COURSE OUTCOMES

FACULTY OF PHARMACY

Course Outcomes - B.Pharm

Sl. No.	Name of the Program	Name of the Course	Course Outcome
1	B.Pharm 1st sem	Human anatomy and Physiology-I	1. Students would have studied about the gross morphology, structure and functions of cell, skeletal, muscular, cardiovascular system of the humanbody. 2. They would have understood the various homeostatic mechanisms and their imbalances. 3. Students would able to identify the different types of bones in human body. 4. Students would be able to identify the various tissues of different systems of human body. 5. Students would learn about the various experimental techniques related to physiology. 6. They would have learnt various techniques like blood group determination, blood pressure measurement, blood cells counting
2		Pharmaceutical analysis I	1. Learning this subject content will develop the ideas with the fundamental of analytical chemistry among the pupil. 2. It constructs the fundamental methodology to prepare different strength of solutions. 3. It facilitate the fellow pupil to predict the sources of mistakes and errors. 4. It helps to develop the fundamentals of volumetric analytical skills. 5. It peculates the basic knowledge in the principles of electrochemical analytical techniques 6. The student interpretation skills will be improve by the course content in terms of choice of analytical

			techniques to perform the estimation of different category drugs.
3		Pharmaceutics I	1.Upon completion of this program the student will have fundamental knowledge in preparing conventional dosage forms
4		Pharmaceutical inorganic chemistry	1. Well acquainted with the principles of limit tests. 2. Familiar with different classes of inorganic pharmaceuticals and their analysis 3. Identification of different anions, cations and different inorganic pharmaceuticals. 4. Knowledge about the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals 5. understand the medicinal and pharmaceutical importance of inorganic compounds 6. To have been introduced to a variety of inorganic drug classes.
5		Communication skills	Upon completion of the course the student shall be able to 1. Understand the behavioral needs for a Pharmacist to function effectively in the 2. areas of pharmaceutical operation 3. Communicate effectively (Verbal and Non Verbal) 4. Effectively manage the team as a team player 5. Develop interview skills 6. Develop Leadership qualities and essentials
6		Remedial biology	The main aim of this course is to

		Remedial mathematics	make aware the students to understand and learn about : 1. Cell biology (Basic Nature of Plant cell and Animal cell) 2. Classification System of both Plants & Animals 3. Various tissue system and organ system in plant and animals 4. Theory of evolution 5. Anatomy and Physiology of plants and animals 1. Apply mathematical concepts and principles to perform computations for Pharmaceutical Sciences. 2. Create, use and analyze mathematical representations and mathematical relationships 3. Communicate mathematical knowledge and understanding to help in the field of Clinical Pharmacy 4. Perform abstract mathematical reasoning

Sl. No.	Name of the Program	Name of the Course	Course Outcome
1	B.Pharm 2nd sem	Human anatomy and physiology II	1. Students would have studied about the gross morphology, structure and functions of nervous, respiratory, urinary and reproductive systems in the human body. 2. They would have studied in detailed about energy and metabolism. 3. Students would able to identify the various organs of different systems of human body. 4. They would have performed and learnt about the experiments like neurological reflex, body temperature measurement 5. They would have studied elaborate on interlinked mechanisms in the maintenance of normal functioning of human body 6. They would have learnt and performed the experiments like Olfaction, gustation reflex and eye sight
2		Pharmaceutical organic chemistry I	1. Write the structure, name of the organic compound 2. Knowledge about the type of isomerism 3. Write the reaction, name the reaction and orientation of reactions 4. Account for reactivity/stability of compounds, 5. Identify/confirm the unknown organic compound 6. Knowledge about the naming reactions of carbonyl compounds 7. To perform common laboratory techniques including reflux, distillation, recrystallization, vacuum filtration, etc.
3		Biochemistry	1. To understand the importance of metabolism of

			substrates. 2. Will acquire chemistry and biological importance of biological macromolecules. 3. To acquire knowledge in qualitative and quantitative estimation of the biological macromolecules. 4. To know the interpretation of data emanating from a Clinical Test Lab. 5. To know how physiological conditions influence the structures and re-activities of biomolecules. 6. To understand the basic principles of protein and polysaccharide structure.
4		Pathophysiology	1. 1.Describe the etiology and pathogenesis of the selected disease states 2. 2.Knowledge of signs and symptoms of the diseases 3. Identify the complications of the diseases. 4. 4.Know most commonly encountered pathophysiological state(s) and/or disease mechanism(s), as well as any clinical testing requirements
5		Computer applications in pharmacy	On completion of this course, the students will be able to: 1. 1.Apply the knowledge of mathematics and computing fundamentals to pharmaceutical applications for any given requirement 2. Design and develop solutions to analyze

			pharmaceutical problems using computers. 3. Integrate and apply efficiently the contemporary IT tools to all Pharmaceutical related activities 4. 4. Solve and work with a professional context pertaining to ethics, social, cultural and regulations with regard to Pharmacy .
6		Environmental sciences	1. This program shall create an awareness about environmental problems, develop an attitude towards of concern for the environment.

Sl. No.	Name of the Program	Name of the Course	Course Outcome
1	B.Pharm 3rdsem	Pharmaceutical organic chemistry II	1. Basic knowledge regarding general methods of preparation of organic compounds. 2. Understand the reactions of some organic compounds. 3. To understand Reactivity of organic compounds. 4. Special emphasis on mechanisms and orientation of chemical reactions 1. 5.To acquire knowledge in heterocyclic compounds 2. 6. To acquire knowledge about the electrophilic and nucleophilic reactions.
2		Physical pharmaceutics I	Upon successful completion of the course, students will be able to: 1. State the physicochemical properties of drug molecules, pH, and solubility 2. Explain the role of surfactants, interfacial phenomenon and thermodynamics 3. Describe the flow behavior of fluids and concept of complexation 4. Analyze the chemical stability tests of various drug products 5. Understand the physical properties of solutions, buffers, isotonicity, disperse systems and rheology. 6. Understand of physicochemical properties of drugs including solubility, distribution, adsorption, and stability.

