the testing of phytopharmaceuticals as per regulatory requirements including finger printing interactions.

Programme : I/II M.Pharmacy

Semester/Year of Study : 1st Semester

Branch : **Pharmaceutical Analysis**

Course Name : Pharmaceutical & Food Analysis

Course code : 21S07102 T (Theory)

C104.1	To recall the knowledge on analysis of primary metabolites
C104.2	To discuss skill oriented approach on analytical techniques in the determination of food additives
C104.3	To produce awareness on natural products and its applications
C104.4	To analyze the traces of pesticides in various products
C104.5	To explain legislation and regulations of analysis of food products
C104.6	To get aware of analytical procedures of milk products and fermentation products

Programme : I/II M.Pharmacy

Semester/Year of Study : 1st Semester

Branch : **Pharmaceutical Analysis**

Course Name : Quality Control and Quality Assurance

Course code : 21S07103 T (Theory)

C203.1	To remember the quality assurance, quality management concepts and quality control tests.
C203.2	To create the document maintenance in industry with required regulatory body guidelines, to analyze the complaints and documents maintenance in industry.
C203.3	To understand the good laboratory practice and GMP concepts as per ICH
C203.4	To analyze the raw materials, finished product, packaging materials as per IP, USP, BP and to check for the compliance
C203.5	To evaluate the organization and personal responsibilities as per USFDA and WHO
C203.6	To discuss the manufacturing operations and controls of pharmaceutical products and documentation

Programme : M.Pharmacy

Semester/Year of Study : Ist Semester

Branch : **Pharmaceutical Analysis**

Subject Name : Modern Pharmaceutical Analytical Techniques Lab

Subject code : 21S01105 L (Practical)

C1105.1	Recall and relate the principle of spectroscopy, chromatography and other commonly usedinstrumental methods of analysis.
C1105.2	Train the students and to give hands ontraining on these sophisticated instruments.
C1105.3	Perform quantitative & qualitative analysis ofdrugs using various analytical instruments like UV-visible and IR spectrophotometer andHPLC.
C1105.4	Plan and select lab experiments using appropriate analytical skills. Evaluate thequantity of a drug in a given formulation.
C1105.5	Practice them on solving spectral problems andgenerate a comprehensive analytical report on the findings.
C1105.6	Interpret spectra of UV-visible, IR, NMR andMass to identity the given compound.

Programme : I/II M.Pharmacy

Semester/Year of Study : 1st Semester

Branch : **Pharmaceutical Analysis**

Course Name : Pharmaceutical & Food Analysis Lab

Course code : 21S07104 L (Practical)

C104.1	To recall the knowledge on analysis of primary metabolites
C104.2	To discuss skill oriented approach on analytical techniques in the determination of food additives
C104.3	To produce awareness on natural products and its applications
C104.4	To analyze the traces of pesticides in various products
C104.5	To explain legislation and regulations of analysis of food products
C104.6	To get aware of analytical procedures of milk products and fermentation products

Programme : M.Pharmacy

Semester/Year of Study : Ist Semester

Branch : **Pharmaceutical Analysis**

Subject Name : Disaster Management

Subject code : 21DAC101b T (Theory)

C101b.1	Analyze the vulnerability of an area to natural and man-made disasters/hazards as per the guidelines to solve complex problems using appropriate techniques ensuring safety, environment and sustainability.
C101b.2	Propose appropriate mitigation strategies for earthquake and tsunami impacts as per code of practice using suitable techniques ensuring safety, environment and sustainability beside communicatingeffectively in graphical form.
C101b.3	Analyze the causes and impacts of floods,cyclones and droughts using appropriate tools and techniques and suggest mitigation measures ensuring safety, environment and sustainability besides communicatingeffectively in graphical form.
C101b.4	Analyze the causes and impacts of landslides using appropriate tools and techniques and suggest mitigation measures ensuring safety, environment and sustainability.
C101b.5	Design disaster management strategies to solve pre, during and post disaster problems using appropriate tools and techniques following the

Programme : I/II M.Pharmacy

Semester/Year of Study : 2nd Semester

Branch : **Pharmaceutical Analysis**

Course Name : Advanced Instrumental Analysis

Course code : 21S07201 T (Theory)

