.PHARMACY - PROGRAMME EDUCATIONAL OBJECTIVES (PEO's)

	Proficiency: Programme encompasses the students with profound functional knowledge in core subjects of pharmaceutical sciences like pharmaceutical chemistry, pharmaceutical analysis, pharmaceutics, pharmacognosy, pharmacology and pharmacy practice. This enables students to be competent enough and apply these tools in pharmaceutical and health care industries, research/clinical laboratories, hospitals and community pharmacies for overall maintenance of public health.
PEO2	**Practicability (Practical aptitude):** 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 sophisticated equipment and in their troubleshooting procedures, problem based learning which makes them to apply the learned theoretical concepts to real time applications and meet the current pharmaceutical industrial demand.
PEO3	**Lifelong learner (Liaisons):** To develop globally accepted competent students in terms of punctuality, amicability, communication skills and self learning. Students are encouraged to participate in class room seminars, group discussions, exhibitions, quizzes, conferences, symposia, seminars, workshops and health care programs. This enables the students with specific hard skills, capable of understanding the most advanced technologies, research and can integrate this knowledge and skills with contemporary needs of the society.
PEO4	**Collaborator:** To inculcate collective learning, knowledge sharing and knowledge transfer through their involvement in interdisciplinary research activities and to improve leadership, team work and managerial skills which helps them to play influential roles either in an organisation or in community.
PEO5	**Professionalism:** To promote the development of scholarly thinking, professional identity and ethics among the students for their further professional growth either in the pharmaceutical and health care industries or to pursue higher studies and research.

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B.PHARMACY - PROGRAMME OUTCOMES (PO's)

PO1	**Pharmacy Knowledge:** Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioural, social, and administrative pharmacy sciences; and manufacturing practices.
PO2	**Planning Abilities:** Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.
PO3	**Problem analysis:** Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.
PO4	**Modern tool usage:** Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.
PO5	**Leadership skills:** Understand and consider the human reaction to change, motivation, issues, leadership and team-building when planning changes required for fulfilment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and wellbeing.
PO6	**Professional Identity:** Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).

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PO7	**Pharmaceutical Ethics:** Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behaviour that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.
PO8	**Communication:** Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective Presentations and documentation, and give and receive clear instructions.
PO9	**The Pharmacist and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.
PO10	**Environment and sustainability:** Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO11	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

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B.PHARMACY - PROGRAMME SPECIFIC OUTCOMES (PSO's)

PSO1	**Scientific Thinking :** Enable student's knowledge in scientific perception to understand the concepts and to solve the problems positively while making pharmaceutical formulations.
PSO2	**Analytical Skills :** Assimilate and develop analytical skills using advanced equipment to design and evaluate pharmaceutical products, also to assess their quality.
PSO3	**Resource Management :** Utilize and manage resources from natural, semi synthetic and synthetic origin to develop real time products with utmost benefit and safety.
PSO4	**Public Health Care :** Promote and empower the healthy living in the community by various means of awareness and health strategies.
PSO5	**Entrepreneurship :** Acquire and develop entrepreneurship and administration skills to establish community pharmacy, learning and training centers for the long term well being of society.

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B.PHARMACY - COURSE OUTCOMES (COs)

Programme : I/IV B.Pharmacy

Semester/Year of Study : 1st Semester

Course Name : Human anatomy and Physiology-I

Course code : BP 101T (Theory)

C101.1	To list out the various homeostatic mechanisms, basic anatomical terms and cellular level organization.
C101.2	To summarize the characteristics of different types of tissues and their location in various organs
C101.3	To organize the structure and functions of skin, bones and joints of human body.
C101.4	To analyze the importance of blood, lymphatic system and immunity in human body.
C101.5	To assess the physiology of sympathetic, parasympathetic, spinal/cranial nerves and organization of special senses.
C101.6	To adapt the anatomy and physiology of heart and blood vessels.

Programme : I/IV B.Pharmacy

Semester/Year of Study : 1st Semester

Course Name : Pharmaceutical Analysis – I

Course code : BP 102 T (Theory)

C102.1	To define the principles of volumetric analysis and recall the preparation and standardization of solutions.
C102.2	To classify the sources of errors and list out the sources of impurities & limit test.
C102.3	To apply theories of acid-base titrations and non-aqueous titrations in estimation of drugs.
C102.4	To analyze inorganic compounds by applying techniques of precipitation, complexometry, gravimetric and diazotization titrations.
C102.5	To estimate inorganic compounds by applying the techniques of redox titrations.
C102.6	To elaborate on various electrochemical methods of analysis like conductometry, potentiometry and polarography.

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Programme	:	I/IV B.Pharmacy
Semester/Year of Study	:	1st Semester
Course Name	:	Pharmaceutics – I
Course code	:	BP103T (Theory)

C103.1	To define various pharmaceutical dosage forms and how the profession of pharmacy had evolved.
C103.2	To outline the importance of prescription and posology.
C103.3	To solve pharmaceutical calculations and understand the formulation of powders and liquid dosage forms.
C103.4	To develop monophasic and biphasic liquid dosage forms.
C103.5	To explain the concepts of suppositories and pharmaceutical incompatibilities.
C103.6	To formulate and evaluate semi solid dosage forms.

Programme	:	I/IV B.Pharmacy
Semester/Year of Study	:	1st Semester
Course Name	:	Pharmaceutical Inorganic chemistry
Course code	:	BP 104 T (Theory)

C104.1	To recall the history and concept of pharmacopoeia and its editions
C104.2	To outline the sources of impurities and methods to determine the impurities in inorganic pharmaceuticals
C104.3	To select buffers in pharmaceutical systems and choose the appropriate electrolytes in therapy
C104.4	To classify and study the preparation, properties and assay of inorganic compounds
C104.5	To explain the importance of various classes of inorganic compounds and their preparations
C104.6	To discuss the radioisotopes and applications of radiopharmaceuticals

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Programme	:	I/IV B.Pharmacy
Semester/Year of Study	:	1st Semester
Course Name	:	Communication Skills
Course code	:	BP 105 T (Theory)

C105.1	To define the components of communication skills.
C105.2	To outline the barriers and perspectives in communication.
C105.3	To apply the elements of communication and make use of communication styles.
C105.4	To take part in active listening, written communication and organization of message.
C105.5	To explain the interview skills and techniques of giving presentations.
C105.6	To develop communication skills through group discussions.

Programme	:	I/IV B.Pharmacy
Semester/Year of Study	:	1st Semester
Course Name	:	Remedial Biology
Course code	:	BP 106 RBT (Theory)

C106.1	To recall the characters of living organisms andclassificationof kingdoms
C106.2	To summarize themorphology and functions of various plant parts such as root, stem, leaf, flower, fruit and seed.
C106.3	To organize the structure and functions ofcardiovascular, digestive and respiratory systems of human body
C106.4	To categorize the physiology of brain and spinal cord, and to assume the role of kidney in regulation of body fluids
C106.5	To determine role of hormones in regulation of vital functions of human body and to assess the process of oogenesis and spermatogenesis.
C106.6	To elaborate the physiology, nutrient requirements, growth and development of plants and to predict the structure and functions of plant/animal tissues.

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Programme	:	I/IV B.Pharmacy
Semester/Year of Study	:	1st Semester
Course Name	:	Remedial Mathematics
Course code	:	BP 106 RMT (Theory)

C106.1	To recall the importance of mathematics in pharmacy
C106.2	To outline the various topics in mathematics
C106.3	To make use of mathematical equations in solving problems
C106.4	To study the derivative of function, constant and their applications
C106.5	To determine the signs of coordinates, explain the rules of integration and its applications
C106.6	To discuss differential equations, write and convert elementary functions using Laplace transform

Programme	:	I/IV B.Pharmacy
Semester/Year of Study	:	1st Semester
Course Name	:	Human anatomy and Physiology-I
Course code	:	BP 107P (Practical)

C107.1	To recall handling of compound microscope and to memorize various animal tissues.
C107.2	To summarize the characteristics of different bones (skeletal system).
C107.3	To illustrate the mechanism of clotting and identify the bleeding time and blood group.
C107.4	To determine and analyse the blood cell count of human blood using hemocytometry.
C107.5	To measure the blood pressure and estimate the content of Haemoglobin in our blood.
C107.6	To predict the erythrocyte sedimentation rate of human blood and to test the heart rate/ pulse rate.

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Programme	:	I/IV B.Pharmacy
Semester/Year of Study	:	1st Semester
Course Name	:	Pharmaceutical Analysis-I
Course code	:	BP 108 P (Practical)

C108.1	To recall the calibration of glassware and apparatus used in volumetric analysis
C108.2	To demonstrate the preparation and standardization of secondary standard solutions
C108.3	To apply the limit test for impurities on inorganic compounds and compare with standards
C108.4	To analyze the inorganic compounds by employing different volumetric techniques
C108.5	To compare the assay results with pharmacopoeial standards
C108.6	To determine the endpoint of titration by electro-analytical methods

Programme	:	I/IV B.Pharmacy
Semester/Year of Study	:	1st Semester
Course Name	:	Pharmaceutics-I
Course code	:	BP 109 P (Practical)

C109.1	To recall the principles used in the preparation of solid, liquid and semi solid dosage forms.
C109.2	To illustrate monophasic liquid dosage forms for internal and external administration.
C109.3	To develop biphasic liquid dosage forms by various methods.
C109.4	To take part in preparation of powders and granules.
C109.5	To justify the use of various excipients and formulation of semi solid dosage forms.
C109.6	To formulate suppositories by moulding technique.

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Programme : I/IV B.Pharmacy
Semester/Year of Study : 1st Semester
Course Name : Pharmaceutical Inorganic Chemistry
Course code : BP 110 P (Practical)

C110.1	To recall the limit test for impurities in inorganic compounds
C110.2	To explain the modified limit test for impurities
C110.3	To experiment with identification tests for selected inorganic compounds
C110.4	To perform test for purity as per pharmacopoeial standards
C110.5	To select the requirements for preparation of compounds
C110.6	To discuss the method of preparation of selected compounds

Programme : I/IV B.Pharmacy
Semester/Year of Study : 1st Semester
Course Name : Communication Skills
Course code : BP 111 P (Practical)

C111.1	To define the basic communication skills required in day today life
C111.2	To apply the elements of communication and make use of communication styles
C111.3	To make use of proper pronunciations using consonant sounds and vowel sounds
C111.4	To take part in listening comprehension and effective writing skills
C111.5	To explain the interview handling and presentation skills
C111.6	To compose email writing and answering by following appropriate email etiquette

Programme : I/IV B.Pharmacy
Semester/Year of Study : 1st Semester
Course Name : Remedial Biology
Course code : BP 112 RBP (Practical)

C112.1	To know the handling of microscope and permanent slide preparation techniques
C112.2	To explain the structure of cell and its inclusions
C113.3	To identify various plant parts and to organize their modifications
C114.4	To categorize the physiology of frog by using models
C115.5	To assess the microscopy study and identification of tissues pertinent to stem, root, leaf, seed, fruit and flower
C116.6	To compile the bones identification, blood group, blood pressure and tidal volume determination

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Programme	:	I/IV B.Pharmacy
Semester/Year of Study	:	II[nd] Semester
Course Name	:	Human anatomy and Physiology-II
Course code	:	BP 201T (Theory)

C201.1	To outline the knowledge on central nervous system including electrophysiology, action potential and reflex activity.
C201.2	To illustrate the structure and functions of gastrointestinal tract and to outline about ATP/CTP/BMR.
C201.3	To identify the structure and functions of respiratory system and summarize the mechanisms involved in regulation of respiration.
C201.4	To simplify the anatomy of urinary system and discover the physiology of urine formation/micturition.
C201.5	To appraise the essentiality of endocrine glands and their hormones.
C201.6	To predict the physiology of male and female reproductive organs and concepts of genetics.

Programme	:	I/IV B.Pharmacy
Semester/Year of Study	:	II[nd] Semester
Course Name	:	Pharmaceutical Organic chemistry – I
Course code	:	BP 202 T (Theory)

C202.1	To recall the classification, nomenclature, isomerism and concepts of hybridization in organic compounds
C202.2	To explain the kinetics, reactivity, stability and orientation of reactions in alkanes, alkenes and conjugated dienes
C202.3	To select the method of preparation of various classes of organic compounds
C202.4	To compare the kinetics, reactivity, stereochemistry and factors influencing reactions in alkyl halides and alcohols
C202.5	To explain the named reactions of carbonyl compounds, acidity of carboxylic acids and basicity of amines
C202.6	To discuss the qualitative tests, structure and uses of selected organic compounds

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Programme	:	I/IV B.Pharmacy
Semester/Year of Study	:	II[nd] Semester
Course Name	:	Biochemistry
Course code	:	BP 203 T (Theory)

C203.1	To recall the classification, biological role, properties and significance of carbohydrates, lipids, nucleic acids, amino acids and proteins
C203.2	To outline the concepts of bioenergetics and metabolism of carbohydrates
C203.3	To apply the concept of enzyme kinetics in design of drugs, study the diagnostic and therapeutic applications of enzymes
C203.4	To distinguish the process of DNA replication, transcription and translation
C203.5	To explain the metabolism of lipids, amino acids and nucleic acids
C203.6	To discuss the causes, manifestations and diagnosis of metabolic disorders

Programme	:	I/IV B.Pharmacy
Semester/Year of Study	:	II[nd] Semester
Course Name	:	Pathophysiology
Course code	:	BP 204 T (Theory)

C204.1	To understand the process of cell injury, morphology of cell injury and cellular adaptations.
C204.2	To understand the etiopathogenesis of cardiovascular, respiratory and renal diseases mentioned.
C204.3	To apply the principles of pathogenesis in understanding symptoms, signs and complications of disease states mentioned.
C204.4	To explain the etiopathogenesis of hematologic, endocrine, nervous, gastrointestinal, musculo skeletal diseases and Immunopathogenesis of infectious diseases.
C204.5	To appraise the principles of physical, chemical and biologic carcinogenesis.
C204.6	To adapt the principles of inflammation in understanding pathogenesis of various disease states.

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Programme	:	I/IV B.Pharmacy
Semester/Year of Study	:	II[nd] Semester
Course Name	:	Computer Applications in Pharmacy
Course code	:	BP 205 T (Theory)

C205.1	To define and list the number systems, information systems and computer software
C205.2	To summarize the programming languages and databases using web technologies
C205.3	To make use of computers in pharmacy in the areas of drug design, hospital and clinical pharmacy
C205.4	To simplify the applications of computers in lab diagnostic systems, patient monitoring and pharma information systems
C205.5	To appraise the role of bioinformatics and its impact in vaccine discovery
C205.6	To elaborate the applications of computers in preclinical development

Programme	:	I/IV B.Pharmacy
Semester/Year of Study	:	II[nd] Semester
Course Name	:	Environmental Sciences
Course code	:	BP 206 T (Theory)

C206.1	To recall basic knowledge on environment and its allied problems
C206.2	To demonstrate the renewable and non-renewable resources
C206.3	To make use of the natural resources and minimize the associated problems
C206.4	To explain the structure and functions of ecosystem
C206.5	To know importance of forest, grassland, desert and aquatic ecosystem
C206.6	To propose the methods for reducing environmental pollution

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Programme	:	I/IV B.Pharmacy
Semester/Year of Study	:	IInd Semester
Course Name	:	Human Anatomy and Physiology
Course code	:	BP 207 P (Practical)

C207.1	To recall the physiology of special senses with the help of models, charts and specimens.
C207.2	To Illustrate the coordinated working of organs of human body with the help of models, charts and specimens.
C207.3	To identify the functions of cranial nerves by various sensory and motor activities.
C207.4	To evaluate body temperature and body mass index.
C207.5	To measure tidal volume and vital capacity.
C207.6	To elaborate the knowledge on family planning devices, pregnancy diagnostic tests, tissues of vital organs and gonads.

Programme	:	I/IV B.Pharmacy
Semester/Year of Study	:	IInd Semester
Course Name	:	Pharmaceutical Organic Chemistry-I
Course code	:	BP 208 P (Practical)

C208.1	To recall the molecular models of organic compounds and their preliminary qualitative tests
C208.2	To compare the physical constants of unknown organic compounds with reference from the literature
C208.3	To experiment with detection of elements and analysis of functional groups
C208.4	To analyze the organic compounds by systematic qualitative analysis
C208.5	To explain the preparation of organic compounds and their derivatives
C208.6	To discuss the appropriate method of purification of organic compounds

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Programme	:	I/IV B.Pharmacy
Semester/Year of Study	:	IInd Semester
Course Name	:	Biochemistry
Course code	:	BP 209 P (Practical)

C209.1	To recall the qualitative analysis of carbohydrates and proteins
C209.2	To explain the principle involved in estimation of blood glucose and its clinical significance
C209.3	To experiment with determination of reducing sugars by DNSA method
C209.4	To test for abnormal constituents present in urine and study their clinical significance
C209.5	To explain the preparation of buffers and determine the effect of temperature and substrate concentration on salivary amylase activity
C209.6	To estimate the amount of proteins, creatinine and cholesterol in blood and study their clinical significance

Programme	:	I/IV B.Pharmacy
Semester/Year of Study	:	IInd Semester
Course Name	:	Computer Application in Pharmacy
Course code	:	BP 210 P (Practical)

C210.1	To find information about a particular disease and draft a questionnaire using word processing package
C210.2	To translate HTML web page to show personal information and summarize the information of a drug using online tools
C210.3	To experiment with MS Word and MS Access to create mailing labels and database to store patient information
C210.4	To take part in generating report from patient database and simplify invoice table using MS Access
C210.5	To support drug information storage and retrieval using MS Access
C210.6	To adapt and modify data using MS Access, web pages and XML pages

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Programme	:	II/IV B.Pharmacy
Semester/Year of Study	:	3rd Semester
Course Name	:	Pharmaceutical Organic Chemistry-II
Course code	:	BP 301 T (Theory)

C301.1	To recall the structure, properties and reactions of benzene
C301.2	To outline the properties of fats and oils and study their analytical constants
C301.3	To identify the effect of substituents on properties of carboxylic acids, phenols and amines
C301.4	To categorize the organic compounds and study their structure and uses
C301.5	To explain the reactions and stabilities of cycloalkanes
C301.6	To discuss the polynuclear hydrocarbons and explain their synthesis and reactions

Programme	:	II/IV B.Pharmacy
Semester/Year of Study	:	3rd Semester
Course Name	:	Physical Pharmaceutics - I
Course code	:	BP 302 T (Theory)

C302.1	To recall the states of matter and understand the applications of various physiochemical properties to design dosage forms.
C302.2	To outline on pH, buffers and their use in the stabilization of pharmaceutical formulations.
C302.3	To illustrate the importance of solubility in designing of dosage forms and principles of diffusion in biological systems.
C302.4	To simplify the principles of interfacial tension and the applications of surface active agents in drug solubilization.
C302.5	To appraise the concepts of complexation and protein binding in pharmacy.
C302.6	To estimate the thermodynamic stability constants of complexes.