			7. Have basic knowledge of pharmaceutical suspensions and colloids. 8. 7.Have basic understanding of the pharmaceutical applications of various physical 9. Principles such as lyophilization, aerosols, condensed systems, and phase diagram.
4		Microbiology	1. Students will be able to acquire, articulate, retain and apply specialized language and knowledge relevant to microbiology. 2. Students will acquire and demonstrate competency in laboratory safety and in routine and specialized microbiological laboratory skills applicable to microbiological research or clinical methods, including accurately reporting observations and analysis. 3. Students will communicate scientific concepts, experimental results and analytical arguments clearly and concisely, both verbally and in writing. 4. Students will demonstrate isolation of and identification of microbes. 5. Students can able to design microbiology laboratory considering all the aspects of safety 6.Students will acquire knowledge about validating the microbiological equipment and reporting the observations
4		Pharmaceutical engineering	1. To know various unit operations used in Pharmaceutical industries.

			2. To understand the material handling techniques. 3. To perform various processes involved in pharmaceutical manufacturing process. 4. To carry out various test to prevent environmental pollution. 5. To appreciate and comprehend significance of plant lay out design for optimum 6. Use of resources. 7. To appreciate the various preventive methods used for corrosion control in 8. Pharmaceutical industries
5		Pharmaceutical jurisprudence	1. Know the Pharmaceutical legislations and their implications in the development and marketing 2. Know various Indian pharmaceutical Acts, Laws and schedule 3. Know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals 4. Know code of ethics during the pharmaceutical practice

Sl. No.	Name of the Program	Name of the Course	Course Outcome
1	B.Pharm 4thsem	Pharmaceutical organic chemistry III	1. To acquire the knowledge and understanding of the basic experimental principles of heterocyclic chemistry. 2. To draw the structures and synthesize simple pharmaceutically active organic compounds having five and six membered heterocyclic compounds. 3. To describe detailed mechanisms for common naming reactions. 4. To be able to run experimental techniques, procedures and safe laboratory practices. 5. Stereo-chemical features including conformation and stereo electronic effects; Geometrical isomers
2		Medicinal chemistry I	1. Helps in correlating between pharmacology of a disease and its mitigation or cure. 2. To understand the drug metabolic pathways, adverse effect and therapeutic value of drugs 3. To know the structural activity relationship of different class of drugs. 4. Well acquainted with the synthesis of some important class of drugs. 5. Knowledge about the mechanism pathways of different class of medicinal compounds.

			6. To understand the chemistry of drugs with respect to their pharmacological activity.
3		Physical pharmaceutics II	Upon successful completion of the course, students will be able to: 1. State the physicochemical properties of drug molecules, pH, and solubility 2. Explain the role of surfactants, interfacial phenomenon and thermodynamics 3. Describe the flow behavior of fluids and concept of complexation 4. Analyze the chemical stability tests of various drug products 5. Understand the physical properties of solutions, buffers, isotonicity, disperse systems and rheology. 6. Understand of physicochemical properties of drugs including solubility, distribution, adsorption, and stability. 7. Have basic knowledge of pharmaceutical suspensions and colloids. 8. Have basic understanding of the pharmaceutical applications of various physical 9. Principles such as lyophilization, aerosols, condensed systems, and phase diagram.
4		Pharmacology I	1. Students would have understood the pharmacological actions of different categories of drugs 2. They would have studied in detailed about mechanism of drug action at organ system/sub cellular/ macromolecular levels. 3. They would have understood the application of basic pharmacological knowledge in the prevention and treatment of various diseases. 4. They would have observed the effect of drugs on animals by simulated experiments 5. They would got an idea about correlation of pharmacology with other bio medical sciences. 6. They would have understood the signal transduction mechanism of various receptors

5		Pharmacognosy I	This course is one of the most advanced introductions in Herbal Medicines that is offered. Will learn and get experience about: 1. Herbs, and their Science. 2. Classification of Medicinal Plants, Phytochemistry, Carbohydrates, Lipids, 3. Terpenes, Polyphenols, Alkaloids, Pharmacology, Toxicity, Formulations and Preparations of HerbalMedicines. 4. How herbs influence our physiology and can be helpful against several disorders. 5. Relationsbetween Phyto-therapy and the Elderly, Phytotherapy and Children, Understanding Herbal Action, and Understanding the MateriaMedica. 6. The recognition of medicinal plants, identification of adulteration andContamination. 7. Ethnobotany&Ethnopharmacology in drug discovery process. 8. 8. DNA Finger printing.

Sl. No.	Name of the Program	Name of the Course	Course Outcome
1	B.Pharm 5th sem	Medicinal chemistry II	1. Helps in correlating between pharmacology of a disease and its mitigation or cure. 2. To write the chemical synthesis of some drugs. 3. To know the structural activity relationship of different class of drugs. 4. Knowledge about the mechanism pathways of different class of medicinal compounds. 5. To acquire knowledge about the chemotherapy for cancer. 6. To understand the chemistry of drugs with respect to their pharmacological activity.
2		Formulative pharmacy	1. After successful completion of the course student will be able to understand the various drug delivery system and its mechanisms. 2. Students will learn advanced drug delivery system early stage. 3. Developing a preparation of the drug which is both stable and acceptable to the patient. 4. They know very well about orally administered drugs, injectables, aerosol and semisolid preparations with standard protocols. 5. Formulated drugs are stored in a suitable container closure system for extended periods of time. 6. Also they know the stability study and its standard evaluation procedure for better storage conditions.
3		Pharmacology II	1. Students would have understood the mechanism of drug action and its

			relevance in the treatment of different diseases 2. They would be trained with isolation of different organs/tissues from the laboratory animals by simulated experiments 3. They would have observed the various receptor actions using isolated tissue preparation 4. Students would appreciate the correlation of pharmacology with related medical sciences 5. They would have understood the cell communication mechanism 6. They would appreciate the newer targets of several disease conditions for treatment.
4		Pharmacognosy II	This course is one of the most advanced introductions in Herbal Medicines that is offered. Will learn and get experience about 1. Herbs, and their Science. 2. Classification of Medicinal Plants, Phytochemistry, Carbohydrates, Lipids, 3. Terpenes, Polyphenols, Alkaloids, Pharmacology, Toxicity, Formulations and Preparations of HerbalMedicines. 4. How herbs influence our physiology and can be helpful against several disorders. 5. RelationsbetweenPhyto-therapy and the Elderly, Phytotherapy and Children, Understanding Herbal Action, and Understanding the MateriaMedica. 6. The recognition of medicinal plants, identification of adulteration and Contamination. 7. Ethnobotany&Ethnopharmacology in drug discovery process. 8. DNA Finger printing.
5		Pharmaceutical biotechnology	1. 1 .Students will understand the various techniques used in modern biotechnology. 2. Students can design research strategy with step-by-step instructions to address a research problem 3. Students can able to provide examples of current applications of biotechnology and advances in the different areas like medical, microbial, environmental, bioremediation, agricultural, plant, animal, and

			forensic 4. Students can explain the concept and application of monoclonal antibody technology 5. Students can demonstrate and Provide examples on how to use microbes and mammalian cells for the production of pharmaceutical products 6. Students can able to explain the general principles of generating transgenic plants, animals and microbes