C201.1	To recall selected instrumental analytical techniques and immobilized polysaccharide chiral stationary phases
C201.2	To gain knowledge on affinity of matter with stationary phase and mobile phase in different chromatographic techniques and capillary electrophoresis
C201.3	To explain the instrumentation of mass and NMR and their hyphenated techniques with applications

C201.4	To illustrate principle, theory and instruments employed for the analysis of drugs
C201.5	To evaluate the drugs using conventional and hyphenated instrumental techniques
C201.6	To maximize the knowledge on interpretation of spectra for structural analysis

Programme : I/II M.Pharmacy

Semester/Year of Study : 2nd Semester

Branch : **Pharmaceutical Analysis**

Course Name : Modern Bio-Analytical Techniques

Course code : 21S07202 T (Theory)

C202.1	To list out the various extraction procedures and bioavailability studies.
C202.2	To explain various extraction principle and procedures involved in bioanalytical method, its validation according to USFDA and EMEA guidelines and biopharmaceutical considerations.
C202.3	To illustrate biopharmaceutics classification system, pharmaco-kinetics and toxicokinetics studies.
C202.4	To explain different cell culture and metabolite identification techniques and regulatory perspectives in assay of drugs.
C202.5	To elucidate drug product performance, *in-vivo* bioavailability and bioequivalence studies and their clinical significance.
C202.6	To create the knowledge on bioavailability and bioequivalence studies in accordance to regulatory guidelines.

Programme : I/II M.Pharmacy

Semester/Year of Study : 2nd Semester

Branch : **Pharmaceutical Analysis**

Course Name : Pharmaceutical Validation

Course code : 21S0E301a T (Theory)

C301.1a	To remember the validation, qualification, concepts and understand the qualification parameters.
C301.2a	To understand and apply the qualification of analytical instruments.
C301.3a	To demonstrate the water systems in pharmaceutical industry.

C301.4a	To explain the validation parameters according to ICH and USP.
C301.5a	To evaluate the cleaning of equipment's as per ICH cleaning validation protocol.
C301.6a	To formulate the IPR concepts as per present industry scenario

Programme : I/II M.Pharmacy

Semester/Year of Study : 2nd Semester

Branch : **Pharmaceutical Analysis**

Course Name : Herbal and Cosmetic Analysis

Course code : 21S07203 T (Theory)

C204.1	To recall the efficacy, validation, pharmacodynamics and pharmacokinetic concerned with herbal medicine products.
C204.2	To develop the skills for the detection of adulteration in herbal drugs and identification of drugs
C204.3	To choose WHO and AYUSH guidelines in quality assessment of herbal drugs
C204.4	To analyze the natural products and drugs using modern analytical instruments and study their monographs in pharmacopoeias
C204.5	To explain the safety monitoring of herbal medicine and reporting bio-drug adverse reactions
C204.6	To evaluate and analyze the herbal cosmetic products including the raw materials and finished products

Programme : I/II M.Pharmacy

Semester/Year of Study : 2nd Semester

Branch : **Pharmaceutical Analysis**

Course Name : Advanced Instrumental Analysis Lab

Course code : 21S07204 L (Practical)

C204.1	To recall selected instrumental analytical techniques and immobilized polysaccharide chiral stationary phases
C204.2	To gain knowledge on affinity of matter with stationary phase and mobile phase in different chromatographic techniques and capillary electrophoresis
C204.3	To explain the instrumentation of mass and NMR and their hyphenated techniques with applications

C204.4	To illustrate principle, theory and instruments employed for the analysis of drugs
C204.5	To evaluate the drugs using conventional and hyphenated instrumental techniques
C204.6	To maximize the knowledge on interpretation of spectra for structural analysis

Programme : I/II M.Pharmacy

Semester/Year of Study : 2nd Semester

Branch : **Pharmaceutical Analysis**

Course Name : Modern Bio-Analytical Techniques Lab

Course code : 21S07205 L (Practical)

C205.1	To list out the various extraction procedures and bioavailability studies.
C205.2	To explain various extraction principle and procedures involved in bioanalytical method, its validation according to USFDA and EMEA guidelines and biopharmaceutical considerations.
C205.3	To illustrate biopharmaceutics classification system, pharmaco-kinetics and toxicokinetics studies.
C205.4	To explain different cell culture and metabolite identification techniques and regulatory perspectives in assay of drugs.
C205.5	To elucidate drug product performance, *in-vivo* bioavailability and bioequivalence studies and their clinical significance.
C205.6	To create the knowledge on bioavailability and bioequivalence studies in accordance to regulatory guidelines.