Programme	:	II/IV B.Pharmacy
Semester/Year of Study	:	3rd Semester
Course Name	:	Pharmaceutical Microbiology
Course code	:	BP 303 T (Theory)

C303.1	To remember the scope of microbiology and its branches, methods of classification, structure, growth requirements for microbes and microscopy.
C303.2	To understand the importance of identification of microbes, procedures of sterilization in pharmaceutical processing and industry.
C303.3	To utilize the knowledge in cultivation, propagation, preservation and sterilization by disinfection of various microorganisms and sterility testing.
C303.4	To examine the microbiological standards of pharmaceuticals and general aspects of environmental cleanliness.
C303.5	To choose and estimate the preservative efficacy on different types of spoilage in pharmaceutical products and animal cell culture technology.
C303.6	To compile the microbiological testing protocols in order to sterilize and identify the microbes.

Programme	:	II/IV B.Pharmacy
Semester/Year of Study	:	3rd Semester
Course Name	:	Pharmaceutical Engineering
Course code	:	BP 304 T (Theory)

C304.1	To define and list various unit operations involved in manufacturing of pharmaceuticals.
C304.2	To outline the concepts of flow of fluids, size reduction and size separation.
C304.3	To apply the basic principles, mechanisms of different types of evaporation/distillation processes and compare other heat process.
C304.4	To simplify the mechanisms of various drying, mixing processes, and their application in pharmaceutical industry.
C304.5	To explain the principles, mechanisms of filtration, centrifugation, and determine the factors influencing filtration/centrifugation.
C304.6	To elaborate various corrosion preventive methods in pharmaceutical industries.

Programme	:	II/IV B.Pharmacy
Semester/Year of Study	:	3rd Semester
Course Name	:	Professional Ethics and Human Values
Course code	:	BP 305 T (Theory)

C305.1	To remember the human values and professional ethics.
C305.2	To outline the ethical norms, anti corruption measures and central vigilance bodies.
C305.3	To apply moral concepts and reasoning in pharmacy.
C305.4	To list out ethical issues in clinical pharmacy practice and manufacturing of pharmaceutical products.
C305.5	To appraise professional societies and various pharmaceutical associations.
C305.6	To adapt the concept of social pharmacy and principles of ethics.

Programme	:	II/IV B.Pharmacy
Semester/Year of Study	:	3rd Semester
Course Name	:	Pharmaceutical Organic Chemistry – II
Course code	:	BP 305 P (Practical)

C305.1	To recall the principles involved in the analysis of fixed oils
C305.2	To understand the methods involved in analysis of fats and oils
C305.3	To relate the experimental values of fat constants with reference values
C305.4	To experiment with preparation of organic compounds
C305.5	To explain the recrystallization and steam distillation techniques to purify organic compounds
C305.6	To plan for purification and characterization of synthesized organic compounds

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Programme	:	II/IV B.Pharmacy
Semester/Year of Study	:	3rd Semester
Course Name	:	Physical Pharmaceutics - I
Course code	:	BP 306 P (Practical)

C306.1	To recall the significance of physical properties such as solubility, surface tension, partition coefficient and pK_a in the design of dosage forms.
C306.2	To interpret adsorption isotherms and determine Freundlich-Langmuir's constant using activated charcoal.
C306.3	To apply Henderson - Hasselbalch equation for interpretation of pK_a value of drugs.
C306.4	To examine the surface tension of sample liquids by drop count and drop weight methods.
C306.5	To determine the HLB value and critical micellar concentration of a surfactant.
C306.6	To estimate the stability constants of complexes by solubility and pH titration methods.

Programme	:	II/IV B.Pharmacy
Semester/Year of Study	:	3rd Semester
Course Name	:	Pharmaceutical Microbiology
Course code	:	BP 307 P (Practical)

C307.1	To recall different techniques of sterilization and equipment used in microbiology laboratory.
C307.2	To outline various staining methods and isolation methods for culturing of microbes.
C307.3	To identify the results of microbial standardization of antimicrobial agents.
C307.4	To test for possible microbial contaminants in a given sample.
C307.5	To estimate qualitatively and quantitatively the amount of microbes in the given sample.
C307.6	To choose the correct method to evaluate and identify the microbial contamination.

Programme	:	II/IV B.Pharmacy
Semester/Year of Study	:	3rd Semester
Course Name	:	Pharmaceutical Engineering
Course code	:	BP 308 P (Practical)

C308.1	To recall the basic principles involved in unit operations such as size reduction, size separation, distillation and drying.
C308.2	To demonstrate and explain about the construction, working, applications of pharmaceutical equipment such as colloid mill, planetary mixer, fluidized bed dryer and freeze dryer.
C308.3	To experiment with the process variables of filtration, evaporation, crystallization and infer the same.
C308.4	To test for the radiation constant of brass, iron, unpainted and painted glass.
C308.5	To determine overall heat transfer coefficient by heat exchanger and calculate the efficiency of steam distillation.
C308.6	To estimate moisture content, loss on drying and construct drying curves for calcium carbonate and starch.

Programme	:	II/IV B.Pharmacy
Semester/Year of Study	:	4th Semester
Course Name	:	Pharmaceutical Organic Chemistry – III
Course code	:	BP 401 T (Theory)

C401.1	To recall the elements of symmetry and nomenclature of stereoisomers.
C401.2	To explain the concepts of optical isomerism, geometrical isomerism and conformational isomerism.
C401.3	To apply stereoisomerism in biphenyl compounds and study stereospecific and stereoselective reactions.
C401.4	To classify and study the nomenclature, synthesis and reactions of heterocyclic compounds.
C401.5	To explain the medicinal uses of heterocyclic compounds and their derivatives.
C401.6	To discuss the named reactions and their synthetic importance

Programme : II/IV B.Pharmacy
Semester/Year of Study : 4th Semester
Course Name : Medicinal Chemistry – I
Course code : BP 402 T (Theory)

C402.1	To recall the physicochemical properties and metabolism of drugs
C402.2	To classify drugs and write their structure, MOA and uses
C402.3	To select the method of synthesis for drugs
C402.4	To compare the structural requirements of drugs with activity
C402.5	To explain the applications, advantages and limitations of drugs
C402.6	To discuss the importance of natural products as drugs

Programme : II/IV B.Pharmacy
Semester/Year of Study : 4th Semester
Course Name : Physical Pharmaceutics - II
Course code : BP 403 T (Theory)

C403.1	To recall dispersed systems and list the properties and applications of colloidal dispersions.
C403.2	To illustrate the principles of kinetics in the stabilization of dosage forms.
C403.3	To build the rheograms of fluids and illustrate the physics of tablet compression.
C403.4	To compare coarse dispersions measuring rheological and electrical properties.
C403.5	To assess powder properties and assume their importance in formulation development.
C403.6	To elaborate the concepts of fundamental and derived properties of powders.

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Programme : II/IV B.Pharmacy
Semester/Year of Study : 4th Semester
Course Name : Pharmacology – I
Course code : BP 404 T (Theory)

C404.1	To define the fundamental concepts of pharmacology and pharmacokinetics.
C404.2	To explain the basics of pharmacodynamics, adverse reactions, drug interactions and drug discovery
C404.3	To identify the role of neurohumoral transmission and drugs acting on peripheral nervous system.
C404.4	To analyse the functions of neurotransmitters and drugs acting on central nervous system.
C404.5	To appraise the pharmacology of psychopharmacological agents.
C404.6	To predict the effects of drugs against neurodegenerative disorders and elaborate the concepts of drug addiction /abuse /tolerance / dependence.

Programme : II/IV B.Pharmacy
Semester/Year of Study : 4th Semester
Course Name : Pharmacognosy and Phytochemistry – I
Course code : BP 405 T (Theory)

C405.1	To recall the history, scope, development of pharmacognosy. To list different sources along with classification of crude drugs
C405.2	To Interpret quality control of drugs along with cultivation, collection, processing and storage of crude drugs.
C405.3	To identify the applications of advanced technologies like polyploidy, mutation and hybridization in medicinal plants.
C405.4	To examine the plant tissue culture and their applications in pharmacognosy
C405.5	To appraise the role of pharmacognosy in allopathy and traditional systems of medicine and to estimate the role of secondary metabolites
C405.6	To elaborate the pharmacognostic study of plant products and primary metabolites.

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Programme : II/IV B.Pharmacy
Semester/Year of Study : 4th Semester
Course Name : Medicinal chemistry – I
Course code : BP 406 P (Practical)

C406.1	To recall the basic requirements for synthesis of drugs.
C406.2	To explain the techniques involved in isolation and purification.
C406.3	To experiment with synthesis and characterization of drugs.
C406.4	To list out the requirements for analysis of drugs.
C406.5	To explain the analysis of drugs and report the percentage purity.
C406.6	To estimate the partition coefficient of selected drugs.

Programme : II/IV B.Pharmacy
Semester/Year of Study : 4th Semester
Course Name : Physical Pharmaceutics - II
Course code : BP 407 P (Practical)

C407.1	To recall the factors to considered in selecting suspending agent to prepare a stable suspension.
C407.2	To infer particle size, particle size distribution using sieving and microscopic methods.
C407.3	To construct and ascertain the shelf life of a given formulation by accelerated stability studies.
C407.4	To analyze fundamental and derived properties of powders to ensure a stable solid formulation.
C407.5	To determine the viscosity of liquids using Ostwald's and Brookfield's viscometer.
C407.6	To estimate the rate constants as per the chemical reaction.

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Programme	:	II/IV B.Pharmacy
Semester/Year of Study	:	4th Semester
Course Name	:	Pharmacology – I
Course code	:	BP 408 P (Practical)

C408.1	To learn about basic instruments, common laboratory animals used in experimental pharmacology and to organize animal house as per the CPCSEA guidelines.
C408.2	To demonstrate the common laboratory techniques like routes of administration, blood withdrawal, anaesthetics and euthanasia used for animal studies.
C408.3	To interpret the effects of various drugs on rabbit eye and ciliary motility of frog oesophagus in correlation with humans.
C408.4	To analyse the effect of drugs acting as enzyme inducers, skeletal muscle relaxants and affecting locomotor activity in laboratory animals
C408.5	To evaluate the stereotype and anticatatonic activity of drugs in rats/mice.
C408.6	To predict various screening models for anticonvulsant and anxiolytic activities.

Programme	:	II/IV B.Pharmacy
Semester/Year of Study	:	4th Semester
Course Name	:	Pharmacognosy and Phytochemistry–I
Course code	:	BP 409 P (Practical)

C409.1	To relate different macroscopical and microscopical characteristic features of crude drugs.
C409.2	To interpret the cellular structure of crude drugs by microscopical evaluation methods.
C409.3	To identify the crude drugs by quantitative evaluation methods.
C409.4	To analyze the crude drugs by physical methods of evaluation
C409.5	To estimate the crude drugs by chemical methods of evaluation.

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Programme	:	III/IV B.Pharmacy
Semester/Year of Study	:	5th Semester
Course Name	:	Medicinal Chemistry-II
Course code	:	BP 501 T (Theory)

C501.1	To recall the various classes of drugs and their structure
C501.2	To outline the mechanism of action and uses of drugs
C501.3	To select the method of synthesis for drugs
C501.4	To list out the structure activity relationships amongst drugs
C501.5	To explain the drugs acting on endocrine system
C501.6	To discuss the applications, advantages and limitations of drugs

Programme	:	III/IV B.Pharmacy
Semester/Year of Study	:	5th Semester
Course Name	:	Industrial Pharmacy - I
Course code	:	BP 502 T (Theory)

C502.1	To list the objectives of preformulation studies in the development and stability of dosage forms.
C502.2	To explain the formulation, manufacturing, coating and quality control tests of tablets.
C502.3	To choose manufacturing considerations and develop liquid oral formulations.
C502.4	To simplify the pharmaceutical aspects of capsules and pellets.
C502.5	To appraise the preparation, quality control of parenteral and ophthalmic preparations.
C502.6	To discuss manufacturing, evaluation of cosmetic preparations, pharmaceutical aerosols and the science of packaging materials.

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Programme	:	III/IV B.Pharmacy
Semester/Year of Study	:	5th Semester
Course Name	:	Pharmacology – II
Course code	:	BP 503 T (Theory)

C503.1	To relate the relative pros and cons in the use of drugs for various cardiac complications.
C503.2	To illustrate the drugs acting on hematopoietic system, shock, diuretics and anti-diuretics.
C503.3	To identify the role of autocoids and related drugs.
C503.4	To analyze and summarize the drugs acting on endocrine system.
C503.5	To appraise the physiological role of sex hormones and to assess the effects of oral contraceptives and drugs acting on the uterus.
C503.6	To predict the principles of bioassay and to construct the bioassay methods of various compounds.

Programme	:	III/IV B.Pharmacy
Semester/Year of Study	:	5th Semester
Course Name	:	Pharmacognosy and Phytochemistry-II
Course code	:	BP 504 T (Theory)

C504.1	To list the metabolic pathways in higher plants and their biogenetic studies.
C504.2	To outline the pharmacognostic study of plants containing secondary metabolites like alkaloids, glycosides, tannins and volatile oils.
C504.3	To identify different types and steps involved in isolation, identification and analysis of Phytoconstituents like terpenoids, glycosides, alkaloids and resins.
C504.4	To distinguish industrial production, estimation and utilization of phytoconstituents.
C504.5	To assess the crude drugs by modern methods of extraction, spectroscopy, chromatography, isolation and purification.

Programme	:	III/IV B.Pharmacy
Semester/Year of Study	:	5th Semester
Course Name	:	Pharmaceutical Jurisprudence
Course code	:	BP 505 T (Theory)

C505.1	To recall the pharmaceutical legislation, ethics and acts concerned with right to information, medical termination of pregnancy and IPR
C505.2	To outline the Drugs and cosmetics act 1940 and its rules 1945 in relation to import and manufacture of drugs
C505.3	To apply the knowledge on schedules as per Drugs and cosmetics act and rules and also administration of the act and rules
C505.4	To list out the functions of Pharmacy Council of India and registration of pharmacist
C505.5	To explain the medicinal and toilet preparations act and narcotic drugs and psychotropic substances act and rules
C505.6	To discuss the salient features of drugs and magic remedies act, prevention of cruelty to animals act and drugs price control order

Programme	:	III/IV B.Pharmacy
Semester/Year of Study	:	5th Semester
Course Name	:	Industrial Pharmacy -I
Course code	:	BP 506 P (Practical)

C506.1	To find the applications of preformulation studies.
C506.2	To illustrate the formulation and evaluation of capsules.
C506.3	To develop tablet dosage forms and apply film coating.
C506.4	To analyse parenteral and ophthalmic products.
C506.5	To explain the preparation of creams.
C506.6	To evaluate glass containers as per pharmacopoeial specifications.

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Programme	:	III/IV B.Pharmacy
Semester/Year of Study	:	5th Semester
Course Name	:	Pharmacology – II
Course code	:	BP 507 P (Practical)

C507.1	To learn the importance of physiological salt solutions and to find the effect of various drugs on isolated frog heart, blood pressure and heart rate in laboratory animals.
C507.2	To illustrate the diuretic activity of drugs in mice/rats
C507.3	To identify the dose response relationship, effect of drugs on DRC and to construct the drug concentrations by various bioassay methods using animal simulator software.
C507.4	To categorize the PA_2 and PD_2 value of drugs using rat anococcygeus muscle and guinea pig ileum.
C507.5	To interpret the effect of spasmogens and spasmolytics using rabbit jejunum.
C507.6	To predict various screening models for analgesic and anti-inflammatory activities.