Sl. No.	Name of the Program	Name of the Course	Course Outcome
1	B.Pharm 6th sem	Medicinal chemistry III	1. To develop an understanding of the physico-chemical properties of drugs. 2. To understand how current drugs were developed by using pharmacophore modeling and docking technique. 3. To acquire knowledge in the chemotherapy for cancer and microbial diseases and different anti-viral agents. 4. To acquire knowledge about the mechanism pathways of different class of medicinal compounds. 5. To have been introduced to a variety of drug classes and some pharmacological properties. 6. To acquire knowledge on thrust areas fir further research.
2		Pharmacology III	1. Students would have studied elaborately on mechanism of drug action and its relevance in the treatment of different infectious diseases 2. They comprehended the principles of toxicology and treatment of various poisonings and 3. They came across the methods of toxicity studies 4. They studied about symptoms of several poisonings 5. They studied about treatment of several poisonings 6. Students understood the toxicity profile of each drugs
3		Herbal drug	1. The aim of the degree

		technology	course is to provide graduates with a good knowledge of thebasic and applied know-how and professional skills in Herbal drugScienceand Technology and the necessary training for admission to the postgraduate courses in this field. 2. They will acquire operative know-how and be able to carry out technical and 3. management tasks and professional activities in the areas of transformation of 4. medicinal herbs, management of the quality of the processes, marketing of 5. medicinal plants and derivatives for use in herbal, food and cosmetic products, 6. Guaranteeing conformity with the national and EU laws in force. 7. At the end of the course, the graduate will have acquired the following know-howand skills: • The recognition, collection and preservation of medicinal plants. • Analyses and dosage of active ingredients. • The biological effects of medicinal plants. • The toxicological aspects of active ingredients and finished products. • The study, design, management, control and conduction of the processing systems of medicinal plants and derivatives. • Management of quality of medicinal plant products and derivatives. • The possible application of medicinal plants and derivatives as health Products, including the food

			and cosmetics sectors. • Technical-scientific consulting in the specialized press for the herbalsector, the promotion of information in the medicinal plants and derivatives sector.
4		Biopharmaceutics and pharmacokinetics	After successful completion of the course student will be able to: 1. Understand the concept of ADME of drug in human body. 2. Determine the various pharmacokinetic parameters from either plasma concentration or urinary excretion data for drug 3. Apply the various regulations related to developing BA-BE study protocol for the new drug molecule.
5		Pharmaceutical quality assurance	1. The students understand the importance of quality in pharmaceutical products. 2. The students is explored into importance of Good practices such as GMP,GLPect. 3. The factors affecting the quality of pharmaceutical is explored. 4. He understands the regulatory aspects of pharmaceutical taught to the student. 5. The process involved in manufacturing of pharmaceuticals different section/department and activity is learnt. 6. The various documentation process is highlighted to the student.

Sl. No.	Name of the Program	Name of the Course	Course Outcome
1	B.Pharm4th year	Medicinal chemistry II	1. Helps in correlating between pharmacology of a disease and its mitigation or cure. 2. To write the chemical synthesis of some drugs. 3. To know the structural activity relationship of different class of drugs. 4. Knowledge about the mechanism pathways of different class of medicinal compounds. 5. To acquire knowledge about the chemotherapy for cancer. 6. To understand the chemistry of drugs with respect to their pharmacological activity.
2		Pharmacology II	1. Students understood the mechanism of drug action and its relevance in the treatment of different diseases 2. They comprehended the principles of toxicology and treatment of various poisonings. 3. They are able to locate and isolate different organs/tissues from the laboratory animals used in pharmacological experiments 4. They studied in detailed about various receptor actions using isolated tissue preparation 5. They understood the correlation of pharmacology

			with related medical sciences 6. Students were studied about the various methods of toxicity studies
3		Advanced Pharmacognosy	This course is one of the oldest specialisations in Herbal Medicines that is offered. Will learn and get experience about 1. Definition and objectives of Pharmacognosy. Information about the use of Medicinal plants. Plant as a source of drugs of pharmaceutical interest. 2. Extraction procedures for natural compounds, their differences and their applications the main pathways of aromatic amino acids, alkaloids, phenylpropanoids 3. Biogenesis and biological activity of natural products coming from mevalonate: terpenoids and steroids; 4. The biological activities of several compounds belonging to polyketides, terpenoids and steroids; and their traditional use and application in pharmaceutical and/or nutraceutical field. 5. Indian Traditional systems of Medicine. 6. Use of microscopic methods in the identification of natural drugs and herbal products, with emphasis on the use of light and scanning electron microscopes. 7. Principles and concepts in plant taxonomy, which include identification, classification, nomenclature, discussion of major recent/modern systems, family characterization and field work methods. 8. Marine natural product chemistry. Include examples

			of marine antineoplastic agents, marine toxins, and other pharmaceutically relevant marine natural products from various marine organisms. 9. Introduction to Herbal cosmetics and Nutrients.
4		Formulative and Industrial pharmacy	1. know the various pharmaceutical dosage forms and their manufacturing techniques. 2. know various considerations in development of pharmaceutical dosage forms 3. formulate solid, liquid and semisolid dosage forms and evaluate them for their quality.
5		Instrumental method of analysis	The student will learn to 1. The basic theoretical knowledge of the instrumentation techniques available. 2. Theoretically understand the aspects of separation for multi components. 3. Practical skills for the analysis of drugs and excipients using various instrumentation techniques. 4. To make accurate analysis and report the results in defined formats. 5. To learn documentation and express the observations with clarity. 6. To understand the professional and safety responsibilities for working in the analysis laboratory.
6		Pharmacy practice	1. Students will demonstrate knowledge of and ability to use principles of therapeutics, quality improvement, communication, economics, health behavior, social and administrative aspects,

			health policy and legal issues in the practice of pharmacy. 2. Students will use knowledge of drug distribution methods in hospital and apply it in the practice of pharmacy. 3. Students will effectively apply principles of drug store management and inventory control to medication use. 4. Students will provide patient-centered care to diverse patients using the best available evidence and monitor drug therapy of patient through medication chart review, obtain medication history interview and counsel the patients, identify drug related problems. 5. Students will engage in innovative activities by making use of the knowledge of clinical trials 6. Students will exhibit professional ethics by producing safe and appropriate medication use throughout society

Course Outcomes - Pharm. D.