Programme : M.Pharmacy

Semester/Year of Study : IInd Semester

Branch : **Pharmaceutical Analysis**

Subject Name : Pedagogy Studies

Subject code : 21DAC201a T (Theory)

C201a.1	Recognize the theories underlyingmethodology, searching, and learning.
C201a.2	Describe the pedagogical approaches of teachers in formal and informal classrooms in developing countries practice.
C201a.3	Analysis of pedagogical practices effectiveness.

C201a.4	Describe the teacher's classroom professionaldevelopment in detail.
C201a.5	Determine and fill research gaps for futureresearch actions.

Programme : M.Pharmacy

Semester/Year of Study : III[rd] Semester

Branch : **Pharmaceutical Analysis**

Subject Name : Research Methodology and Intellectual Property Rights

Subject code : 21DRM101 T (Theory)

CM101.1	Understand Research Problem formulation.
CM101.2	Analyze research Related information.
CM101.3	Follow research ethics.
CM101.4	Understand that today's world is controlled by computer, Information technology, but tomorrow world will be ruled by ideas, concept, and creativity.
CM101.5	Understand that when IPR would take suchimportant place in growth of individuals &nation, it is needless to emphasis the need of information about Intellectual Property Rightto be promoted among students in general &engineering in particular.
CM101.6	Understand that IPR protection provides an incentive to inventors for further research workand investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

Programme : M.Pharmacy

Semester/Year of Study : III[rd] Semester

Branch : **Pharmaceutical Analysis**

Subject Name : **Biological Screening Methods**

Subject code : 21S0E301d T (Theory)

CM301.1d	Students will be able to appraise the regulations and ethical requirement for the usage of experimental animals
CM301.2d	Students will be able to describe the various animals used in the drug discovery process
CM301.3d	Students will be able to describe good laboratory practices in maintenance and handling of experimental animals

CM301.4 d	Students will be able to describe the various newer pre-clinical screening methods involved in the drug discovery process
CM301.5 d	Students will be able to appreciate and correlate the preclinical data to humans

Subject Name: ASSIGNMENTS Year of Study: 1st M.Pharmacy 1st 2nd and 3 rd Semester	
C.1	To recall the fundamentals of proposed topic and carry out literature review.
C.2	To classify / compare, interpret the various methods and techniques.
C.3	To organize the collected data in chronological order and develop writing skills.
C.4	To analyze the data and interpret the relationships.
C.5	To evaluate and conclude the given topic.
C.6	To propose, design research in given concept and improve presentation skills.

Subject Name: SEMINARS Year of Study: 1st M.Pharmacy 1st and 2nd Semester	
C.1	To recall the fundamentals of proposed topic and carry out literature review.
C.2	To classify / compzare, interpret the various methods and techniques.
C.3	To organize the collected data in chronological order and develop writing skills.
C.4	To analyze the data and interpret the relationships.
C.5	To evaluate and conclude the given topic.
C.6	To propose, design research in given concept and improve presentation skills.

Subject Name: Co-Curricular activities Year of Study: 2nd M.Pharmacy 4th Semester	
C.1	To select the scientific concept based on literature and define the objectives of research.
C.2	To outline the hypothesis and summarize the concept for presentation.
C.3	To plan for a meeting, discuss SOWT analysis, the design and methods used in concept.
C.4	To analyze the variables and their inter relationships.
C.5	To conclude the results and to discuss its significance.
C.6	To appraise the concept for societal needs, acknowledge and improve presentation skills.

Subject Name: RESEARCH WORK I & II Year of Study: 2nd M.Pharmacy 3rd & 4th Semester	
C.1	To recall the fundamentals, carry out literature review on proposed research topic and identify research problem.
C.2	To outline the requirements toper form the proposed research.
C.3	To construct the research hypothesis.
C.4	To take part in research experiments meticulously and documentation as per format.
C.5	To evaluate and conclude the results using statistical analysis.
C.6	To appraise societal application and appreciation.