Programme	:	III/IV B.Pharmacy
Semester/Year of Study	:	5th Semester
Course Name	:	Pharmacognosy and Phytochemistry-II
Course code	:	BP 508 P (Practical)

C508.1	To recall wide variety of the crude drugs and their sources by morphological characteristics
C508.2	To identify the powder mixture and to report the types of adulterants and substituent's present.
C508.3	To analyze and evaluate the powdered crude drugs by morphological and microscopical characteristics.
C508.4	To evaluate crude drugs by chemical tests
C508.5	To estimate the quality of crude drugs by performing chromatographic techniques

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Programme	:	III/IV B.Pharmacy
Semester/Year of Study	:	6th Semester
Course Name	:	Medicinal Chemistry – III
Course code	:	BP 601 T (Theory)

C601.1	To recall the various classes of drugs and their structure
C601.2	To outline the concept of prodrugs, MOA and uses of drugs
C601.3	To construct the relationship between structure and biological activity
C601.4	To select the method of synthesis for drugs
C601.5	To explain the applications, advantages and limitations of drugs
C601.6	To discuss the various approaches used in drug design and their applications

Programme	:	III/IV B.Pharmacy
Semester/Year of Study	:	6th Semester
Course Name	:	Pharmacology – III
Course code	:	BP 602 T (Theory)

C602.1	To list the drugs used in respiratory and gastrointestinal complications
C602.2	To understand the principles of chemotherapy and illustrate the mechanism of action of antibiotics.
C602.3	To explain and compare the mechanism of anti-mycobacterial, anti-fungal, anti-viral, anthelmintics, antimalarial and antiamoebic agents
C602.4	To analyze the chemotherapy of UTI's, STD's, anti-cancer drugs and to categorize the immunopharmacology.
C602.5	To assess various types of toxicity studies, principles of treatment and management of various poisoned conditions.
C602.6	To compile the biological clock and its significance leading to chronotherapy.

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Programme	:	III/IV B.Pharmacy
Semester/Year of Study	:	6th Semester
Course Name	:	Herbal Drug Technology
Course code	:	BP 603 T (Theory)

C603.1	To learn the fundamental concepts of herbal raw materials and biodynamic agriculture techniques.
C603.2	To outline the concept of nutraceuticals and herbal food Interactions.
C603.3	To apply the knowledge for evaluation and preparation of herbal formulations.
C603.4	To categorize the regulatory guidelines for the assessment of herbal drugs and patenting.
C603.5	To interpret the scope and future prospects of the herbal drug Industry.
C603.6	To predict the SOP's, infrastructure of herbal drug industries as per GMP

Programme	:	III/IV B.Pharmacy
Semester/Year of Study	:	6th Semester
Course Name	:	Biopharmaceutics & Pharmacokinetics
Course code	:	BP 604 T (Theory)

C604.1	To recall and remember basic concepts of absorption, distribution, metabolism and excretion of drugs.
C604.2	To explain the process mechanisms, interpret various factors affecting drug absorption, distribution, metabolism and excretion of drugs.
C604.3	To make use of pharmacokinetic models for the determination of pharmacokinetic parameters by compartment models.
C604.4	To analyse the bioavailability of a drug and compare the bioequivalence between formulations.
C604.5	To evaluate various pharmacokinetic parameters for the drugs exhibiting saturation kinetics.
C604.6	To design multiple dosage regimens based on pharmacokinetic parameters for maximizing therapeutic effectiveness and patient compliance.

Programme	:	III/IV B.Pharmacy
Semester/Year of Study	:	6th Semester
Course Name	:	Pharmaceutical Biotechnology
Course code	:	BP 605 T (Theory)

C605.1	To define the basic concepts of biotechnology with respect to enzyme technology, immunology, microbial technology, genetic and protein engineering.
C605.2	To relate the steps involved in recombinant DNA technology with the production of important pharmaceutical products.
C605.3	To make use of the concepts of immunology in vaccine production and blood products.
C605.4	To compare the genetic organization of different types of cells and to list detection methods at genomic level, gene transfer methods and mutagens.
C605.5	To explain general requirements of fermentative production and biotechnological production of pharmaceuticals.
C605.6	To elaborate on microbial genetics, biotransformation and various immunological products.

Programme	:	III/IV B.Pharmacy
Semester/Year of Study	:	6th Semester
Course Name	:	Pharmaceutical Quality Assurance
Course code	:	BP 606 T (Theory)

C606.1	To define the quality assurance, quality management and ICH guidelines.
C606.2	To illustrate the concepts of QbD, ISO and NABL used in the industry.
C606.3	To study the organization, personnel, premises, equipments and raw materials.
C606.4	To analyze quality control parameters and good laboratory practices.
C606.5	To evaluate the complaints and document maintenance in industry.
C606.6	To elaborate on calibration, validation and warehousing practices.

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Programme	:	III/IV B.Pharmacy
Semester/Year of Study	:	6th Semester
Course Name	:	Medicinal Chemistry-III
Course code	:	BP 607 P (Practical)

C607.1	To recall the basic requirements for synthesis of drugs.
C607.2	To explain the principle and method of preparation of drugs.
C607.3	To choose the appropriate method for assay of drugs
C607.4	To make use of microwave technique for synthesis of drugs
C607.5	To explain the drawing of chemical structures and reactions using Chemdraw.
C607.6	To determine the physicochemical properties of drugs using drug design software.

Programme	:	III/IV B.Pharmacy
Semester/Year of Study	:	6th Semester
Course Name	:	Pharmacology – III
Course code	:	BP 608 P (Practical)

C608.1	To recall the dose calculations in pharmacological experiments, and to relate the anti-allergic activity / anti-ulcer activity in rat models.
C608.2	To demonstrate the effect of drugs on gastrointestinal motility and the agonistic /antagonistic effect on guinea pig ileum
C608.3	To construct serum biochemical parameters by using semi auto analyzer.
C608.4	To analyze the effect of purgatives on frog intestine, hypoglycemic effect and test for pyrogens using rabbit method.
C608.5	To evaluate acute oral toxicity (LD_{50}), acute skin irritation / corrosion and acute eye irritation / corrosion of a test substance
C608.6	To predict the pharmacokinetic parameters and adapt the biostatistics methods in experimental pharmacology.

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Programme	:	III/IV B.Pharmacy
Semester/Year of Study	:	6th Semester
Course Name	:	Herbal Drug Technology
Course code	:	BP 609 P (Practical)

C609.1	To learn different preliminary phytochemical screening methods of crude drugs.
C609.2	To Illustrate various herbal formulations.
C609.3	To organize the monographic analysis of herbal drugs as per pharmacopoeias.
C609.4	To determine the parameters such as aldehyde and phenol contents.
C609.5	To assess the total alkaloid content.

Programme	:	IV/IV B.Pharmacy
Semester/Year of Study	:	7th Semester
Course Name	:	Instrumental Methods of Analysis
Course code	:	BP 701 T (Theory)

C701.1	To recall the principle and theory of instrumental analytical techniques
C701.2	To outline the instrumentation and applications of UV visible spectroscopy and flourimetry techniques
C701.3	To explain theory, instrumentation and applications of IR and atomic absorption spectroscopy, flame photometry and nepheloturbidometry
C701.4	To compare adsorption and partition chromatography, study the TLC and paper chromatographic techniques
C701.5	To explain the theory, instrumentation and applications of electrophoresis, GC and HPLC
C701.6	To discuss the theory, instrumentation and applications of ion exchange, gel and affinity chromatography

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Programme	:	IV/IV B.Pharmacy
Semester/Year of Study	:	7th Semester
Course Name	:	Industrial Pharmacy - II
Course code	:	BP 702 T (Theory)

C702.1	To recall stages of formulation development, pilot plant and scale up techniques.
C702.2	To outline various aspects of technology transfer from R & D to large scale production.
C702.3	To identify the regulatory requirements for drug approval.
C702.4	To analyse and study various quality management systems in pharmaceutical industry.
C702.5	To perceive drug approval procedures as per Indian regulations.
C702.6	To discuss about regulatory requirements and approval procedures for new drugs.

Programme	:	IV/IV B.Pharmacy
Semester/Year of Study	:	7th Semester
Course Name	:	Pharmacy Practice
Course code	:	BP 703 T (Theory)

C703.1	To acquire the knowledge of therapeutic drug monitoring, medication adherence and to apply the knowledge on assessment of drug related problems like adverse drug reactions and drug interactions.
C703.2	To outline the organization and structure of community pharmacy and to build ability to design and run community pharmacy.
C703.3	To demonstrate the knowledge on organization of hospitals, various methods of distribution, pharmacy and therapeutic committee and hospital formulary in hospitals and apply it in the practice of pharmacy.
C703.4	To categorize and evaluate the role of clinical pharmacist in medication history interview, drug information services, patient counseling, individualized therapy and education programmes.
C703.5	To explain the principles of drug store management, investigational drugs, OTC sales, budget and inventory control methods during practice.
C703.6	To interpret clinical laboratory tests of specific disease states to provide better patient centered service.

Programme	:	IV/IV B.Pharmacy
Semester/Year of Study	:	7th Semester
Course Name	:	Novel Drug Delivery Systems
Course code	:	BP 704 T (Theory)

C704.1	To recall fundamentals and polymers used in controlled drug delivery systems.
C704.2	To outline the concepts of formulation and evaluation of oral, mucosal and implantable drug delivery system.
C704.3	To make use of oral, mucosal, dermal, pulmonary and nasal drug delivery systems over conventional dosage forms for prolonged action.
C704.4	To simplify the principles and fundamentals in the design of site specific drug delivery systems.
C704.5	To appraise the importance of site specific drug delivery systems or devices for ocular and intra uterine routes
C704.6	To improve the rate and compliance of site specific drug delivery systems by modifying conventional dosage forms.

Programme	:	IV/IV B.Pharmacy
Semester/Year of Study	:	7th Semester
Course Name	:	Instrumental Methods of Analysis
Course code	:	BP 705 P (Practical)

C705.1	To recall the principle involved in spectroscopic methods of analysis
C705.2	To experiment with estimation of drugs by colorimetry, flourimetry and UV spectrophotometry
C705.3	To identify the quenching effect on fluorescence
C705.4	To analyze ions by flame photometry and nepheloturbidometry
C705.5	To explain and interpret separation of compounds by chromatographic techniques
C705.6	To maximize the knowledge by demonstration of HPLC and gas chromatography

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Programme	:	IV/IV B.Pharmacy
Semester/Year of Study	:	8th Semester
Course Name	:	Biostatistics and research methodology
Course code	:	BP 801 T (Theory)

C801.1	To understand the basic aspects of statistics such as central tendency, dispersion and correlation
C801.2	To make use of regression and probability while analyzing data by statistical methods.
C801.3	To explain the need of research, research designs and their applications and the process of randomization and bias.
C801.4	To assess the need of regression modeling and to build up the ability to use various statistical problems.
C801.5	To elaborate design and analysis of experiment and response surface methodology
C801.6	To build the ability to perform various parametric and non-parametric statistical tests and to draw graphs and plots based on type of India.

Programme	:	IV/IV B.Pharmacy
Semester/Year of Study	:	8th Semester
Course Name	:	Social and Preventive Pharmacy
Course code	:	BP 802 T (Theory)

C802.1	To understand the concept of health and health education
C802.2	To build the ability to aware people about preventive measures of various communicable and non-communicable diseases
C802.3	To apply the knowledge of national health programmes mentioned in the real world to serve the society
C803.4	To elaborate various vaccines under national immunization programme and their schedule
C803.5	To assess the impact of socio-cultural factors and urbanization on health
C803.6	To evaluate the health and pharmacy related problems in the societal perspective

Programme	:	IV/IV B.Pharmacy
Semester/Year of Study	:	8th Semester
Course Name	:	Pharma Marketing Management
Course code	:	BP 803 ET (Elective Subject)

C803.1	To recall the concepts of marketing.
C803.2	To explain marketing mix for pharmaceutical products.
C803.3	To plan for different types of sales promotion.
C803.4	To examine different pharmaceutical marketing channels.
C803.5	To compare pricing of various pharmaceutical products.
C803.6	To adapt to emerging concepts of marketing.

Programme	:	IV/IV B.Pharmacy
Semester/Year of Study	:	8th Semester
Course Name	:	Pharmaceutical Regulatory Science
Course code	:	BP 804 ET (Elective Subject)

C804.1	To recall the concepts of drug discovery, development process, clinical studies and generic drug product development.
C804.2	To outline the regulatory approval process and timelines for IND, NDA and ANDA.
C804.3	To make use of guidelines provided by regulatory authorities and agencies.
C804.4	To simplify the registration process of Indian drugs in overseas market.
C804.5	To explain the process of clinical trials and pharmacovigilance studies.
C804.6	To discuss the concepts of regulatory science.

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Programme : IV/IV B.Pharmacy

Semester/Year of Study : 8th Semester

Course Name : Pharmacovigilance

Course code : BP 805 ET (Elective Subject)

C805.1	To understand the history of pharmacovigilance, adverse drug reactions and basic terminologies in Pharmacovigilance.
C805.2	To make use of various drug disease classification, drug dictionaries and drug information resources in Pharmacovigilance.
C805.3	To explain various methods of pharmacovigilance and communication process during ADR reporting.
C805.4	To appraise safety data generation and ICH guidelines in pharmacovigilance.
C805.5	To evaluate drug and vaccine safety in special population and to appraise the process of haemovigilance and materiovigilance.
C805.6	To build the ability to report adverse drug reactions through various ADR reporting forms.

Programme : IV/IV B.Pharmacy

Semester/Year of Study: 8th Semester

Course Name : Quality Control and Standardization of Herbals

Course code : BP 806 ET (Elective Subject)

C806.1	To recall the WHO guidelines for the quality control of herbal drugs.
C806.2	To illustrate and outline the quality assurance in traditional system of medicine including CGMP, GAP, GMP and GLP
C806.3	To compare the quality control parameters of drugs according to European union and ICH guidelines
C806.4	To make use of research guidelines for evaluation of safety and efficacy of herbal medicine.
C806.5	To apply the knowledge of chromatography in standardization of herbal drugs and to perform the stability studies.
C806.6	To improve the knowledge on regulatory issues for herbal medicine including GMP, WHO guidelines on safety monitoring of herbal medicine in Pharmacovigilance.

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Programme	:	IV/IV B.Pharmacy
Semester/Year of Study	:	8th Semester
Course Name	:	Computer aided drug design
Course code	:	BP 807 ET (Elective Subject)

C807.1	To recall the approaches in drug discovery and drug development
C807.2	To compare SAR verses QSAR and understand the types of physicochemical parameters
C807.3	To make use of 3D-QSAR approaches like COMFA and COMSIA
C807.4	To list out the molecular docking and virtual screening techniques
C807.5	To explain the concepts of bioinformatics, chemoinformatics and pharmaceutical databases
C807.6	To discuss the molecular modeling techniques and its importance in drug design

Programme	:	IV/IV B.Pharmacy
Semester/Year of Study	:	8th Semester
Course Name	:	Cell and Molecular Biology
Course code	:	BP 808 ET (Elective Subject)

C808.1	To relate the basic structure, properties of cells (prokaryotic and eukaryotic) and cell membranes / cellular reproduction.
C808.2	To illustrate DNA structure and functioning, RNA and protein synthesis (transcription/translation).
C808.3	To organize protein structure, pathways, cellular processes and significance of protein synthesis.
C808.4	To distinguish the science of genetics, transgenics, genomic and cell cycle analysis.
C808.5	To interpret mitosis / meiosis, cellular activities and checkpoints.
C808.6	To elaborate on cell signalling pathways and protein kinases.

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Programme	:	IV/IV B.Pharmacy
Semester/Year of Study	:	8th Semester
Course Name	:	Cosmetic Science
Course code	:	BP 809 ET (Elective Subject)

C809.1	To define cosmetics, cosmeceutical products and list various cosmetic excipients
C809.2	To explain the basic structure, functions and common problems associated with skin, hair and oral cavity.
C809.3	To apply the principles of formulations, building blocks various skin care products and hair care products.
C809.4	To describe the role of herbs in cosmetics and analytical methods for cosmetics.
C809.5	To explain various instrumental methods of analysis for cosmetics.
C809.6	To adapt the knowledge gained and develop cosmetics to solve problems associated with skin, hair and scalp.

Programme	:	IV/IV B.Pharmacy
Semester/Year of Study	:	8th Semester
Course Name	:	Pharmacological Screening Methods
Course code	:	BP 810 ET (Elective Subject)

C810.1	To recall the CPCSEA/OECD guidelines for maintenance, breeding and conduct of experiments on laboratory animals and to demonstrate different laboratory/transgenic/ mutant animals, various routes of administration, techniques of blood collection and euthanasia.
C810.2	To outline various preclinical screening models for diuretics, nootropics, anti-asthmatics and drugs acting on CNS.
C810.3	To construct preclinical screening models for drugs acting on ANS, eye and local anesthetics.
C810.4	To analyze the preclinical screening models for drugs acting on CVS.
C810.5	To appraise the preclinical screening models for drugs like antiulcer, antidiabetic and anticancer agents.
C810.6	To compile research methodology and biostatistics

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Programme	:	IV/IV B.Pharmacy
Semester/Year of Study	:	8th Semester
Course Name	:	Advanced Instrumentation Techniques
Course code	:	BP 811 ET (Elective Subject)

C811.1	To recall the principle and theories of NMR and MASS spectroscopic techniques
C811.2	To illustrate the instrumentation and applications of NMR and MASS spectroscopic techniques
C811.3	To explain principle, instrumentation and applications of thermal and X- Ray diffraction methods
C811.4	To examine the calibration and validation of analytical instruments as per ICH and USFDA guidelines
C811.5	To explain the principle and methods employed in radio immuno assay and extraction techniques
C811.6	To elaborate the principle, instrumentation and applications of hyphenated techniques

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M.PHARMACY – PROGRAMME OUTCOMES (PO's) PHARMACEUTICS (MPH) /INDUSTRIAL PHARMACY (MIP)	
PO 1	**Scientific knowledge**: To apply the scientific and technological principles to design, develop effective pharmaceutical dosage forms and drug delivery systems for better therapeutic results.
PO 2	**Technological applications**: To utilize technical knowledge and identify any factors affecting the quality of pharmaceutical production.
PO 3	**Modern tool usage:** Learn, select, apply appropriate methods, procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.
PO 4	**Entrepreneurship:** To understand the basics of establishing and management of pharmaceutical enterprise.
PO 5	**Practical skills:** To gain practical expertise in formulating and evaluating various novel drug release systems for minor ailments to major diseases.
PO6	**Applied science:** To employ contemporary scientific knowledge viz., pharmacology, biotechnology for designing disease-centric pharmaceuticals.
PO 7	**Computational and statistical methodologies:** Applying and utilizing the statistical tools with the aid of computer software to optimize the formulations.
PO 8	**Pharmaceutical ethics:** To respect personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural, personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.
PO 9	**Environment and sustainability:** To understand, protect and cooperate environmental concerns for sustaining biodiversity.
PO10	**Life-long learning:** To develop the habit of updating knowledge from time to time to meet industrial demands and social needs for having a fruitful career.