Sl. No.	Name of the Program	Name of the Course	Course Outcome
1.1	Pharm.D. – First Year	Human Anatomy and Physiology	1. They would have learnt the gross anatomy, histology and physiology of various organs of the human body. 2. They would identify the various tissues and organs associated with the different organ systems with help of charts and specimens. 3. They would have studied the coordination in functioning of different organs of each system. 4. They would have understood the several physiological homeostatic mechanisms and their imbalances in human body. 5. They would have learnt the interlinked mechanisms in the maintenance in normal and physical exercise conditions. 6. They would have learnt and performed the hematological tests parameters, blood pressure recording, heart rate, pulse and respiratory volumes.
1.2		Pharmaceutics	1. Upon completion of this program the student will know the formulation aspects of different dosage forms do different pharmaceutical calculation involved in formulation and appreciate the importance of good formulation for effectiveness.
1.3		Medicinal Biochemistry	1. To understand the importance of metabolism of substrates. 2. Will acquire chemistry and biological importance of biological macromolecules. 3. To acquire knowledge in qualitative and quantitative estimation of the

			biological macromolecules. 4. To know the interpretation of data emanating from a Clinical Test Lab. 5. To know how physiological conditions influence the structures and reactivity's of biomolecules. 6. To understand the basic principles of protein and polysaccharide structure.
1.4		Pharmaceutical Organic Chemistry	1. To be able to give systematic names to simple organic compounds and poly functional group. 2. To achieve an understanding of the behavior of organic compounds and to establish a foundation for studies into natural and synthetic products of pharmaceutical interest. 3. To acquire the knowledge and understanding of the basic experimental principles of pharmaceutical organic chemistry. 4. To draw the structures and synthesize simple pharmaceutically active organic compounds. 5. To describe detailed mechanisms for common reactions. 6. To be able to run experimental techniques, procedures and safe laboratory practices.
1.5		Pharmaceutical Inorganic Chemistry	1. Well acquainted with the principles of limit tests. 2. Understand the principles and procedures of analysis of drugs and also regarding the application of inorganic pharmaceutical. 3. Knowledge about the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals 4. Appreciate the importance of inorganic pharmaceuticals in

			preventing and curing the disease. 5. To have been introduced to a variety of inorganic drug classes. 6. To know the analysis of the inorganic pharmaceuticals their applications.
1.6		Remedial Mathematics Remedial Biology	1. Apply mathematical concepts and principles to perform computations for Pharmaceutical Sciences. 2. Create, use and analyze mathematical representations and mathematical relationships 3. Communicate mathematical knowledge and understanding to help in the field of Clinical Pharmacy 4. Perform abstract mathematical reasoning The main aim of this course is to make aware the students to understand and learn about 1. Cell biology (Basic Nature of Plant cell and Animal cell) 2. Classification System of both Plants & Animals 3. Various tissue system and organ system in plant and animals 4. Theory of evolution 5. Anatomy and Physiology of plants and animals
2.1		Pathophysiology	1. Students will define the basic pathogenesis of human disease 2. Students will define and explore the most common etiologies and predisposing factors associated with human disease 3. Students understands the basis for some laboratory tests and other diagnostic procedures 4. Students will make correlations between pathophysiology and clinical skills they are learning in their allied health science programs. 5. Students will understand how the

	Pharm.D.-Second Year		various organ systems are interrelated, and use this understanding to promote a holistic approach towards the evaluation and treatment of patients
2.2		Pharmaceutical Microbiology	1. Students can able to demonstrate an understanding at an advanced level of microbial virulence mechanisms and host response to infection; application of molecular techniques to medical microbiology; microbial susceptibility and resistance to antimicrobial agents; replication of viruses, viral immunology and pathogenesis, detection of viruses 2. Students can able to understanding of various infections (microbial causes, pathogenesis, transmission of infection, diagnosis, prevention and treatment) by being able to identify a unknown organisms in clinical samples, and describe the pathogenesis of important pathogens 3. Students Demonstrate a basic understanding of the pathogenesis of some important fungal infections of humans, and be able to identify and isolate them from clinical samples 4. Students Work cooperatively as part of a small group and Critically assess and interpret scientific literature 5. Students can Analyze and report on complex research questions, and solve problems, plan a work program or diagnostic strategy and learn independently 6. Students can able to demonstrate safe working practices in microbiology, adhere to microbiological requirements for safe work procedures

2.3		Pharmacognosy&Phytopharmaceuticals	This course is one of the most advanced introductions in Herbal Medicines that is offered. Will learn and get experience about 1. Herbs and their Science 2. Classification of Medicinal Plants, Phytochemistry, Carbohydrates, Lipids, 3. Terpenes, Polyphenols, Alkaloids, Pharmacology, Toxicity, Formulations and Preparations of Herbal Medicines 4. How herbs influence our physiology and can be helpful against several disorders. 5. Relationsbetween Phyto-therapy and the Elderly, Phytotherapy and Children, Understanding Herbal Action, and Understanding the Materia Medica. 6. The recognition of medicinal plants, identification of adulteration andContamination. 7. Ethnobotany &Ethno pharmacology in drug discovery process. 8. DNA Finger printing.
2.4		Pharmacology - I	1. The student would have learnt about the different drugs used with an emphasis on its classification, Pharmacodynamic and pharmacokinetic aspects, adverse effects, Therapeutic uses. 2. They would have studied, dose, route of administration, precautions, and contraindications. 3. They would have understood the pharmacological aspects of drugs used to treat ailment of different organ systems of the body. 4. They would appreciate the importance of drug discovery by preclinical and clinical trials. 5. They would appreciate the importance of pharmacology subject as a basis of therapeutics. 6. They would apply the knowledge of