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M.PHARMACY – PROGRAMME EDUCATIONAL OBJECTIVES (PEO's) PHARMACEUTICS (MPH) / INDUSTRIAL PHARMACY (MIP)	
PEO 1	To impart sound pharmaceutical knowledge, scientific principles to make them ever-ready for producing quality, safety and effective pharmaceutical formulations.
PEO 2	To develop creative thinking, innovative strategies to overcome therapeutic challenges with customized medicines time to time for society.
PEO 3	To produce skilled pharmaceutical professionals, leaders, policy makers and entrepreneurs for building healthy nation.

M. PHARMACY - PROGRAMME SPECIFIC OUTCOMES (PSO's) PHARMACEUTICS (MPH) / INDUSTRIAL PHARMACY (MIP)	
PSO 1	**Formulation strategies:** To impart practical knowledge, expertise to develop, design disease-centric formulations, targeting approaches using current, advanced scientific principles for better patient care and compliance.
PSO 2	**Emerging science:** To introduce knowledge about emerging cutting-edge technologies and their application in pharmaceutical field with better formulations for effective treatments.
PSO 3	**Computational literacy:** To demonstrate the use of artificial intelligence, computer programs or software applications useful in screening formulations, interpretation of experimental data and their validation.
PSO 4	**Pharmaceutical regulations:** To understand the objectives, roles, functions of various pharmaceutical regulatory bodies governing quality, safety and efficacy of pharmaceuticals from manufacturing to patient door.

M.PHARMACY - COURSE OUTCOMES (COs)

Programme : I/II M.Pharmacy

Semester/Year of Study: 1st Semester

Branch : **Pharmaceutics**

Course Name : Modern Pharmaceutical Analytical Techniques

Course code : MPH 101 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 : **Pharmaceutics**

Course Name : Drug Deleivery System

Course code : MPH 102 T (Theory)

C102.1	To recall the basic concepts of sustained release, controlled release, polymer science and personalized medicine.
C102.2	To explain (impart) the principles and fundamentals of controlled drug delivery systems, protein-peptide drug delivery and vaccine drug delivery systems.
C102.3	To (train) develop the formulations of gastro retentive, ocular, transdermal, protein-peptide and vaccine drug delivery systems.
C102.4	To analyze the formulations of gastro retentive and ocular drug delivery systems.
C102.5	To assess the transdermal and protein-peptide drug delivery systems.
C102.6	To evaluate the formulated vaccine drug delivery systems.

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Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	1st Semester
Branch	:	**Pharmaceutics**
Course Name	:	Modern Pharmaceutics
Course code	:	MPH 103 T (Theory)

C103.1	To recall the concepts of preformulation and relate them to formulation development.
C103.2	To illustrate the parameters of optimization and its applications in formulation development.
C103.3	To develop validation and calibration master plan as per regulatory guidelines.
C103.4	To categorize the policies of cGMP, layout of buildings, equipment and management of production.
C103.5	To explain the principles of tablet compression and compaction.
C103.6	To compile the consolidation parameters to determine the stability of a dosage form.

Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	1st Semester
Branch	:	**Pharmaceutics**
Course Name	:	Regulatory Affair
Course code	:	MPH 104 T (Theory)

C104.1	To recall the concepts of drug product development, innovator and generic products, their drug master file.
C104.2	To outline the scale up post approval changes, post marketing surveillance and outsourcing of bioavailability studies to CRO.
C104.3	To apply the regulatory agencies like USFDA, EU, MHRA, TGA and ROW countries for product approval.
C104.4	To contrast CTD and eCTD format for combination products and medical devices.
C104.5	To compare the submission process of IND, NDA, ANDA and preparation of Medicinal Products Dossier.
C104.6	To build the ability to develop clinical trial protocol, pharmacovigilance and safety monitoring in clinical trials.

Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	1st Semester
Branch	:	**Pharmaceutics**
Course Name	:	Pharmaceutics Practical-I
Course code	:	MPH 105 P (Practical)

C105.1	To recall the basic principles of analytical techniques and their instrumentation used for drug analysis.
C105.2	To summarize the preformulation studies and basic excipients used for various controlled/sustained drug delivery systems
C105.3	To make use of various analytical instruments for estimation of drugs in various formulations.
C105.4	To simplify the formulation techniques, prepare matrix tablets, floating tablets and cosmetics.
C105.5	To assess the drug release from sustained and controlled drug delivery systems.
C105.6	To evaluate the dosage forms, construct kinetic plots and determine similarity factor.

Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	2nd Semester
Branch	:	**Pharmaceutics**
Course Name	:	Molecular Pharmaceutics (Nano Tech and Targeted DDS)
Course code	:	MPH 201 T (Theory)

C201.1	To define the concepts involved in targeting drug delivery specific to tumor and brain.
C201.2	To outline the formulation, optimization and evaluation of nanoparticles, liposomes and multiparticulate drug carrier systems.
C201.3	To develop nanoparticles, liposomes and multiparticulate and other drug delivery systems for drug delivery.
C201.4	To simplify the formulation of pulmonary drug delivery systems and their evaluation.
C201.5	To perceive the concepts of gene therapy and liposomal gene delivery.
C201.6	To discuss the concepts of therapeutic antisense molecules.

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Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	2nd Semester
Branch	:	**Pharmaceutics**
Course Name	:	Advanced Biopharmaceutics & Pharmacokinetics
Course code	:	MPH 202 T (Theory)

C202.1	To recall the basic concepts of absorption, distribution, metabolism and excretion of drugs.
C202.2	To understand the mechanisms, interpret various factors affecting drug absorption, distribution, metabolism and excretion of drugs.
C202.3	To apply the pharmacokinetic models for the determination of pharmacokinetic parameters.
C202.4	To analyze the drug product performance by *in-vitro*, *in-vivo* and *in-situ* models.
C202.5	To determine the bioavailability testing protocol of a drug and compare the bioequivalence among marketed products.
C202.6	To predict pharmacokinetic and pharmacodynamic drug interactions.

Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	2nd Semester
Branch	:	**Pharmaceutics**
Course Name	:	Computer Aided Drug Delivery System
Course code	:	MPH 203 T (Theory)

C203.1	To recall the basics of computers in pharmaceutical research and development.
C203.2	To illustrate the computational modeling of drug disposition.
C203.3	To utilize the concepts for computer-aided formulation development.
C203.4	To simplify the pharmacokinetic and pharmacodynamic characteristics of drugs by simulations.
C203.5	To assess the applications of computers in clinical data management.
C203.6	To discuss the impact of artificial intelligence, robotics and computational fluid dynamics.

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Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	2nd Semester
Branch	:	**Pharmaceutics**
Course Name	:	Cosmetic and Cosmeceuticals
Course code	:	MPH 204 T (Theory)

C204.1	To remember Indian regulatory requirements for manufacture, sale, import and labeling of cosmetics.
C204.2	To outline the biological aspects of cosmetics, basic structure, functions, common problems associated with skin, hair and oral cavity.
C204.3	To apply the principles of formulation building blocks for different cosmetic / cosmeceutical products.
C204.4	To simplify the controversial ingredients used in the formulation of cosmetics.
C204.5	To justify the cosmeceutical products for solving problems related to skin, hair and oral cavity.
C204.6	To elaborate the regulatory guidelines forherbal cosmetics, herbal ingredients used in hair care, skin care and oral care.

Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	2nd Semester
Branch	:	**Pharmaceutics**
Course Name	:	Pharmaceutics Practical-II
Course code	:	MPH 205 P (Practical)

C205.1	To recall the basic techniques for preparation of microspheres, liposomes, niosomes and solid dispersions.
C205.2	To compare the dissolution studies of various marketed products.
C205.3	To develop various novel drug delivery systems.
C205.4	To test for drug binding characteristics, cell permeation and bioavailability of the formulations.
C205.5	To evaluate the novel drug delivery systems.
C205.6	To design formulations by QbD concept, use simulations for estimation of pharmacokinetics and pharmacodynamics.

Programme : I/II M.Pharmacy
Semester/Year of Study : 1st Semester
Branch : **Industrial Pharmacy**
Course Name : Modern Pharmaceutical Analytical Techniques
Course code : MIP 101 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 : **Industrial Pharmacy**
Course Name : Pharmaceutical Formulation Development
Course code : MIP 102 T (Theory)

C102.1	To recall the significance of preformulation studies in the pharmaceutical formulation development.
C102.2	To illustrate various formulation additives and understand the factors influencing their incorporation, new developments in excipient science.
C102.3	To outline the importance of solubility studies and determine the solubility of drugs in various solvents.
C102.4	To examine different techniques to improve the solubility of poorly aqueous soluble drugs.
C102.5	To perceive the theories, mechanism of dissolution, *in vitro* dissolution testing models, factors influencing dissolution *in-vitro* and *in-vivo* correlation.
C102.6	To elaborate the drug degradation mechanisms, factors influencing drug stability, stability testing of drugs and pharmaceuticals as per ICH guidelines.

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Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	1st Semester
Branch	:	**Industrial Pharmacy**
Course Name	:	Novel Drug Delivery Systems
Course code	:	MIP 103 T (Theory)

C103.1	To define, list rate controlled drug delivery systems and various polymers used.
C103.2	To explain the basic concepts in the formulation and evaluation of various drug delivery systems.
C103.3	To develop the formulation and evaluation parameters for transdermal drug delivery system and topical delivery systems.
C103.4	To categorize the formulation and evaluation concepts of cosmetics for skin, hair, nail and eye.
C103.5	To appraise the events involved in drug targeting.
C103.6	To elaborate the concepts of protein, peptide drug delivery, recombinant DNA technology and new trends in personalized medicine.

Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	1st Semester
Branch	:	**Industrial Pharmacy**
Course Name	:	Intellectual Property Rights
Course code	:	MIP 104 T (Theory)

C104.1	To define the patent, its types, different parts, essential elements and filling process.
C104.2	To understand the role of GATT, TRIPS and WIPO in patenting.
C104.3	To identify the major bodies regulating Indian pharmaceutical sector, IPR's and their types.
C104.4	To classify the organisation and functions of CDSCO, WHO and USFDA.
C104.5	To compare the functions and regulations of EMEA, TGA, MHRA, MCC and ANVISA.
C104.6	To discuss the regulatory requirements for contract research organization and regulations of Biosimilars.

Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	1st Semester
Branch	:	**Industrial Pharmacy**
Course Name	:	Industrial Pharmacy Practical-I
Course code	:	MIP 105 P (Practical)

C105.1	To recall the basic principles of analytical techniques and their instrumentation used for drug analysis.
C105.2	To understand the characteristic futures of basic excipients used for various sustained, controlled drug delivery systems and cosmetics.
C105.3	To make use of various analytical instruments for estimation of drugs in various formulations.
C105.4	To examine the formulation techniques, prepare various sustained/controlled drug delivery systems and cosmetic preparations.
C105.5	To evaluate the drug and excipients compatibility and drug release from various formulations.
C105.6	To test the prepared modified drug delivery systems and assess the stability.

Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	2nd Semester
Branch	:	**Industrial Pharmacy**
Course Name	:	Advanced Biopharmaceutics and Pharmacokinetics
Course code	:	MIP 201 T (Theory)

C201.1	To recall the basic concepts of absorption, distribution, metabolism and excretion of drugs.
C201.2	To understand the mechanisms, interpret various factors affecting drug absorption, distribution, metabolism and excretion of drugs.
C201.3	To apply the pharmacokinetic models for the determination of pharmacokinetic parameters.
C201.4	To examine the drug product performance in *in-vitro*, *in-vivo* and *in-situ* models.
C201.5	To determine the bioavailability testing protocol of a drug and compare the bioequivalence among marketed products.
C201.6	To predict pharmacokinetics for determination of pharmacokinetic and pharmacodynamic drug interactions.

Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	2nd Semester
Branch	:	**Industrial Pharmacy**
Course Name	:	Scale up and Technology Transfer
Course code	:	MIP 202 T (Theory)

C202.1	To define the pilot plant and scale up processes in pharmaceutical industry.
C202.2	To outline the general concepts of validation, analytical validation, cleaning validation and vendor qualification.
C202.3	To apply the equipment qualification concepts.
C202.4	To analyze the pharmaceutical process validation.
C202.5	To assess the industrial hazards, safety monitoring and prevention systems.
C202.6	To discuss the industrial effluent treatments, testing and forecasting environmental pollution.

Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	2nd Semester
Branch	:	**Industrial Pharmacy**
Course Name	:	Pharmaceutical Production Technology
Course code	:	MIP 203 T (Theory)

C203.1	To recall the tablet production process, selection of equipment and problems encountered with coating.
C203.2	To explain the production of parenterals, controls and maintenance of aseptic area.
C203.3	To utilize the process of freeze drying and spray drying dosage form development.
C203.4	To assess the production process of capsules and dispersed systems.
C203.5	To justify use of various packaging materials for different dosage forms.
C203.6	To elaborate air handling systems and processing of water for Pharmaceutical use.

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Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	2nd Semester
Branch	:	**Industrial Pharmacy**
Course Name	:	Entrepreneurship Management
Course code	:	MIP 204 T (Theory)

C204.1	To define enterprise, types of enterprises, government policies and schemes for enterprise development.
C204.2	To outline the process entrepreneurship development, interpersonal skills, creativity and factors affecting entrepreneur.
C204.3	To plan for launching an enterprise, its organization and SWOT analysis.
C204.4	To analyze the resources, raw materials, manpower, market and quality control of an enterprises.
C204.5	To appraise the performance, assessment of growth, networking and profitability of an enterprise.
C204.6	To plan for stat new enterprise, project proposal, resources and implementation

Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	2nd Semester
Branch	:	**Industrial Pharmacy**
Course Name	:	Industrial Pharmacy Practical-II
Course code	:	MIP 205 P (Practical)

C205.1	To recall the basics of dissolution rate testing.
C205.2	To compare the dissolution profiles of two marketed products.
C205.3	To develop various tablets, capsules, injections, suspensions, emulsions, enteric coated tablets, freeze dried formulations and spray dried formulations.
C205.4	To analyze the pharmacokinetics and IVIVC data by software like WinNonlin® software.
C205.5	To evaluate the prepared tablets, capsules, injections, suspensions, emulsions, enteric coated tablets, freeze dried and spray dried formulations.
C205.6	To predict the *in-vitro* drug permeability, metabolism and *in-vivo* bioavailability.

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Programme	:	II/II M.Pharmacy
Semester/Year of Study	:	3rd Semester
Branch	:	**Common for All Specializations**
Course Name	:	Research methodology & Biostatistics
Course code	:	MIP 301 T (Theory)

C301.1	To recall the concepts of research methodology which includes study design, type of studies, stratifies and different design techniques.
C301.2	To infer the data using biostatistics technique like "t" test, ANOVA and chi square tests as well as recognize the importance of samples size and its significances.
C301.3	To learn the history of medical research for understanding the values of clinical ethics as well as its importance in communication and sociological relationships.
C301.4	To explain the CPCSEA guidelines for laboratory animal facilities which include handling, maintenance, record keeping and transportation of lab animals.
C301.5	To discuss the history and basic principles of Declaration of Helsinki for medical research.

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Course Name: ASSIGNMENTS 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 / 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.

Course 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 / 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.

Course Name: Journal club Year of Study: 2nd M.Pharmacy 3rd 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.

Course Name: PROJECT WORK Year of Study: 2nd M.Pharmacy 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.

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M.PHARMACY – PROGRAMME OUTCOMES (PO's)

PHARMACEUTICAL ANALYSIS (MPA)	
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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M.PHARMACY – PROGRAMME EDUCATIONAL OBJECTIVES (PEO's)

PHARMACEUTICAL ANALYSIS-MPA	
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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M.PHARMACY– PROGRAMME SPECIFIC OUTCOMES (PSO's)

PHARMACEUTICAL ANALYSIS (MPA)	
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.

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M.PHARMACY - COURSE OUTCOMES (C Os)

Programme : I/II M.Pharmacy

Semester/Year of Study : 1st Semester

Branch : **Pharmaceutics**

Course Name : Modern Pharmaceutical Analytical Techniques

Course code : MPA 101 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 : MPA 102 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.
C102.6	To design the biological test and assays of vaccines as per IP and immunoassays.

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Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	1st Semester
Branch	:	**Pharmaceutical Analysis**
Course Name	:	Pharmaceutical Validation
Course code	:	MPA 103 T (Theory)

C103.1	To remember the validation, qualification, concepts and understand the qualification parameters.
C103.2	To understand and apply the qualification of analytical instruments.
C103.3	To demonstrate the water systems in pharmaceutical industry.
C103.4	To explain the validation parameters according to ICH and USP.
C103.5	To evaluate the cleaning of equipment's as per ICH cleaning validation protocol.
C103.6	To formulate the IPR concepts as per present industry scenario

Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	1st Semester
Branch	:	**Pharmaceutical Analysis**
Course Name	:	Food Analysis
Course code	:	MPA 104 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

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Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	1st Semester
Branch	:	**Pharmaceutical Analysis**
Course Name	:	Pharmaceutical Analysis Practical-1
Course code	:	MPA 105 P (Practical)

C105.1	To choose the spectroscopic techniques for analysis of pharmacopoeial compounds
C105.2	To understand the impurity profile concept of various drugs.
C105.3	To learn and perform the assay analysis of various drugs by using different titrations
C105.4	To explain the calibration of different analytical instruments for their compliance
C105.5	To analyze the various constituents in food products
C105.6	To estimate the purity of food products by using various methods

Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	2nd Semester
Branch	:	**Pharmaceutical Analysis**
Course Name	:	Advanced Instrumental Analysis
Course code	:	MPA 201 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

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Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	2nd Semester
Branch	:	**Pharmaceutical Analysis**
Course Name	:	Modern Bio-Analytical Techniques
Course code	:	MPA 202 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	:	Quality Control and Quality Assurance
Course code	:	MPA 203 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

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Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	2nd Semester
Branch	:	**Pharmaceutical Analysis**
Course Name	:	Herbal and Cosmetic Analysis
Course code	:	MPA 204 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	:	Pharmaceutical Analysis Practical-II
Course code	:	MPA 205 P (Practical)

C205.1	To learn the structural identification rules of drug molecules.
C205.2	To understand the interpretation rules of different spectroscopic techniques.
C205.3	To remember the quality control tests for various pharmaceuticals.
C205.4	To interpret quantitative methods herbal drug products
C205.5	To understand the protocol preparation of analytical or bioanalytical validation.
C205.6	To analyze the raw materials, finished product, packaging materials as per IP, USP, British pharmacopoeias and create the specifications.

Programme	:	II/II M.Pharmacy
Semester/Year of Study	:	3rd Semester
Branch	:	**Common for All Specializations**
Course Name	:	Research methodology & Biostatistics
Course code	:	MPA 301 T (Theory)

C301.1	To recall the concepts of research methodology which includes study design, type of studies, stratifies and different design techniques.
C301.2	To infer the data using biostatistics technique like "t" test, ANOVA and chi square tests as well as recognize the importance of samples size and its significances.
C301.3	To learn the history of medical research for understanding the values of clinical ethics as well as its importance in communication and sociological relationships.
C301.4	To explain the CPCSEA guidelines for laboratory animal facilities which include handling, maintenance, record keeping and transportation of lab animals.
C301.5	To discuss the history and basic principles of Declaration of Helsinki for medical research.

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Course Name: ASSIGNMENTS 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 / 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.

Course 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 / 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.

Course Name: Journal club Year of Study: 2nd M.Pharmacy 3rd 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.

Course Name: PROJECT WORK Year of Study: 2nd M.Pharmacy 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.

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M. PHARMACY - PROGRAMME OUTCOMES (PO's)

PHARMACOLOGY (MPL)	
PO 1	**Drug Expertise :** Acquire knowledge on various classes of drugs and their mode of actions to unveil the remedies for many ailments.
PO 2	**Analytical Reasoning:** Identify assumptions and reveal the evidence based reason for the disease or disorder take place, to select the type of relevant treatment.
PO 3	**Experimental Ethics :** Consider and follow ethics and guidelines specified by the authorities of various agencies and Government of India for animal congenial laboratory practice.
PO 4	**Interdisciplinary engagement :** Obtain skill oriented practical proficiency by exposing and utilizing the needs of pharmacy in all disciplines to emerge as potent researcher.
PO 5	**Professional Identity :** Be committed and responsible person to play a proactive role with fidelity to community and empower society.
PO 6	**Statistical Skills :** Apply and analyze quantitative metrics to gain safety data on dosage, also to compare the effectiveness among experimental groups.
PO 7	**Intellectual Flexibility :** Engage in critical thinking and gain insight to identify, design and formulate pharmaceutical products that are in need of current aspects by using material from natural sources.
PO 8	**Lifelong learning :** Understand and apply the concepts in day to day life activities for the benefit of self and for the welfare of society and its concerns.

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M. PHARMACY – PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)	
PHARMACOLOGY (MPL)	
PEO 1	**Innovation Culture :** Devise research strategies for empowering and promoting culture of innovation among students for the industrial needs. Also encourage and excel the students to perform their skills in the areas of interest to promote the potency and zeal towards research.
PEO 2	**Professional Interaction :** Develop comprehensive skills by identifying time to time life situations and keep updating the knowledge professionally for community up-liftment. Also acquire higher order thinking skills and become professionally competent to take up careers in academics, health care and service industry.
PEO 3	**Global Health Care :** Integrate and apply techniques to advance the research scenario for the welfare of Global health care. Also acquire knowledge on diagnostic, therapeutic, rehabilitative and preventive health care for qualitative skills.
PEO 4	**Entrepreneurial Spirit :** Build capacities and develop practical awareness which results in smooth transition from education to self-employment and finally to entrepreneurship. Also relocate the gained knowledge, skills and training to their own personal interests for socio economic empowerment. o promote the potency and zeal towards research.

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M.PHARMACY– PROGRAMME SPECIFIC OUTCOMES (PSOs)

PHARMACOLOGY (MPL)

PSO 1	**Integrative and Applied Learning :** An Approach where learning through connections and relativity to the concepts of theoretical aspect with preclinical experimentation. Apply knowledge and skills developed in traditional classroom learning to hands-on and real-world settings.
PSO 2	**Biological Research :** Demonstrate an understanding of the action of drugs, and test samples with isolated organs or non invasive methods by in-vitro and in-vivo techniques. Biological research leads to analyze and compare the safety and toxicity of products at initiation.
PSO 3	**Technical Advancements :** Exhibit the usage of various advanced equipment to analyze and assess the potency of drug by using the animals. Creates innovative screening methods and best practices to identify and evaluate parameters for various pharmacological activities.
PSO 4	**Ethical Reasoning :** Apply ethical principles to validate the pre clinical experiments. Plan, implement and evaluate the procedures as per the CPCSEA guidelines. Enhance the functional skills and transparency by record keeping.
PSO 5	**Employability:** Acquire in depth knowledge on life sciences and exhibit critical thinking, problem solving and decision making to enhance employability. Apply skill based knowledge in various sectors and relate the principles of scientific advancement.

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M.PHARMACY - COURSE OUTCOMES (C Os)

Programme : I/II M.Pharmacy
Semester/Year of Study : 1st Semester
Branch : **Pharmacology**
Course Name : Modern Pharmaceutical Analytical Techniques
Course code : MPL 101 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 : **Pharmacology**
Course Name : Advanced Pharmacology – I
Course code : MPL 102 T (Theory)

CM102.1	To learn basic principles of pharmacokinetic and pharmacodynamic parameters of drugs.
CM102.2	To understand various biogenesis pathways involved in synthesis of Neurotansmitters and their physiology and to Illustrate pharmacology of Drugs acting on peripheral nervous system.
CM102.3	To construct the pharmacology of drugs acting on central nervous system
CM102.4	To contrast the relative pros and cons in the use of drugs for various cardiac complications.
CM102.5	To assess the drugs acting on hematopoietic system
CM102.6	To compile the role of autocoids and related drugs.

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Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	1st Semester
Branch	:	**Pharmacology**
Course Name	:	Pharmacological and Toxicological Screening Methods – I
Course code	:	MPL 103 T (Theory)

CM103.1	To gain basic knowledge on regulations and ethical requirement for the maintenance and breeding of laboratory animals and the role of transgenic animals in preclinical research
CM103.2	To outline General principles of *invivo, in vitro*,screening techniques for drugs acting on CNS and ANS
CM103.3	To identify the newer screening methods for drug acting on respiratory, reproductive and gastrointestinal system.
CM103.4	To distinguish the screening methods for new substances acting on cardiovascular system
CM103.5	To appraise the screening methods of the newer drugs for metabolic disorders
CM103.6	To predict the *invivo, in vitro* screening models for immunomodulators , to discuss General principles of immunoassay and extrapolation of in vitro/preclinical data to human

Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	1st Semester
Branch	:	**Pharmacology**
Course Name	:	Cellular and Molecular Pharmacology
Course code	:	MPL 104 T (Theory)

CM104.1	To learn basic structure and function of genome in the living organism and the importance of siRNA and micro RNA
CM104.2	To summarize various phases of cell cycle,apoptosis ,necrosis and autophagy
CM104.3	To construct the role of receptors and secondary messengers in cellsignaling pathways
CM104.4	To analyse the principles and applications of genomic and proteomic tools DNA eclctrphorsosis,PCR, SDS page, ELISA ,western blotting ,Recombinant DNA technology and gene therapy
CM104.5	To evaluate significance of Pharmacogenomics and immunotherapeutics
CM104.6	Toconstruct the various cell culture techniques, Principles and applications of cell viability/ glucose uptake/Calcium influx assays , flow cytometry and biosmilars

Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	1st Semester
Branch	:	**Pharmacology**
Course Name	:	Pharmacology Practical – I
Course code	:	MPL 105 P (Practical)

CM105.1	To recall handling of laboratory animals, various routes of drug administrations, blood collection, anaesthesia and euthanasia techniques.
CM105.2	To demonstrate the CNS stimulant, depressant, anxiogenics , anxiolytic, anticonvulsant, analgesic, anti-inflammatory, local anesthetic, mydriatic and miotic activities using animal models.
CM105.3	To Identify the concentration test compounds using HPLC,UV,GC, fluorimetry and flame photometry
CM105.4	To examine diuretic, antiulcer activities and to analyse Oral glucose tolerance test.
CM105.5	To interpret the isolation of DNA/RNA and to assess PCR, Western Blotting, gel electrophoresis techniques and Enzyme based in-vitro/Cell viability assays
CM105.6	To predict Comet assay and to elaborate the pharmacokinetics parameters of drugs by using biological samples and software

Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	2nd Semester
Branch	:	**Pharmacology**
Course Name	:	Advanced Pharmacology – II
Course code	:	MPL 201 T (Theory)

CM201.1	To relate functions of hormones and to list out drugs acting on endocrine system.
CM201.2	To outline the principles of chemotherapy and illustrate the mechanism of action of antibiotics, Antifungal, antiviral, and anti-TB drugs
CM201.3	To identify the chemotherapeutic agents for Protozoal Helimenthetic infections and cancer.
CM201.4	To categorize the inflammatory mediators, allergic /hypersensitivity reactions and simplify pharmacotherapy of asthma and COPD.
CM201.5	To assess the mechanism of drugs acting on GIT and applications of chronopharmacology to treat disorders.
CM201.6	To elaborate the role of free radicals in etiopathology of various diseases and adapt the recent Advances in treatment of various diseases.

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Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	2nd Semester
Branch	:	**Pharmacology**
Course Name	:	Pharmacological and Toxicological Screening Methods – II
Course code	:	MPL 202 T (Theory)

CM202.1	To recall types of toxicology, to list out the regulatory guide lines for conducting toxicity studies and its importance in drug development
CM202.2	To Illustrate Acute, sub-acute and chronic- oral, dermal and inhalational toxicity studies as per OECD guidelines.
CM202.3	To construct reproductive toxicology, tearatogenicity, Genotoxicity and In vivo carcinogenicity studies.
CM202.4	To categorize IND enabling studies
CM202.5	To appraise and importance of safety pharmacological studies(Tier-1 and 2)
CM202.6	To compile the Importance and applications of toxicokinetic Studies and Alternative methods to animal toxicity testing.

Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	2nd Semester
Branch	:	**Pharmacology**
Course Name	:	Principles of Drug Discovery
Course code	:	MPL 203 T (Theory)

CM203.1	To recall the modern drug discovery process, target Discovery and validation and role of transgenic animalsin target validation.
CM203.2	To relate the concepts of combinatorial chemistry , high throughput screening and in silico lead discovery techniques
CM203.3	To identify the prediction of protein structure and the NMR and X-ray crystallography in protein structure prediction
CM203.4	To contrast the Rational Drug Design Methods and Virtual Screening techniques
CM203.5	To interpret the various molecular Docking studies and to assess the importance of QSAR and SAR studies
CM203.6	To elaborate the Statistical methods used in QSAR and compile the Prodrug design process

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Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	2nd Semester
Branch	:	**Pharmacology**
Course Name	:	Clinical Research and Pharmacovigilance
Course code	:	MPL 204 T (Theory)

CM204.1	To label various regulatory requirements for clinical trials.
CM204.2	To demonstrate the types and designs of clinical trial and to infer roles and responsibilities of Clinical Trial Personnel
CM204.3	To construct the documentation process of clinical trials and to identify Adverse Drug Reactions
CM204.4	To contrast the roles and responsibilities of Pharmacovigilance
CM204.5	To appraise various methods of ADR reporting and tools used inPharmacovigilance
CM204.6	To predict principles and concepts of Pharmacoepidemiology, Pharmacoeconomics and safety pharmacology

Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	2nd Semester
Branch	:	**Pharmacology**
Course Name	:	Pharmacology Practical-II
Course code	:	MPL 205 P (Practical)

CM205.1	To understand the dose response relationship, effect of drugs on DRC and PD_2 value
CM205.2	To outline the acute, sub acute and chronictoxicity studies as per OECD guidelines
CM205.3	To identify the effects of various drugs on isolated heart preparations, and to Illustratethe rat BP, heart rate and ECG.
CM205.4	To evaluate the drug concentrations by various bioassay methods using isolated tissue preparations
CM205.5	To prioritize the Repeated dose toxicity studies and evaluate Drug mutagenicity study using mice bone-marrow chromosomal aberration.
CM205.6	To elaborate Protocol for clinical trial, ADR monitoring. In-silico docking studies/pharmacophore based screening/QSAR studies and ADR reporting

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Programme	:	II/II M.Pharmacy
Semester/Year of Study	:	3rd Semester
Branch	:	**Common for All Specializations**
Course Name	:	Research methodology & Biostatistics
Course code	:	MPL 301 T (Theory)

C301.1	To recall the concepts of research methodology which includes study design, type of studies, stratifies and different design techniques.
C301.2	To infer the data using biostatistics technique like "t" test, ANOVA and chi square tests as well as recognize the importance of samples size and its significances.
C301.3	To learn the history of medical research for understanding the values of clinical ethics as well as its importance in communication and sociological relationships.
C301.4	To explain the CPCSEA guidelines for laboratory animal facilities which include handling, maintenance, record keeping and transportation of lab animals.
C301.5	To discuss the history and basic principles of Declaration of Helsinki for medical research.

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Course Name: ASSIGNMENTS 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 / 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.

Course 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 / 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.

Course Name: Journal club Year of Study: 2nd M.Pharmacy 3rd 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.

Course Name: PROJECT WORK Year of Study: 2nd M.Pharmacy 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.

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M.PHARMACY - PROGRAMME OUTCOMES (PO's)	
PHARMACEUTICAL REGULATORY AFFAIRS (MRA)	
PO1	**Regulatory Knowledge:** Possess knowledge, comprehension of the core and basic knowledge associated with the profession of Pharmaceutical Regulatory Sciences, including drug development process, dossier preparation, good manufacturing practices, clinical trials and human research.
PO2	**Planning Abilities:** Demonstrate effective planning abilities and elements that are necessary to accumulate the regulatory submissions including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.
PO3	**Problem analysis:** Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions while reviewing and submission of dossiers to regulatory markets.
PO4	**Modern tool usage:** Learn, select, and apply appropriate methods and procedures, resources and modern regulatory-related computing tools with an understanding of their limitations.
PO5	**Collaboration and Team Work:** Understand and consider the human reaction to change, motivation, issues, leadership and team-building when planning changes required for fulfilment of practice, professional and societal responsibilities which also includes interpersonal skills, knowledge sharing and strategy in between members of a virtual team.
PO6	**Ethics:** Use ethical frameworks, apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions in clinical research and clinical investigations.
PO7	**Regulatory Professional:** Understand, analyze and communicate the value of their professional roles in society and business development and be reliable with critical thinking and regulatory writing skills.