			drugs and its detailed description therapeutically in clinical case scenario.
2.5		Community Pharmacy	1. Students will 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 team 2. Students will demonstrate knowledge of the business and professional practice management skills in community pharmacies. 3. Students will educate patients through counseling &provide health screening services to public 4. Students will identify symptoms of minor ailments and provide appropriate medication 5. Students will participate in prevention programs of communicable diseases 6. Students will exhibit professional ethics by promoting safe and appropriate medication use throughout society
2.6		Pharmacotherapeutics– I	1. Students will be able to describe the pathophysiology and management of cardiovascular,respiratory and endocrine diseases 2. Students will be developing Patient case based Assessment Skills 3. Students willbe able to describe the quality use of medicines issues surrounding the therapeutic agents in the treatment of these diseases 4. Students will have developed clinical skills in the therapeutic management of these conditions 5. Continue to develop communication skills. 6. Students will provide patient –

			centred care to diverse patients using the evidence based medicine
3.1	Pharm. D. – Third Year	Pharmacology -II	1. In continuation with the previous year, this subject would have continued describing about the different drugs used for treatment of diseases. 2. The students would have learnt about drugs used to cancer, inflammation, respiratory system, GIT, immune system and hormones. 3. They would have understood the principles of animal toxicology and bioassay procedures. 4. They would have learnt in depth knowledge on cell, macromolecules, cell signaling, DNA replication and cell cycle. 5. They would appreciate the importance of gene and its structure, genome, gene expression, recombinant DNA technology and other associated aspects. 6. They would have finally learnt to apply the knowledge of drugs practically using simulated pharmacological experiments.
3.2		Pharmaceutical Analysis	1. To understand the importance of analysis in pharmaceutical industry 2. To understand the knowledge about assay of pharmaceutical substance and product 3. To develop basic practical skills using instrumental techniques 4. To inculcate theoretical knowledge on various instrumental techniques adopted for analysis of pharmaceuticals 5. To develop various methodologies for assay of drugs and pharmaceuticals with the skills and knowledge gained 6. To understand and gain knowledge

			on trouble shooting in adopting various methodologies using instrumental techniques
3.3		Pharmacotherapeutics – II	1. Students will be able to describe the pathophysiology and management of cardiovascular,respiratory and endocrine diseases 2. Students will be developing Patient case based Assessment Skills 3. Students willbe able to describe the quality use of medicines issues surrounding the therapeutic agents in the treatment of these diseases 4. Students will have developed clinical skills in the therapeutic management of these conditions 5. Continue to develop communication skills. 6. Students will provide patient – centred care to diverse patients using the evidence based medicine
3.4		Pharmaceutical Jurisprudence	Upon Completion of the subject student learnt: 1. About Professional ethics 2. They understood the various concepts of the Pharmaceutical Legislation in India. 3. They understood the various parameters in the Drug and Cosmetic Act and rules. 4. They understood the various concepts of Drug policy, DPCO, Patent and Designing act. 5. They came to know about the labelling requirements and packaging guidelines for Drugs and Cosmetics. 6. They understood the concepts of Dangerous Drugs Act, Pharmacy Act and Excise duties Act. 7. They came to know about the salient features of different laws which have been prescribed by the Pharmacy Council of India from

			time to time including International Laws.
3.5		Medicinal Chemistry	1. To understand the chemistry of drugs with respect to their biological activity. 2. To know the metabolism, adverse effect and therapeutic activity of drugs. 3. To understand the different modern techniques of drug design. 4. To appreciate the SAR of some important drug classes. 5. To acquire knowledge in the chemotherapy for cancer and microbial diseases and different anti-viral agents. 6. To have been introduced to a variety of drug classes and some pharmacological properties.
3.6		Pharmaceutical Formulations	1. Students will understand the principle involved in formulation of various pharmaceutical dosage forms, prepare various pharmaceutical formulation, perform evaluation of pharmaceutical dosage forms, understand and appreciate the concept of bioavailability and bioequivalence, their role in clinical situations.
4.1		Pharmacotherapeutics -III	1. Initiate drug therapy and the anticipated therapeutic goals by therapeutic intervention 2. Know the effective use of non-pharmacological therapeutic interventions in the treatment of specific diseases, conditions and symptoms. 3. Demonstrate the ability to effectively communicate and work collaboratively together with others in the small group setting

			4. Have moral reasoning, ethical judgement and professionalism
4.2	Pharm.D.-Fourth Year	Hospital Pharmacy	1. Know Various Drug Distribution Methods; 2. Know The Professional Practice Management Skills In Hospital Pharmacies; 3. Provide Unbiased Drug Information To The Doctors; 4. Know The Manufacturing Practices Of Various Formulations In Hospital Set Up; 5. Appreciate The Practice Based Research Methods; And 6. Appreciate the stores management and inventory control.
4.3		Clinical Pharmacy	1. Monitor drug therapy of patient through medication chart review and clinical review; 2. Obtain medication history interview and counsel the patients; 3. Identify and resolve drug related problems; 4. Detect, assess and monitor adverse drug reaction; 5. Interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states; and 6. Retrieve, analyze, interpret and formulate drug or medicine information.
4.4		Biostatistics & Research Methodology	1. Know the various statistical methods to solve different types of problems 2. Operate various statistical software packages 3. Appreciate the importance of Computer in hospital and Community Pharmacy 4. Appreciate the statistical technique in solving the pharmaceutical problems

4.5		Biopharmaceutics & Pharmacokinetics	1. Broader understanding about the concepts of biopharmaceutics and pharmacokinetics. 2. Ability to calculate the various pharmacokinetic parameters by using various mathematical models. 3. Ability to design a basic protocol for the conduct of BA/BE study and the interpretation of the BA/BE data 4. Preparedness to use the concepts of pharmacokinetic principles in the clinical contexts. 5. Ability to design and perform *in-vitro* dissolution studies for various drugs as per the standards of official monographs 6. Basic understanding about the concepts of *in-vitro - in-vivo* correlations (IVIVC)
4.6		Clinical Toxicology	1. Developing general working knowledge of the principles and practice of clinical toxicology 2. Demonstrating an understanding of the health implications of toxic exposures and commonly involved chemicals for toxicity 3. Demonstrating and applying an understanding of general toxicology principles and clinical management practice 4. Demonstrating and applying an understanding of the history, assessment, and therapy considerations associated with the management of a toxic exposure 5. Demonstrating and apply an understanding of the characteristics of and treatment guidelines for specific toxic substances 6. Proposing several preventive approaches to reduce unintentional poisonings 7. Enabling the pharmacist to function as contributing health care team

			member when faced with a toxic exposure experience, including emergencies.
4.7		Pharmacotherapeutics I & II	1. The pathophysiology of selected disease states and the rationale for drug therapy. 2. The therapeutic approach to management of these diseases. 3. The controversies in drug therapy. 4. The importance of preparation of individualized therapeutic plans based on diagnosis. 5. Needs to identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects). 6. Describe the pathophysiology of selected disease states and explain the rationale for drug therapy. 7. Summarize the therapeutic approach to management of these diseases including reference to the latest available evidence. 8. Discuss the controversies in drug therapy. 9. Discuss the preparation of individualized therapeutic plans based on diagnosis. 10. Identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects).
5.1		Clinical Research	1. Know the new drug development process. 2. Understand the regulatory and ethical requirements. 3. Appreciate and conduct the clinical