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PO8	**Cross Cultural Communication:** Appreciation of and ability to learn from and work with people from diverse linguistic and cultural backgrounds. It should emphasize how regulatory strategy increases a products chance of entering a market and staying there. Once cross- functional teams understand regulatory strategy and its importance in product development and inter-team communication.
PO9	**Initiative and Entrepreneurialism:** Individual's ability to turn ideas into practice. Like finding new opportunities to share information and concepts. Generating options and solutions to cope with changes. It involves imagination, novelty and risk-taking, as well as the ability to plan and manage projects in order to achieve objectives.
PO10	**Creativity and Innovation:** Function of knowledge, curiosity, imagination, and evaluation. The greater individual knowledge base and level of curiosity, the more ideas, patterns, and combinations will achieve, which then correlates to creating new and innovative products and services.
PO11	**Lifelong Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self- access and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

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M.PHARMACY - PROGRAMME EDUCATIONAL OBJECTIVES (PEO's)	
PHARMACEUTICAL REGULATORY AFFAIRS (MRA)	
PEO1	**Cognition:** Program encompasses the students with profound functional knowledge in core subjects of pharmaceutical regulatory sciences. This enables students to understand the basics of regulatory compilation, create and assemble the regulation submission as per the requirements of regulatory agencies and be competent enough and apply these tools in pharmaceutical and health care industries, research, clinical laboratories, hospitals and community pharmacies for overall maintenance of public health.
PEO2	**Core competence:** To provide students with a strong foundation of regulatory and compliance elements with respect to Good Manufacturing Practices, Good Laboratory Practices, Good Automated Laboratory Practices and Good Documentation Practices as well as prepare for the readiness and conduct of audits and inspections.
PEO3	**Amplitude:** To train students for understanding different acts and guidelines that regulate Drugs & Cosmetics, Medical devices, Biologicals, Herbals and Food & Nutraceuticals industries as well as comprehend the approval process and regulatory requirements for pharmaceutical products in different regulatory markets.
PEO4	**Technicality:** Implementation of innovative teaching learning methodologies with visual aids/ computer aided tools to empower the students in understanding the concepts with clarity and transparency. Students are trained in handling regulatory software's like e-CTD and in their troubleshooting procedures, problem-based learning which makes them to apply the learned theoretical concepts to real time applications and meet the current pharmaceutical industrial demand in regulatory market.
PEO5	**Adroitness:** To inculcate in students professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach and an ability to relate Pharmaceutical, Health care issues to broader social context.

M.PHARMACY - PROGRAM SPECIFIC OUTCOMES (PSO's)

PHARMACEUTICAL REGULATORY AFFAIRS (MRA)	
PSO1	Gain the respective background information, regulatory framework and necessary resources to understand how pharmaceutical products are regulated in different countries and how regulatory affairs professionals can help organizations navigate through regulatory obstacles.
PSO2	Apply the relevant regulations, policies, guidance documents as well as important initiatives with respect to pharmaceuticals, biologicals, natural health products and various other therapeutic products.
PSO3	The course also helps students to discuss on how regulatory affairs professionals add value to various organizations and opportunities available within the industry.
PSO4	Students able to develop and enhance communication skills, including verbal, nonverbal and written which is essential in professional environments of regulatory affairs. Students learn proper writing, editing and comprehension strategies.
PSO5	Students gain knowledge of project management processes and their application to regulatory submissions. This course equips students with skills necessary for global regulatory submissions, from selection of submission type to planning and preparing such submissions for review by respective regulatory agencies.
PSO6	Students become familiar with the legislative framework and regulations that guide the selection and designation of medical products globally. Case studies are used to provide practical experience in applying international regulations and legislations, including EU and US. Students are also introduced to softwares commonly used in the regulatory affairs field.

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M.PHARMACY - COURSE OUTCOMES (COs)

Programme : I/II M.Pharmacy
Semester/Year of Study : 1st Semester
Branch : Pharmaceutical Regulatory Affairs
Course Name : Good Regulatory Practices
Course code : MRA 101 T (Theory)

C101.1	To recall the concepts of current Good Manufacturing Practices (cGMP) and Global Harmonization Task Force (GHTF) official guidelines for medical devices.
C101.2	To Illustrate the concepts of Good Laboratory Practices and its regulations including ISO and QCI standards.
C101.3	To make use of the Good Automated Laboratory Practices and its requirements as per US FDA and other regulatory guidelines like ISO and QCI.
C101.4	To explain the Good Distribution Practices which involves personnel, self-inspection, document handling and following its relevant guidelines as per WHO, ISO and CDSCO.
C101.5	To summarize the concepts and process of Quality Management System and its guidelines provided by ICH, ISO and CDSCO.

Programme : I/II M.Pharmacy
Semester/Year of Study : 1st Semester
Branch : **Pharmaceutical Regulatory Affairs**
Course Name : Documentation and Regulatory writing
Course code : MRA 102 T (Theory)

C102.1	To recall the documentation in pharmaceutical industries and its plan to product development and to learn preparing documents like SMF and DMF.
C102.2	To outline the process and preparation of regulatory dossier and its online submission by following ICH e-CTD guidelines and other guidelines like ACTD etc.
C102.3	To utilize the concepts of audits and its different types, preparing the reports and maintaining the audit timelines as well as referring the ISO and GHTF guidance documents.
C102.4	To evaluate the reports of Regulatory Inspections and understanding the concepts of Root cause analysis and CAPA.
C102.5	To adapt the product life cycle management and other concepts like PAS, SUPAC, CBE-30 and EIR including ISO risk management standards.

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Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	1st Semester
Branch	:	**Pharmaceutical Regulatory Affairs**
Course Name	:	Clinical Research Regulations
Course code	:	MRA 103 T (Theory)

C103.1	To define the concepts of clinical drug development process and to plan the clinical investigation and its evaluation process for Medical devices.
C103.2	To outline the concepts related to Ethics in clinical research and understand the role of Sponsors and Investigators including functions of CROs.
C103.3	To apply the regulations governing the clinical trials in INDIA, US and EU by following its official research guidelines towards clinical trials and its registration process.
C103.4	To compare the different clinical research related guidelines by following ICH GCP, ICMR and GHTF guidance documents.
C103.5	To discuss the USA and EU guidelines for clinical investigations and its reports including pharmacovigilance studies and FDA Med watch.

Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	1st Semester
Branch	:	**Pharmaceutical Regulatory Affairs**
Course Name	:	Regulations and legislation for Drugs & Cosmetics
Course code	:	MRA 104 T (Theory)

C104.1	To recall the acts and rules related to drugs, biologicals, herbals and nutraceuticals.
C104.2	To explain the guidelines and standards for regulatory filing of Drugs & Cosmetics, Medical Devices, Biologicals & Herbals and Food & Nutraceuticals
C104.3	To compare the Indian Pharmacopoeial, BIS, ISO and other relevant standards
C104.4	To interpret the Bioavailability & Bioequivalence data, Guidelines for Drug testing in animals, humans and ICMR-DBT Guidelines for Stem Cell Research
C104.5	To discuss the concepts of intellectual property rights and comparing IPR vs Regulatory affairs

Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	1st Semester
Branch	:	**Pharmaceutical Regulatory Affairs**
Course Name	:	Regulatory Affairs, Practical – I
Course code	:	MRA 105 P (Practical)

C105.1	To select the case studies of Good Manufacturing Practices and documentation for in-process finished products and their QC tests.
C105.2	To outline the SOP's, documentation record, protocols and analytical reports for BMR, MFR and DR for stability and validation process.
C105.3	To identify the regulatory requirements, registration process and submission guidelines for different pharmaceutical products.
C105.4	To compare the regulatory requirement checklists and documents for registration and submission to different regulatory bodies.
C105.5	To elaborate regulatory requirements checklists for conducting clinical trials in different countries.

Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	2nd Semester
Branch	:	**Pharmaceutical Regulatory Affairs**
Course Name	:	Regulatory Aspects of Drugs & Cosmetics
Course code	:	MRA 201 T (Theory)

C201.1	To recall the regulatory drug approval process and marketing in US and CANADA by following its official guidelines provided by regulatory bodies like USFDA and Health Canada.
C201.2	To show the regulatory drug approval process and marketing in EU and AUSTRALIA by following its official guidelines provided by regulatory bodies like EMA and TGA.
C201.3	To plan the regulatory drug approval process and marketing in JAPAN by following its official guidelines provided by regulatory bodies like PMDA.
C201.4	To compare the regulatory drug approval process and marketing in Emerging Markets like ASEAN, APEC, EAC, GCC, PANDRH and SADC etc.
C201.5	To discuss the regulatory drug approval process and marketing in Brazil, CIS and UAE as well as to understand its post approval requirements.

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Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	2nd Semester
Branch	:	**Pharmaceutical Regulatory Affairs**
Course Name	:	Regulatory Aspects of Herbal & Biologicals
Course code	:	MRA 202 T (Theory)

C202.1	To recall the knowledge of regulations, guidelines, market authorization and post market data of similar biologics in India.
C202.2	To compare the generic drug & biosimilars and to study the laws, regulations, guidance and packaging of biologics as per USA.
C202.3	To make use of the scientific guidelines, development pre-clinical and clinical development considerations; stability, safety, advertising, labeling, packing and regulatory approval of biologics in European Union (EU).
C202.4	To take part in the marketing authorisation, clinical evaluation, licensing, quality assessment and pharmacovigilance of vaccines in India.
C202.5	To discuss the quality, safety and legislation for herbal products in India, USA and European Union (EU).

Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	2nd Semester
Branch	:	**Pharmaceutical Regulatory Affairs**
Course Name	:	Regulatory Aspects of Medical advices
Course code	:	MRA 203 T (Theory)

C203.1	To relate the Medical Devices and its risk-based classification along with history of MD and guidance documents of IMDRF like STED and GMDN.
C203.2	To recall the ethics in clinical investigations of medical Devices and its quality related guidelines by ISO.
C203.3	To identify the regulatory approval process and marketing of medical devices in US by following US FDA official guidance documents.
C203.4	To discuss the regulatory approval process and marketing of medical devices in EU by following EMA official guidance documents.
C203.5	To compare the regulatory approval process and marketing of medical devices in ASEAN countries like china & Japan by following their own countries guidance documents.

Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	2nd Semester
Branch	:	**Pharmaceutical Regulatory Affairs**
Course Name	:	Regulatory Aspects of Food & Nutraceuticals
Course code	:	MRA 204 T (Theory)

C204.1	To define the concepts related to Nutraceuticals and its opportunities in Nutraceutical market.
C204.2	To illustrate the global aspects of Nutraceuticals and its guidelines provided by WHO and NSF Internationals.
C204.3	To identify the regulatory approval process of Nutraceuticals and its market regulations in INDIA with reference to RDA.
C204.4	To explain the regulatory approval process of Nutraceuticals and its market regulations in USA with reference to RDA.
C204.5	To acquire the regulatory approval process of Nutraceuticals and its market regulations in EU with reference to RDA.

Programme	:	I/II M.Pharmacy
Semester/Year of Study	:	2nd Semester
Branch	:	**Pharmaceutical Regulatory Affairs**
Course Name	:	Regulatory Affairs Practical – II
Course code	:	MRA 205 P (Practical)

C205.1	To find case studies of change controls, deviations and CAPA in pharmaceutical industries.
C205.2	To Illustrate the preparation of submission through eCTD software for FDA, EMA and MHRA.
C205.3	To compare the drug registration requirements procedures for different regulatory and emerging market countries for marketing authorization.
C205.4	To assess the checklist for different pharmaceutical products for regulatory submissions.
C205.5	To design applications and clinical investigation plans for Medical devices and its facilities.

Programme	:	II/II M.Pharmacy
Semester/Year of Study	:	3rd Semester
Branch	:	**Common for All Specializations**
Course Name	:	Research methodology & Biostatistics
Course code	:	MRA 301 T (Theory)

C301.1	To recall the concepts of research methodology which includes study design, type of studies, stratifies and different design techniques.
C301.2	To infer the data using biostatistics technique like "t" test, ANOVA and chi square tests as well as recognize the importance of samples size and its significances.
C301.3	To learn the history of medical research for understanding the values of clinical ethics as well as its importance in communication and sociological relationships.
C301.4	To explain the CPCSEA guidelines for laboratory animal facilities which include handling, maintenance, record keeping and transportation of lab animals.
C301.5	To discuss the history and basic principles of Declaration of Helsinki for medical research.

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Course Name: ASSIGNMENTS 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 / 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.

Course 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 / 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.

Course Name: Journal club Year of Study: 2nd M.Pharmacy 3rd 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.

Course Name: PROJECT WORK Year of Study: 2nd M.Pharmacy 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 toperform 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.

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PHARM.D- PROGRAMME EDUCATIONAL OBJECTIVES (PEO's)

PEO1	**Fundamental knowledge:** Develop and demonstrate the depth and breadth of knowledge from the foundational sciences in core subjects of pharmaceutics, pharmaceutical chemistry, pharmacotherapeutics, social, behavioural, administrative, health policies and clinical sciences to evaluate the scientific literature, elucidate drug action, identify and solve therapeutic problems, and advance population health and patient-centered care.
PEO2	**Practice and care:** Provide patient-centered care as the medication expert and prioritize patients need and manage patient healthcare needs using human, financial, technological, and physical resources to optimize the safety and efficacy of medication use systems, graduates will be able to design prevention, intervention, and educational strategies for individuals and communities to manage chronic disease and improve health and wellness. Effectively communicate verbally and nonverbally when interacting with an individual, group, or organization.
PEO3	**Lifelong learning and innovation:** Demonstrate the ability to set personal and professional goals and priorities, effectively plan and manage time, and organize work. identify and analyze emerging issues, products, and services that may affect public health policy, patient-centered and population-based therapeutic outcomes, medication use systems, and pharmacy benefits, develop new ideas and approaches to improve quality or overcome barriers to advance the profession. Engage in innovative activities by using creative thinking to envision better ways of accomplishing professional goals.

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PEO4	**Interprofessional collaboration:** Collaborate as an integral part of an interprofessional team, inclusive of patients, caregivers, colleagues, health professionals and members of the community to make patient-centered pharmacotherapy decisions and care plans; prevent, identify, and resolve drug-related problems; and promote patient-centered and population-based health and actively participate and engage as a healthcare team member by demonstrating mutual respect, understanding, and values to meet patient care needs.
PEO5	**Traits Improvement and Professionalism:** Exhibit behaviours and values consistent with the trust given to the profession by patients, other healthcare providers, and society. Take responsibility for health outcomes and make rational and ethical decisions that represent the best interest of the patient and the community. Respect and actively engage the patient, the community, and other health professionals as well as respect the privacy and confidentiality of health information.

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PHARM.D - PROGRAMME OUTCOMES (PO's)

PO1	**Comprehensive pharmacy and clinical knowledge :** Demonstrate mastery and application of core knowledge and skills in relation to the evolving pharmaceutical, biomedical, clinical and epidemiological sciences. This includes competency in areas supporting high quality pharmacy practice (e.g., pharmaceutics, medicinal chemistry, pharmacokinetics, pharmacodynamics, pharmacology, pathophysiology, pharmacotherapeutics, and pharmaceutical care).
PO2	**Patient centered care :** Provide patient-centered care to diverse patients using the best available evidence and in consideration of patients' circumstances to devise, modify, implement, document and monitor pharmacotherapy care plans, either independently or as part of healthcare teams.
PO3	**Problem solving and decision making :** Demonstrate the ability to use observational, analytical and critical thinking skills to develop, implement and evaluate solutions that solve pharmacotherapy problems and build the ability to take decisions based on evidenced based practice.
PO4	**Social and cultural awareness :** Recognize social determinants of health and respect patients' cultural, social and religious perspectives to produce safe and appropriate medication use throughout society. Reflect their knowledge, experiences, values, attitudes, biases and beliefs, to show evidence of being self-aware and life-long learners.
PO5	**Professionalism :** Exhibit professional ethics, attitudes and behaviors by demonstrating patient advocacy, altruism, accountability, compassion, integrity and respect for others. Understand, analyze and communicate the value of their professional roles in society (Ex. Health care professionals, health promoters, educators, managers, employers and employees).

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PO6	**Innovation and entrepreneurship** : Engage in innovative activities by using creative thinking to envision better ways of accomplishing professional goals. Utilize the principles of scientific enquiry and critical thinking while solving problems and making decisions in daily practice. Attain the key ability to start a community pharmacy or chain community pharmacies with patient care services.
PO7	**Confidentiality and professional ethics :** Practice ethically, maintaining patient confidentiality, responding to errors in care and professional misconduct (including plagiarism), and understanding principles of ethical research (including conflicts of interest and obtaining appropriate informed consent). Apply ethical principles while making decisions and take responsibility for the outcomes associated with decisions.
PO8	**Interpersonal and communication skills :** Demonstrate effective interpersonal written and verbal skills, adapt to socioeconomic and cultural factors as well as situational applications. Effectively educate families, patients, caregivers and other health care professional (HCPs). Function effectively in a team and act in a consultative position for other members of the health care team, regulatory agencies and policy makers.
PO9	**Clinical pharmacist and society :** Apply contextual knowledge to assess the societal health care needs and demonstrate effective planning abilities in order to solve problems related to health care practice. Educate and aware the patients regarding the aspect of health and prevention of diseases and provide them a cost-effective drug therapy.
PO10	**Environment and sustainability :** Understand the impact of professional pharmacy solution in societal and environmental context and demonstrate the knowledge and need of sustainable development.

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PO11	**Practice based learning and improvement :** Evaluate practice and care, and promote continuous improvement in one's own patient care and pharmacy services. Demonstrate self-calibration skills and a commitment to the lifelong learning needed to provide high quality care. Locate, appraise and assimilate evidence from scientific studies to enhance the quality of care and services. Effectively utilize information, informatics and technology to optimize learning and patient care.

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PHARM.D - PROGRAMME SPECIFIC OUTCOMES (PSO's)

PSO1	To understand various drug distribution methods, know the professional practice management skills in hospital pharmacies.
PSO2	To provide unbiased and authentic informations to all the stakeholders of health, appreciate practice-based research methods, and appreciate stores management and inventory control.
PSO3	To prepare personalized therapeutic strategies based on diagnosis, through identification of options, observing treatment, time-course of clinical and laboratory indices of therapeutic response and adverse effects.
PSO4	To explicate patient care in performing medication history, interpretations of laboratory data, categorizing potential-medicine related impacts of Pharmacotherapy.
PSO5	To understand the clinical aspects of drug development, such as phases, ethical issues, and roles and responsibilities of clinical trial personnel and able to design clinical study documents, data management and safety monitoring in clinical trials.
PSO6	To render the services to the public by providing patient centric effective treatments to curb the therapeutic issues with the required medicines and explain the effects of the drugs by analyzing the scientific literature for improving their health and well-being.

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PHARM.D - COURSE OUTCOMES (COs)

Programme : I/VI Pharm.D

Course Name : Human Anatomy and Physiology

Course code : 1.1 (Theory)

C1.1.1	To recall the terminologiesin the human anatomy and physiology, along with learn the functions of human cell
C1.1.2	To summarize the functions of tissue, bones and joints in the skeleton.
C1.1.3	To explain the functions of formed elements in the bloodalong with lymph and its role in immunity
C1.1.4	To compare the anatomical features of heart, lungs and GIT and to analyze their physiology.
C1.1.5	To assess the structure and function of brain, spinal cord and cranial nerves and to interpret the physiology of urinary system.
C1.1.6	To elaborate the physiology of endocrine glands, reproductive organs, sensory organs and to discuss the physiology skeletal muscles.

Programme : I/VI Pharm.D

Course Name : Human anatomy and Physiology

Course code : 1.1 (Practical)

C1.1.1	To find and relate characteristics of various tissues of human body
C1.1.2	To demonstrate bleeding time, clotting time, blood pressure and blood grouping.
C1.1.3	To identify the number of RBC and WBC using hemocytometer
C1.1.4	To examine the functions of various organ systems in human body
C1.1.5	To interpret the mechanisms of pregnancy diagnosis tests and various family planning appliances
C1.1.6	To construct and record simple curves using frog gastroenemius sciatic nerve

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Programme	:	I/VI Pharm.D
Course Name	:	Pharmaceutics
Course code	:	1.2 (Theory)

C1.2.1	To define the profession of pharmacy and pharmacopoeias.
C1.2.2	To outline the classification of dosage forms, summarize importance of prescription and posology.
C1.2.3	To develop monophasic and biphasic liquid dosage forms.
C1.2.4	To simplify the preparation of suppositories and powders.
C1.2.5	To explain the concepts of surgical aids and galenicals.
C1.2.6	To elaborate the importance of pharmaceutical incompatibilities and solve calculations.

Programme	:	I/VI Pharm.D
Course Name	:	Pharmaceutics
Course code	:	1.2 (Practical)

C1.2.1	To remember the principles used in the preparation of liquid, semisolid and solid dosage forms.
C1.2.2	To illustrate monophasic internal and external liquid dosage forms.
C1.2.3	To experiment with biphasic liquid dosage forms.
C1.2.4	To take part in formulation of powder dosage forms.
C1.2.5	To appraise the formulation of suppositories.
C1.2.6	To solve the prescriptions having the incompatibility problems.

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Programme	:	I/VI Pharm.D
Course Name	:	Medicinal Biochemistry
Course code	:	1.3 (Theory)

C1.3.1	To recall the importance of biochemistry, catalytic activity, mechanism of action and applications of enzymes.
C1.3.2	To understand the metabolism of carbohydrates, lipids, electron transport chain and ATP formation.
C1.3.3	To apply the clinical chemistry knowledge in diagnosis and prognosis of diseases.
C1.3.4	To simplify the metabolism and disorders associated with nucleic acids and amino acids.
C1.3.5	To interpret the genetic organization of mammalian genome, study protein synthesis and DNA replication.
C1.3.6	To elaborate the knowledge on immunochemical techniques and their applications.

Programme	:	I/VI Pharm.D
Course Name	:	Medicinal Biochemistry
Course code	:	1.3 (Practical)

C1.3.1	To remember the qualitative analysis of urine and confirmatory test for carbohydrates.
C1.3.2	To understand the quantitative estimation and clinical significance of constituents like glucose, creatinine, calcium and chlorides in urine.
C1.3.3	To experiment with estimation of glucose, creatinine, urea, uric acid in blood and their clinical significance
C1.3.4	To perform the liver function tests and lipid profile tests.
C1.3.5	To determine the enzymatic hydrolysis of starch and influence of factors like pH and temperature on enzyme activity.
C1.3.6	To discuss the preparation of standard buffer solutions and their pH measurements.

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Programme	:	I/VI Pharm.D
Course Name	:	Pharmaceutical Organic Chemistry
Course code	:	1.4 (Theory)

C1.4.1	To recall the nomenclature, properties and isomerism in organic compounds
C1.4.2	To explain the preparation, reactions and stability of alkanes and alicyclic compounds
C1.4.3	To study the kinetics, mechanism, stereochemistry of free radical, electrophilic, nucleophilic addition reactions and theory of resonance
C1.4.4	To compare reactivity, orientation and factors influencing aliphatic nucleophilic substitution with aromatic nucleophilic substitution
C1.4.5	To explain the mechanism and applications of selected named reactions
C1.4.6	To discuss the method of preparation, test for purity, assay and medicinal uses of selected organic compounds

Programme	:	I/VI Pharm.D
Course Name	:	Pharmaceutical Organic Chemistry
Course code	:	1.4 (Practical)

C1.4.1	To recall and show the stereo models of organic compounds
C1.4.2	To outline the preliminary tests and detection of elements for qualitative analysis
C1.4.3	To apply the laboratory techniques involved in synthesis of organic compounds
C1.4.4	To analyze the organic compounds and identify the functional groups by systematic qualitative analysis
C1.4.5	To explain the synthesis and characterization of selected organic compounds
C1.4.6	To discuss the appropriate method of purification of organic compounds

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Programme	:	I/VI Pharm.D
Course Name	:	Pharmaceutical Inorganic Chemistry
Course code	:	1.5 (Theory)

C1.5.1	To recall the errors in pharmaceutical analysis and principles of volumetric analysis
C1.5.2	To understand acid-base titrations and limit tests for inorganic compounds
C1.5.3	To select the appropriate titrimetric method for analysis of drugs
C1.5.4	To classify and study the method of preparation and assay of selected inorganic compounds
C1.5.5	To explain the importance of inorganic pharmaceuticals in preventing and curing the disease
C1.5.6	To discuss the radioisotopes and applications of radiopharmaceuticals

Programme	:	I/VI Pharm.D
Course Name	:	Pharmaceutical Inorganic Chemistry
Course code	:	1.5 (Practical)

C1.5.1	To recall the glassware and apparatus used in volumetric analysis
C1.5.2	To explain the limit test for impurities in inorganic compounds
C1.5.3	To make use of volumetric methods for performing assays
C1.5.4	To analyze selected inorganic compounds by different titrimetric methods
C1.5.5	To estimate the compounds present in a mixture
C1.5.6	To perform test for identity of selected inorganic compounds

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Programme : I/VI Pharm.D

Course Name : Remedial Mathematics

Course code : 1.6 (Theory)

C1.6.1	To recall the importance of mathematics in pharmacy
C1.6.2	To outline the various topics in mathematics
C1.6.3	To utilize mathematical equations in doing problems
C1.6.4	To take part in solving problems by applying the concepts
C1.6.5	To appraise the important applications of mathematics
C1.6.6	To solve and convert elementary functions using Laplace transform

Programme : I/VI Pharm.D

Course Name : Remedial Biology

Course code : 1.6 (Theory)

C1.6.1	To learn the organization and nomenclature of living things
C1.6.2	To summarize the functions of various types of tissues in plants and animals
C1.6.3	To develop knowledge on structural modifications in plants and importance of pollination in plants
C1.6.4	To analyze various physiological processes in plants and animals
C1.6.5	To determine the various taxonomical characters of different families and micro-organisms
C1.6.6	To elaborate the study of different kinds of phylum's includes Pisces, Reptiles, Amphibians, Aves& Mammals

Programme : I/VI Pharm.D

Course Name : Remedial Biology

Course code : 1.6 (Practical)

C1.6.1	To understand the basic experiments in Biology and to list out the parts in cell
C1.6.2	To demonstrate the preparation of permanent slides, section cutting techniques & different staining methods
C1.6.3	To improve knowledge on identification of various animal and plant specimens
C1.6.4	To distinguish the various plant by microscopically examination of roots, stems, fruits, leaf and seeds
C1.6.5	To assess the plant taxonomy based on macroscopic and microscopy findings
C1.6.6	To create experiments on the plant physiology

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Programme	:	II/VI Pharm.D
Course Name	:	Pathophysiology
Course code	:	2.1 (Theory)

C2.1.1	To understand the process of cell injury by various etiological agents, morphology of cell injury and cellular adaptations.
C2.1.2	To summarize the events of acute and chronic inflammation and to relate them to the process of wound healing.
C2.1.3	To apply the knowledge of immune tolerance and Human Leucocytic antigen system in understanding the process of organ transplantation, autoimmunity and hypersensitivity reactions.
C2.1.4	To assess the need of balanced diet and the effect of radiation and air pollution on human body.
C2.1.5	To appraise the principles of physical, chemical and biologic carcinogenesis and to evaluate the pathological changes observed in a cancer tissue.
C2.1.6	To adapt the principles of cell injury, inflammation and immune-pathology in understanding pathogenesis of various disease states and their clinical features and complications.

Programme	:	II/VI Pharm.D
Course Name	:	Pharmaceutical Microbiology
Course code	:	2.2 (Theory)

C2.2.1	To list the branches, scope of microbiology and morphology of microbes.
C2.2.2	To explain the methods of identification, cultivation and preservation of various microorganisms.
C2.2.3	To apply the principles of sterilization in pharmaceutical processing and sterility testing.
C2.2.4	To compare different types of immunological reactions, antigens, vaccines and their role in immunity.
C2.2.5	To evaluate microbiological standards of pharmaceuticals and presence of pathogens.
C2.2.6	To elaborate the characteristics, mode of infection, diagnosis, prophylaxis and treatment of bacterial, fungal and viral infectious agents.

Programme : II/VI Pharm.D

Course Name : Pharmaceutical Microbiology

Course code : 2.2 (Practical)

C2.2.1	To recall different techniques of sterilization and equipment used in microbiology laboratory.
C2.2.2	To interpret characteristics of microbes using staining techniques, isolation methods and quantitative estimation.
C2.2.3	To construct standard graphs for estimating antibiotics and vitamins using microbes.
C2.2.4	To test for possible microbial contamination in a given sample.
C2.2.5	To estimate qualitatively and quantitatively the amount of microbes in a sample.
C2.2.6	To choose the correct method for evaluating the microbes by serological and bacteriological methods.

Programme : II/VI Pharm.D

Course Name : Pharmacognosy and Phyto pharmaceuticals

Course code : 2.3 (Theory)

C2.3.1	To define and introduce the history, scope and classification of crude drugs
C2.3.2	To explain and relate about the cultivation, collection, processing and storage of crude drugs
C2.3.3	To apply the knowledge of microscopical for studying properties of cell constituents
C2.3.4	To compare and classify the natural pesticides
C2.3.5	To determine and evaluate the importance of carbohydrates, proteins, lipids and fibers along with their pharmacognistic study
C2.3.6	To estimate and predict the types of adulteration of crude drugs

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Programme : II/VI Pharm.D

Course Name : Pharmacognosy & Phytopharmaceuticals

Course code : 2.3 (Practical)

C2.3.1	To understand collection and preparation of crude drugs and to recall selected crude drugs.
C2.3.2	To understand microscopic study and the methods of quality control for crude drugs with WHO guidelines.
C2.3.3	To perform the transversection of the crude drugs for identification.
C2.3.4	To identify crude drugs by chemical tests: Tragacanth, Acacia, Agar, Gelatin, Starch, Honey and lipids.
C2.3.5	To evaluate the crude drugs for adulteration by macroscopic features.
C2.3.6	To estimateacid value, saponification value, ester value, iodine value and extractive values of crude drugs.

Programme : II/VI Pharm.D

Course Name : Pharmacology - I

Course code : 2.4 (Theory)

C2.4.1	To define the fundamental concepts of pharmacology, pharmaco kinetics and to understand the basics of drugs interactions, drug discovery and toxicity studies.
C2.4.2	To classify the role of neurotransmitter in autonomic nervous system and summarize the drugs action on it.
C2.4.3	To organize the pharmacology of the drugs acting on cardiovascularsystem.
C2.4.4	To analyze the role of neurotransmitter in central nervous system and summarize the drugs action on CNS and respiratory system.
C2.4.5	To appraise the physiological role of hormones and assess the therapeutic effects of its replacement therapy.
C2.4.6	To predict the role of autocoids in pathological conditions and their importance in treating various diseases.

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Programme : II/VI Pharm.D

Course Name : Community Pharmacy

Course code : 2.5 (Theory)

C2.5.1	To recollect the parts of prescription and study the concepts of pharmaceutical care.
C2.5.2	To understand the scope of community pharmacy, site selection, space layout, legal requirements and inventory management of community pharmacy.
C2.5.3	To identify the best way of improving medication adherence and to excel in conducting patient counseling.
C2.5.4	To survey the health status of patients in the community by participating on health screening services and to build the ability to manage minor ailments.
C2.5.5	To explain the importance of rational drug therapy, OTC medication counseling and code of ethics to became a competent pharmacist.
C2.5.6	To improve the professional skills about health, balance diet, family planning, health promotion and prevention of communicable diseases in community.

Programme : II/VI Pharm.D

Course Name : Pharmacotherapeutics-I

Course code : 2.6 (Theory)

C2.6.1	To recall the pathophysiology of cardiovascular disorders and relate their etiology with the therapeutic approach including treatment controversies.
C2.6.2	To outline the concept of essential drugs use and rational drug therapy and summarize the choice of drugs with justification in various disease conditions.
C2.6.3	To identify various types of respiratory and endocrine disorders with respect to clinical features and laboratory investigations, list their complications along with replacement in their management.
C2.6.4	To distinguish between various disease conditions and analyze the results with drug induced disorders.
C2.6.5	To select the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy among pediatric, geriatric, pregnant and lactating women.
C2.6.6	To develop competency to design individual care plan for cardiovascular, respiratory, ocular and hormonal disorders.

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Programme : II/VI Pharm.D

Course Name : Pharmacotherapeutics-I

Course code : 2.6 (Practical)

C2.6.1	To list the sign and symptoms, laboratory parameters of the cardiovascular diseases.
C2.6.2	To identify the drug interactions and find a solutions to overcome drug interactions in the given prescriptions.
C2.6.3	To plan an individual care plan in the cases with endocrine and thyroid disorders.
C2.6.4	To analyze the prescription for rational drug use.
C2.6.5	To explain the safety of oral contraceptives, hormone replacement therapy and the drugs used on occular disorder
C2.6.6	To minimize the drug related problems in the prescriptions and to choose a choice of drugs in various diseases.

Programme : III/VI Pharm.D

Course Name : Pharmacology-II

Course code : 3.1 (Theory)

C3.1.1	To list the various drugs acting on bloodand blood forming agents
C3.1.2	To classify drugs acting on renal system and explain the mechanism adverseeffects & therapeuticuses of drugs.
C3.1.3	To develop the knowledge on principles of chemotherapy and treatment for various microbial infections.
C3.1.4	To assume the role of immunotherapeutic agents and distinguish acute, sub-acute and chronic animal toxicity studies
C3.1.5	To predict the structure and functions of the components of the cell, role of secondary messengers in cell signaling and determine the structure of chromosome
C3.1.6	To compile the role of genetic material in synthesis of proteins. The appropriateness of gene therapy and recombinant DNA technology.

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Programme : III/VI Pharm.D

Course Name : Pharmacology-II

Course code : 3.1 (Practical)

C3.1.1	To recall the different laboratory animals, laboratory appliances, physiological salt solutions and anesthetic agents used in experimental pharmacology.
C3.1.2	To demonstrate the different animal handling techniques, routes of administration of drugs to experimental animals.
C3.1.3	To apply knowledge on the various bio-assay and improve techniques to construct DRC by using standard drugs
C3.1.4	To analyse the data obtained from various animal experiments and compare the potency of test compound
C3.1.5	To assesspharmacological action of minor and major tranquillizers with the experimental animal models
C3.1.6	To evaluate the cardiotonic activity of drugs using isolated frog heart preparations.

Programme : III/VI Pharm.D

Course Name : Pharmaceutical Analysis

Course code : 3.2 (Theory)

C3.2.1	To recall the principle and theory of instrumental analytical techniques
C3.2.2	To outline the instrumentation of spectroscopic, chromatographic and thermal techniques
C3.2.3	To apply the knowledge of spectroscopic, chromatographic and thermal methods in analysis of drugs
C3.2.4	To analyze API's and formulation by using elements of interpretation of data
C3.2.5	To explain theory, instrumentation and applications of electrometric methods of analysis
C3.2.6	To maximize knowledge on concepts of validation, calibration, ICH, GLP, ISO9000, TQM and quality variation concepts

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Programme : III/VI Pharm.D

Course Name : Pharmaceutical Analysis

Course code : 3.2 (Practical)

C3.2.1	To recall the separation and identification of compounds by chromatographic techniques
C3.2.2	To explain the qualitative and quantitative analysis of drugs by spectroscopic techniques
C3.2.3	To experiment with instrumental analysis of selected drugs as per pharmacopoeia
C3.2.4	To compare and characterize compounds by using analytical techniques
C3.2.5	To determine concentration of ions by electrometric analysis
C3.2.6	To discuss the instrumentation, applications of advanced analytical techniques and to interpret spectral data

Programme : III/VI Pharm.D

Course Name : Pharmacotherapeutics-II

Course code : 3.3 (Theory)

C3.3.1	To remember and recall the pathophysiology of selected diseases and rationale for drug therapy.
C3.3.2	To identify various therapeutic approaches for the management of selected diseases.
C3.3.3	To apply the concepts of various drug therapies and identify the controversies in drug therapy.
C3.3.4	To assess the drug therapy by preparing individual therapeutic plan based on diagnosis.
C3.3.5	To evaluate the patient specific parameters relevant in initiating drug therapy and monitoring therapy.
C3.3.6	To create a pharmaceutical care plan, design a list of patient counselling points on the specific illness.