	Pharm.D.-Fifth Year		trials activities 4. Know safety monitoring and reporting in clinical trials 5. Manage the trial coordination process 6. Know the new drug development process. 7. Understand the regulatory and ethical requirements. 8. Appreciate and conduct the clinical trials activities 9. Know safety monitoring and reporting in clinical trials 10. Manage the trial coordination process
5.2		Pharmacoepidemiology&Pharmacoeconomics	1. Describe the methods used in Pharmacoepidemiology 2. Demonstrate competency in the design, conduct and evaluation of Pharmacoepidemiology studies. 3. Describe the methods used in Pharmacoeconomic analysis. 4. Demonstrate competency in the design, conduct and evaluation of Pharmacoeconomic studies.
5.3		Clinical Pharmacokinetics & Pharmacotherapeutic Drug Monitoring	1. Ability to apply the concepts of Pharmacokinetics to individualize the drug dosage regimen in clinical settings. 2. Ability to design a dosage regimen of a drug based on its route of administration 3. Ability to design and implement pharmacokinetic services such as • Intravenous to Oral conversion of dosage regimens • Therapeutic Drug Monitoring Services 4. Broader understanding about the significance of altered pharmacokinetics, Pharmacogenetics and

			Pharmacometrics. 5. Ability to adjust the dosage regimen for patients with renal / hepatic impairments 6. Ability to assess the drug interaction issues in the clinical settings 7. Ability to design and implement therapeutic drug monitoring services for various drugs

Course Outcomes – M.Pharm

1. Pharmaceutics

Sl. No.	Name of the Program	Name of the Course	Course Outcome
1	M. Pharm.	Drug Delivery Systems	• Drug delivery system give a detailed information transporting a pharmaceutical compound in the body as needed to safely achieve its desired therapeutic effect. • Also it refers to approaches, formulations, technologies, and systems for transporting a pharmaceutical compound in the body as needed to safely achieve its desired therapeutic effect with suitable drug delivery. • Vaccine delivery and different mode of application approach for clinical use. • They know the different types of Drug carrier used in the process of drug delivery which serves to improve the selectivity, effectiveness, and/or safety of drug administration. • The students will know the latest drug delivery knowledge and think to develop new formulation based on the individual Requirement. • Recent developments in protein and peptide for parenteral delivery approaches will give new dimension of drug deliver for antibiotics, insulin, etc.
2		Modern Pharmaceutics	• Basics of medical devices and IVDs, process of development, ethical and

			quality considerations harmonization initiatives for approval and marketing of medical devices and IVDs regulatory approval process for medical devices and IVDs in India, US, Canada, EU, Japan and ASEAN clinical evaluation and investigation of medical devices and IVDs
3		Regulatory Affairs	• The Concepts of innovator and generic drugs, drug development process • The Regulatory guidance's and guidelines for filing and approval process • Preparation of Dossiers and their submission to regulatory agencies in different countries • Post approval regulatory requirements for actives and drug products • Submission of global documents in CTD/ eCTD formats • Clinical trials requirements for approvals for conducting clinical trials • Pharmacovigilence and process of monitoring in clinical trials
4		Molecular Pharmaceutics (Nano Tech and targeted DDS)	• The various approaches for development of novel drug delivery systems. • The criteria for selection of drugs and polymers for the development of NTDS • The formulation and evaluation of novel drug delivery systems.
5		Advanced Biopharmaceutics and pharmacokinetics	• The basic concepts in biopharmaceutics and pharmacokinetics. • The use raw data and derive the pharmacokinetic models

			and parameters the best describe the process of drug absorption, distribution, metabolism and elimination. • The critical evaluation of biopharmaceutic studies involving drug product equivalency. • The design and evaluation of dosage regimens of the drugs using pharmacokinetic and biopharmaceutic parameters. • The potential clinical pharmacokinetic problems and application of basics of pharmacokinetic
6		Computer Aided drug delivery System	• History of Computers in Pharmaceutical Research and Development • Computational Modeling of Drug Disposition • Computers in Preclinical Development • Optimization Techniques in Pharmaceutical Formulation • Computers in Market Analysis • Computers in Clinical Development • Artificial Intelligence (AI) and Robotics • Computational fluid dynamics(CFD)
7		Cosmetics and Cosmeceuticals	• Key ingredients used in cosmetics and cosmeceuticals. • Key building blocks for various formulations. • Various key ingredients and basic science to develop cosmetics and • cosmeceuticals • Scientific knowledge to develop cosmetics and with desired Safety, stability, and efficacy.

2. Regulatory Affairs

Sl. No.	Name of the Program	Name of the Course	Course Outcome
1	M. Pharm.	Good Regulatory Practices	• The key elements of current Good Manufacturing Practices, Good Laboratory Practices, Good Automated Laboratory Practices, Good Documentation Practices and Good Regulatory Practices. • The check lists for various Good Pharmaceutical Practices and Prepare SOPs for Good Pharmaceutical Practices • Implement Good Pharmaceutical Practices in the Industries and Prepare for the Audit of the Pharmaceutical Industries.
2		Documentation and Regulatory Writing	• Know the various documents pertaining to drugs in pharmaceutical • industry • Understand the basics of regulatory compilation • Create and assemble the regulation submission as per the • requirements of agencies • Follow up the submissions and post approval document requirements
3		Clinical Research Regulation	• History, origin and ethics of clinical and biomedical research and evaluation • Clinical drug, medical device development process and different types and phases of clinical trials • Regulatory requirements and guidance for conduct of clinical trials and research

4		Regulations And Legislation For Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, And Food & Nutraceuticals In India And Intellectual Property Rights	• Know different Acts and guidelines that regulate Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals industry in India. • Understand the approval process and regulatory requirements for • Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food& Nutraceuticals
5		Regulatory Aspects of Drugs and Cosmetics	• Process of drug discovery and development and generic product development • regulatory approval process and registration procedures for API and drug products in US, EU • Cosmetics regulations in regulated and semi-regulated countries • A comparative study of India with other global regulated markets
6		Regulatory Aspects of Herbal & Biologicals	• Know the regulatory Requirements for Biologics and Vaccines • Understand the regulation for newly developed biologics and biosimilars • Know the pre-clinical and clinical development considerations of biologics • Understand the Regulatory Requirements of Blood and/or Its Components Including Blood Products and label requirements

7		Regulatory Aspects of Medical Devices	• Basics of medical devices and IVDs, process of development, ethical and quality considerations harmonization initiatives for approval and marketing of medical devices and IVDs regulatory approval process for medical devices and IVDs in India, US, Canada, EU, Japan and ASEAN clinical evaluation and investigation of medical devices and IVDs
8		Regulatory Aspects Of Food & Nutraceuticals	• Know the regulatory Requirements for nutraceuticals • Understand the regulation for registration and labeling of nutraceuticals and food supplements in India, USA and Europe.

3. Industrial Pharmacy

Sl. No.	Name of the Program	Name of the Course	Course Outcome
1	M. Pharm.	Pharmaceutical Formulation	• The scheduled activities in a Pharmaceutical firm. • The pre formulation studies of pilot batches of pharmaceutical industry. • The significance of dissolution and product stability
2		Novel Drug Delivery System	• The need, concept, design and evaluation of various customized,sustained and controlled release dosage forms. • To formulate and evaluate various novel drug delivery systems
3		IPR	• Assist in Regulatory Audit process. • Establish regulatory guidelines for drug and drug products • The Regulatory requirements for contract research organization
4		Advanced Biopharmaceutics and pharmacokinetics	• The basic concepts in Biopharmaceutics and pharmacokinetics. • The use of raw data and derive the pharmacokinetic models and parameters the best describe the process of drug absorption, distribution, metabolism and elimination. • To critically evaluate Biopharmaceutics studies involving drug product equivalency. • To design and evaluate dosage regimens of the drugs using pharmacokinetic and biopharmaceutic parameters
5		Scale up Technology Transfer	• Manage the scale up process in pharmaceutical industry. • Assist in technology transfer. • To establish safety guidelines, which prevent industrial hazards
6		Pharmaceutical Production Technology	• Handle the scheduled activities in a Pharmaceutical firm. • Manage the production of large batches of pharmaceutical formulations.
7		Entrepreneurship Development	• The Role of enterprise in national and global economy • Dynamics of motivation and concepts of entrepreneurship • Demands and challenges of Growth Strategies And Networking

4. Pharmaceutical Chemistry

Sl. No.	Name of the Program	Name of the Course	Course Outcome
1	M.Pharm	Advanced Organic Chemistry-I	• To describe mechanisms for reactions in organic chemistry, polymer chemistry and biochemistry • To develop synthetic route for small molecules. • To apply the structure and theory to the study of organic reaction mechanisms • To apply all the naming reactions in multistep process in manufacturing of drugs and drug intermediates special reactive intermediates including carbenes, carbanions and free radicals • Will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments. • To carry out an organic reaction, including isolating, purifying, and characterizing the product.
2		Advanced Medicinal Chemistry	• To design around the various market-approved drug molecules • To understand the mechanism of action of drugs belonging to the classes of Anti-hypertensive, Psychoactive. • Anticonvulsant, H1/H2 receptor antagonistic, COX1 & COX2 inhibiting, Adrenergic & Cholinergic, Antineoplastic and Antiviral agents. • A detailed understanding of the processes involved in the design, development and discovery of medicinal compounds.
3		Chemistry of Natural Products	• To attain detailed knowledge about chemistry of medicinal compounds from natural origin. • To understand general methods of structural elucidation of medicinally active natural compounds. • To attain knowledge regarding isolation and purification of medicinal compounds from natural origin. • To characterize products by physical and

			spectroscopic means including IR, NMR, GC, and MS. • To identify different types of natural products, their occurrence, structure, biosynthesis and properties. • To know the use of natural products as starting materials.
4		Advanced Spectral Analysis	• Student will learn the various hyphenated analytical instrumental techniques • Student will deals with different analytical data from diffent principle instrument. • The fellow student will gain the interpretation skills • Student will expose to different analytical data like LC-MS, GC-MS, ATR-IR, DSC etc. theoretically and practically. • Fellow student will able to handle different analytical data to predict the unknown structures • ☐ At the end of the course student should know to handle different hyphenated instruments data
5		Advanced Organic Chemistry-II	• To utilize green chemistry concepts and to be the effective substitute for conventional chemistry. • To apply all the catalysis in single & multistep process in manufacturing of drugs and drug intermediates • To synthesize novel peptidomimetics using peptide chemistry. • Stereo-chemical features including conformation and stereo electronic effects; reaction dynamics, and photochemical reactions • To acquire knowledge in the field of sonochemistry. • to apply a detailed organic structure analysis.
6		Computer Aided Drug Design	• To utilize various molecular modeling softwares in the design of novel drug-like molecules. • To apply the various softwares for physico-chemical property prediction. • To understand how current drugs were

			developed by using pharmacophores modeling and docking technique.
7		Pharmaceutical Process chemistry	• To develop synthetic routes that is safe, cost-effective, environmentally friendly, and efficient. • To impart knowledge on the development and optimization of a synthetic route/s. • The pilot plant procedure for the manufacture of Active Pharmaceutical Ingredients and new chemical entities for the drug development phase. • To create and carry out work up and separation procedure. • To predict the outcome of organic reactions using a basic understanding of the general reactivity of functional groups and mechanism. • The principles and applications of modern chemical instrumentation, experimental design, and data analysis.