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Programme	:	III/VI Pharm.D
Course Name	:	Pharmacotherapeutics-II
Course code	:	3.3 (Practical)

C3.3.1	To remember and recall the pathophysiology and management of cardiovascular, respiratory ,endocrine diseases and viral infections
C3.3.2	To identify various drug interactions and rationalize the prescription.
C3.3.3	To plan the quality use of medicines surrounding the therapeutic agents in the treatment of selected diseases
C3.3.4	To analyze the clinical skills in the therapeutic management of selected disease conditions
C3.3.5	To prioritize the treatment strategies for better patient outcome and discuss the controversies in treatment
C3.3.6	To improve the skills on patient – centred approach to improve treatment satisfaction and perform patient counselling

Programme	:	III/VI Pharm.D
Course Name	:	Pharmaceutical Jurisprudence
Course code	:	3.4 (Theory)

C3.4.1	To recall the concepts of pharmaceutical legislations in India and code of pharmaceutical ethics
C3.4.2	To outline the schedules and provisions given under Drugs and Cosmetics act 1940 and its rules 1945
C3.4.3	To apply the provisions of Pharmacy act 1948 and procedure for registration of pharmacist
C3.4.4	To list out the provisions under medicinal and toilet preparations act, narcotic drugs and psychotropic substances act and rules, drugs and magic remedies act and rules
C3.4.5	To understand the importance of Essential commodities act and National drug policy
C3.4.6	To discuss the salient features of Prevention of cruelty to animals act 1960 and Patents and design act 1970

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Programme	:	III/VI Pharm.D
Course Name	:	Medicinal Chemistry
Course code	:	3.5 (Theory)

C3.5.1	To recall the various classes of medicinal compounds
C3.5.2	To outline the drugs used as chemotherapeutic agents
C3.5.3	To identify the structural features of drugs required for activity and study their mechanism of action
C3.5.4	To plan for the synthesis of selected category of drugs and their clinical uses
C3.5.5	To explain the importance of diagnostic agents and concept of anti-sense molecules
C3.5.6	To discuss the QSAR studies, combinatorial chemistry and CADD techniques used in rational drug design

Programme	:	III/VI Pharm.D
Course Name	:	Medicinal Chemistry
Course code	:	3.5 (Practical)

C3.5.1	To recall the basic requirements for synthesis of medicinal compounds
C3.5.2	To explain the principle and techniques involved in synthesis of drugs
C3.5.3	To apply the various methods for quantitative analysis of drugs
C3.5.4	To analyze medicinal compounds and study their pharmacopoeial monographs
C3.5.5	To determine the percentage purity of marketed formulations
C3.5.6	To estimate the physicochemical parameters for QSAR analysis

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Programme	:	III/VI Pharm.D
Course Name	:	Pharmaceutical Formulations
Course code	:	3.6 (Theory)

C3.6.1	To recall the basic concepts of pharmaceutical dosage forms.
C3.6.2	To explain formulation, coating and evaluation of tablets.
C3.6.3	To develop and examine capsule dosage forms.
C3.6.4	To simplify the formulation, evaluation and stability considerations of liquid orals. the preparation and quality control of parenteral preparations.
C3.6.5	To appraise parenteral, ophthalmic, semisolids products and packaging material.
C3.6.6	To design various sustained and controlled drug delivery systems.

Programme	:	III/VI Pharm.D
Course Name	:	Pharmaceutical Formulations
Course code	:	3.6 (Practical)

C3.6.1	To recall the preparation and evaluation of compressed tablets.
C3.6.2	To illustrate the basic requirements for formulation and evaluation of capsules.
C3.6.3	To develop parenteral formulations.
C3.6.4	To take part in formulation of liquid orals.
C3.6.5	To justify the use of excipients and formulate of semisolid dosage forms.
C3.6.6	To develop various cosmetic preparations.

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Programme	:	IV/VI Pharm.D
Course Name	:	Pharmacotherapeutics-III
Course code	:	4.1 (Theory)

C4.1.1	To remember the etiopathogenesis and clinical presentation of gastrointestinal and haematological diseases.
C4.1.2	To summarize the diagnosis and therapeutic approaches of gastrointestinal and haematological diseases.
C4.1.3	To identify the causes, pathogenesis and clinical manifestations of neurological and psychiatric diseases.
C4.1.4	Tosimplify understanding on diagnosis, desired outcomes and management of neurological and psychiatric diseases
C4.1.5	To explain the physiology of pain pathway and management of pain, neuralgia and headaches.
C4.1.6	To develop skills on evidence-based practice in diseases management to become a competent pharmacist.

Programme	:	IV/VI Pharm.D
Course Name	:	Pharmacotherapeutics-III
Course code	:	4.1 (Practical)

C4.1.1	To understand the therapeutic approaches and treatment alternatives in the management of gastrointestinal diseases.
C4.1.2	Torelate the concept of pharmaceutical care to identify therapeutic problems in haematological diseases.
C4.1.3	To apply the knowledge to develop therapeutic decision-making skills in gastrointestinal and haematological diseases.
C4.1.4	To take part in drug related problem identification and problem-solving skills in neurological diseases.
C4.1.5	To prioritize the rational pharmacotherapeutic alternatives in the management of psychiatric diseases.
C4.1.6	To develop skills on drug of choice and patient education in management of diseases.

Programme : IV/VI Pharm.D

Course Name : Hospital Pharmacy

Course code : 4.2 (Theory)

C4.2.1	To define the structure, organization and functions of hospital and hospital pharmacist
C4.2.2	To understand and involve in the preparation and implementation of budget, inventory control various drug policies
C4.2.3	To make use of various hospital drug policies to develop hospital pharmacy news letters
C4.2.4	To list out various drug distribution methods for inpatients and outpatients including narcotic and controlled drugs.
C4.2.5	To prioritize the procurement, manufacturing and storage process of various formulations and handling of radio pharmaceuticals
C4.2.6	To develop programmes for professional upraising continuously and to build inter professional relations in the hospitals.

Programme : IV/VI Pharm.D

Course Name : Hospital Pharmacy

Course code : 4.2 (Practical)

C4.2.1	To understand various drug distribution systems in hospital.
C4.2.2	To extend the professional practice management skills in hospital pharmacy.
C4.2.3	To utilize various methods for the preparation and labelling of pharmaceutical products such as powders and intravenous solutions
C4.2.4	To recommend the solutions to overcome the drug interaction and adverse drug reactions.
C4.2.5	To appreciate various store management and inventory control.
C4.2.6	To solve drug related problems through prescription analysis and individualized dose.

Programme	:	IV/VI Pharm.D
Course Name	:	Clinical Pharmacy
Course code	:	4.3 (Theory)

C4.3.1	To understand and explain the daily activities of clinical pharmacist and to monitor the patient rug therapy through medication chart review and clinical review.
C4.3.2	To obtain medication history interview and counsel the patients on various diseases and lifestyle modifications and by applying communication skills.
C4.3.3	To provide response to a drug and poison information queries using modified systemic approach and to gain ability to establish a drug and poison information center.
C4.3.4	To interpret selected laboratory results of specific disease states mentioned and to report ADRs and understand the process of pharmacovigilance.
C4.3.5	To identify and resolve drug related problems and medication errors.
C4.3.6	To critically evaluate biomedical literature in order to get an unbiased clinical evidence to develop individualized pharmaceutical care plan.

Programme	:	IV/VI Pharm.D
Course Name	:	Clinical Pharmacy
Course code	:	4.3 (Practical)

C4.3.1	To create awareness in patients by counselling them on various diseases and drugs using clinical knowledge and communication skills.
C4.3.2	To conduct comprehensive and meticulous medication history interview for the preparation of individualized pharmaceutical care plan.
C4.3.3	To interpret laboratory results of specific disease states mentioned and correlating with patient drug therapy while monitoring disease progression.
C4.3.4	To provide response to a drug and poison information queries using modified systemic approach by critically appraising the biomedical literature.
C4.3.5	To report and assess causality of adverse drug reactions to establish a causal relation between an ADR and a drug.

Programme	:	IV/VI Pharm.D
Course Name	:	Biostatistics and Research Methodology
Course code	:	4.4 (Theory)

C4.4.1	To define the concepts of research methodology and sample size determination with report writing.
C4.4.2	To discuss different types of clinical study designs involved in medical research like case studies, observational studies and interventional studies.
C4.4.3	To apply the concepts of biostatistics and data graphics along with clinical soft wares like SPSS, SAS to support the research design.
C4.4.4	To learn to utilize the computer applications and their advantages in both hospital, community pharmacy.
C4.4.5	To simplify the understanding of statistical methods in epidemiology and be conscious about its relative, attributable risks
C4.3.6	To critically evaluate biomedical literature in order to get an unbiased clinical evidence to develop individualized pharmaceutical care plan.

Programme	:	IV/VI Pharm.D
Course Name	:	Biopharmaceutics & Pharmacokinetics
Course code	:	4.5 (Theory)

C4.5.1	To recall basic concepts of absorption, distribution, metabolism and excretion of drugs.
C4.5.2	To understand the mechanisms, interpret various factors affecting drug absorption, distribution, metabolism and excretion of drugs.
C4.5.3	To apply the pharmacokinetic models for the determination of pharmacokinetic parameters.
C4.5.4	To examine multiple dosage regimens based on pharmacokinetic parameters for maximizing therapeutic effectiveness and patient compliance.
C4.5.5	To evaluate various pharmacokinetic parameters for the drugs exhibiting saturation kinetics.
C4.5.6	To design the bioavailability testing protocol of a drug and compare the bioequivalence between marketed products.

Programme	:	IV/VI Pharm.D
Course Name	:	Biopharmaceutics & Pharmacokinetics
Course code	:	4.5 (Practical)

C4.5.1	To recall the concepts in biopharmaceutics, basic pharmacokinetic parameters and their significance.
C4.5.2	To interpret the effect of surfactant, diluents, lubricant and polymorphism on rate of drug dissolution.
C4.5.3	To solve bioavailability parameters of drugs by using plasma data and methods to improve bioavailability.
C4.5.4	To analyze absorption rate constant, K_E, biological half-life, mean residence time and mean absorption time for the given data.
C4.5.5	To estimate the extent of protein biding by equilibrium dialysis or dynamic dialysis methods.
C4.5.6	To predict the pharmacokinetic parameters for the given data as per one compartment and two compartment models.

Programme	:	IV/VI Pharm.D
Course Name	:	Clinical Toxicology
Course code	:	4.6 (Theory)

C4.6.1	To understand the general principles involved in the management of poisoning with toxicokinetics parameters.
C4.6.2	To identify the role of antidotes, supportive care, gut decontamination and elimination enhancement in poisoning.
C4.6.3	To distinguish the clinical symptoms and to plan various managements of pesticides, drugs acting on CNS, hydrocarbons, caustics and radiation poisoning.
C4.6.4	To categorize the toxic symptoms and management of venomous snake bites, toxicity of plants and contaminated foods and heavy metals.
C4.6.5	To compare the characteristics and specific standard treatment guideline for the treatment of various toxins.
C4.6.6	To propose several preventive approaches to reduce unintended poisoning.

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Programme	:	IV/VI Pharm.D
Course Name	:	Pharmacotherapeutics I & II
Course code	:	4.7 (Theory)

C4.7.1	To remember and recall the pathophysiology of selected diseases and rationale for drug therapy.
C4.7.2	To identify various therapeutic approaches for the management of selected diseases.
C4.7.3	To apply the concepts of various drug therapies and identify the controversies in drug therapy.
C4.7.4	To distinguish between various disease conditions and analyze the results with drug induced disorders.
C4.7.5	To select the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy among pediatric, geriatric, pregnant and lactating women.
C4.7.6	To develop competency to design individual care plan for cardiovascular, respiratory, ocular and hormonal disorders.

Programme	:	IV/VI Pharm.D
Course Name	:	Pharmacotherapeutics I & II
Course code	:	4.7 (Practical)

C4.7.1	To remember and recall the pathophysiology and management of cardiovascular, respiratory, endocrine diseases and viral infections
C4.7.2	To identify various drug interactions and rationalize the prescription.
C4.7.3	To plan the quality use of medicines surrounding the therapeutic agents in the treatment of selected diseases
C4.7.4	To analyze the clinical skills in the therapeutic management of selected disease conditions
C4.7.5	To prioritize the treatment strategies for better patient outcome and discuss the controversies in treatment
C4.7.6	To improve the skills on patient – centred approach to improve treatment satisfaction and perform patient counselling.

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Programme : V/VI Pharm.D

Course Name : Clinical Research

Course code : 5.1 (Theory)

C5.1.1	To study the regulations involved in drug discovery and drug development process.
C5.1.2	To understand the regulatory guidelines and ethics of clinical trials.
C5.1.3	To plan and construct pre-clinical trials and clinical trial activities.
C5.1.4	To distinguish the roles and responsibilities of trial related personnel and designing of clinical trial documents.
C5.1.5	To compare the regulatory aspect of clinical trials in India with other countries (USA and Europe).
C5.1.6	To adapt and improve the skills in data management, safety monitoring and reporting to regulatory authorities.

Programme : V/VI Pharm.D

Course Name : Pharmacoepidemiology and Pharmacoeconomics

Course code : 5.2 (Theory)

C5.2.1	To remember and recall the origin and need; measurement of outcomes in pharmacoepidemiology and pharmacoeconomics.
C5.2.2	To understand the various concepts of risks in pharmacoepidemiology.
C5.2.3	To apply the concepts of pharmacoepidemiological methods in conducting various research studies with the help of case studies and available software's.
C5.2.4	To distinguish the selected special applications of pharmacoepidemiology.
C5.2.5	To evaluate the outcome by using various Pharmacoeconomic methods.
C5.2.6	To solve various case studies by applying the concepts of pharmacoepidemiology and Pharmacoeconomics in designing a good outcome.

Programme : V/VI Pharm.D

Course Name : Clinical Pharmacokinetics & Pharmacotherapeutic Drug Monitoring

Course code : 5.3 (Theory)

C5.3.1	To understand the basics of pharmacokinetics.
C5.3.2	To demonstrate nomograms and tabulations and their applications in designing dosage regimens in special populations.
C5.3.3	To apply the principles of pharmacokinetics in identifying the drug interactions.
C5.3.4	To analyze GFR, creatinine clearance, extracorporeal removal of drugs and pharmacokinetic considerations in dosing renal and hepatic diseases.
C5.3.5	To discuss bayesian theory, adaptive methods and pharmacogenetics in developing drug dosage regimens.
C5.3.6	To develop the skills on individualization of drug dosage regimen in special population by considering TDM indications.

Programme : V/VI Pharm.D

Course Name : Clerkship

Course code : 5.4 (Practical)

C5.4.1	To elicit the patient's chief complaints, history of present illness, past medical history, social, family and occupational histories, complete review of systems for case study analysis.
C5.4.2	To interpret the laboratory investigations in terms of the related pathophysiology.
C5.4.3	To build effective and empathetical skills in counseling the patients on their medications and life style modifications.
C5.4.4	To examine and demonstrate a new patient's case in a focused manner, chronologically developing the present illness, summarizing the pertinent positive and negative findings as well as the differential diagnosis and plans for further testing and treatment.
C5.4.5	To estimate factors that frequently alter the effects of medications, including drug interactions and compliance problems.
C5.4.6	To develop an ability to compile an assessment and plan for an individual patient organized by problem, discussing the likely diagnosis and plan of treatment.

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Programme : V/VI Pharm.D

Course Name : Project

Course code : 5.5 (Practical)

C5.5.1	To identify the societal issues related to health and pharmaceuticals and to report the aims and objectives of the project.
C5.5.2	To review and compare the literature on selected topic/problem/issue.
C5.5.3	To construct research plan and execute it accordingly.
C5.5.4	To compile and analyze the data applying the knowledge of suitable statistical method to draw conclusion.
C5.5.5	To measure short-term and long-term outcomes of a specific research to draw conclusion.
C5.5.6	To propose new solutions and develop recommendations or guidelines to improve societal health outcomes.

Programme : VI/VI Pharm.D

Course Name : Internship

Course code : Practical

C6.0.1	To relate the clinical knowledge in ward rounds for case analysis.
C6.0.2	To interpret the results of the laboratory tests in terms of the related pathophysiology.
C6.0.3	To interview the patient to provide better patient care by critical analysis.
C6.0.4	To analyse each case to identify the drug related problems and overcome the burden on patients.
C6.0.5	To take a part of health care team to bring better patient outcomes and drug information services.
C6.0.6	To build an ability to choose critical area where interventions required for better pharmaceutical care.

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