5. Department of Pharmacognosy

Sl. No.	Name of the Program	Name of the Course	Course Outcome
1	M.Pharm	Advanced Pharmacognosy I & II	This course is one of the oldest specialisations in Herbal Medicines that is offered. Will learn and get experience about • Definition and objectives of Pharmacognosy. Information about the use of Medicinal plants. Plant as a source of drugs of pharmaceutical interest. • Extraction procedures for natural compounds, their differences and their applications the main pathways of aromatic amino acids, alkaloids, phenylpropanoids • Biogenesis and biological activity of natural products coming from mevalonate: terpenoids and steroids; • The biological activities of several compounds belonging to polyketides, terpenoids and steroids; and their traditional use and application in pharmaceutical and/or nutraceutical field. • Occurence, isolation, characterization, identification, biosynthesis and activity profile of biologically active natural products.
2		Phytochemistry	The course aims to provide students with the necessary skills for • Separation of the active constituents obtained from natural sources (alkaloids – glycosides – hallucinating and anticancer drugs) in addition to the different methods of separation (chromatography). • To identify these active ingredients either in pure form of a mixture- as well as the different methods to evaluate these components and how to deal with the side effects of some components (if any) and how to overcome it and solve problems as well as how to deal with poisoning and abuse substances. • Herbal Drug discovery and development. • Optimisation of Lead compounds. • After finishing the course, the students will get professional, Practica skills & time

			management skills in extraction , Isolation and Phytochemical analysis of Natural products. • Phytochemical documentation
3		Industrial Pharmacognostical Technology	The course aims to provide students with the necessary skills for • Starting up of new herbal drug industry. • Regulatory requirements/ documentation for starting a new natural drug industry. • Export and import policies in herbal industry sector. • ISO documentation. • GMP / GLP in Herbal drug sector. • WHO guidelines in safety assessment of herbal drugs. • Morgraph preparation and documentation. • Patentisation
4		Medicinal Plant Biotechnology	The course aims to provide students with the necessary skills in • Plant genetic engineering and molecular biology • Plant tissue culture techniques for production of genetically modified plants. • Hairy root culture for production of different primary and secondary metabolites. • Plant fermentation technology. • Different methods of cloning and its applications. • Application of PCR in plant genome analysis.
5		Indian systems of Medicine	The course aims to provide students with the necessary skills in learning and acquiring knowledge in • Primary concepts of traditional system of medicine • Formulation development and standardisation of various traditional formulations. • Various purification process (Shodana and Marana concepts) • Basic principles and healing potentials of Yoga, Naturopathy and Aromatherapy. • Good manufacturing skills in traditional drug industry. • Safety monitoring of herbal medicines. • Quality control and quality assurance concepts involved in traditional system of medicine.

			• Concepts of AYUSH, AYUSH, ISM, CCRAS, CCRS, CCRH, CCRU.
6		Herbal cosmetics	The course aims to provide students with the necessary skills in learning and acquiring knowledge in • Basic Concepts in herbal cosmetics • Regulatory Provisions relation to manufacture of cosmetics: - License, GMP, offences & Penalties, • Import & Export policies ofHerbal/natural cosmetics • Herbal cosmeceutical development and standardization • Raw product analysis • Possible interactions between chemicals and herbs • Quality control and quality assurance of herbal cosmetics • Toxicological and allergen screening techniques.
7		Research Methodology & Biostatistics	• Students should understand a general definition of research design. • Students should know why educational research is undertaken, and the audiences that profit from research studies. • Students should be able to identify the overall process of designing a research study from its inception to its report. • Students should be familiar with ethical issues in educational research, including those issues that arise in using quantitative and qualitative research. • Students should know the primary characteristics of quantitative research and qualitative research. • Students should be able to identify a research problem stated in a study. • Students should be familiar with how to write a good introduction to an educational research studyand the components that comprise such an introduction. • Students should be familiar with conducting a literature review for a scholarly educational study: a. The steps in the overall process. b. The types of databases often searched.

			c. The criteria for evaluating the quality of a study. d. The ways of organizing the material found. e. The different types of literature reviews.

6. Department of Pharmacology

Sl. No.	Name of the Program	Name of the Course	Course Outcome
1	M Pharm	Advanced Pharmacology-I	• The students would appreciate the basic knowledge in the field of pharmacology pertaining to the drugs and its therapeutic applications • They would have elaborately learnt the recent advances in the drugs used for the treatment of various diseases. • They would have understood the concepts of drug action and mechanisms involved. • They would have discussed the pathophysiology and pharmacotherapy of certain diseases • They would have understood the underlying mechanism of drug actions at cellular and molecular level. • They would havelearnt the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases
2		Screening methods in Pharmacology	• The students would appreciate the knowledge gained on preclinical evaluation of drugs and recent experimental techniques in the drug discovery and development. • They would have understood the maintenance of laboratory animals as per the guidelines, basic knowledge of various *in-vitro* and *in-vivo* preclinical evaluation processes • They would have appraised the regulations and ethical requirement for the usage of experimental animals. • They would have learnt to describe the various animals used in the drug discovery process and good laboratory practices in maintenance and handling of experimental animals • They would have learnt to describe the various screening methods involved in the drug discovery process • They would appreciate to correlate the preclinical data to humans
3		Cellular and Molecular Pharmacology	• The students would have understood the fundamental knowledge on the structure and functions of cellular components.

			• They would appreciate the interaction of these components with drugs. This would enable them to apply the knowledge in drug discovery process. • They would have learnt to explain the receptor signal transduction processes. • They would have learnt to explain the molecular pathways affected by drugs. • They would appreciate the applicability of molecular pharmacology and biomarkers in drug discovery process. • They would have learnt to demonstrate molecular biology techniques as applicable for pharmacology.
4		Advanced Pharmacology-II	• The students would appreciate the basic knowledge in the field of pharmacology pertaining to the drugs and its therapeutic applications • They would have elaborately learnt the recent advances in the drugs used for the treatment of various diseases. • They would have understood the concepts of drug action and mechanisms involved. • They would have studied the pathophysiology and pharmacotherapy of certain diseases • They would have understood the underlying mechanism of drug actions at cellular and molecular level. • They would have learnt the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases
5		Principles of Toxicology	• The students would appreciate the knowledge on the preclinical safety and toxicological evaluation of drug & new chemical entity. • They would have better understanding in the regulatory aspects for the toxicological evaluation of drugs and chemicals. • They would have studied the various types of toxicity studies and their procedure. • They would appreciate the importance of ethical and regulatory requirements for toxicity studies. • They would have studied the practical skills required to conduct the preclinical toxicity studies. • They would appreciate the use of experimental

			animals for the different toxicological studies.
6		Principles of drug discovery	• The students would appreciate the knowledge on the basics of drug discovery. • They would have better understanding on the various stages of drug discovery. • They would have studied the importance of the role of genomics, proteomics and bioinformatics in drug discovery. • They would have studied on the various targets for drug discovery. • They would have better understanding on the lead seeking method and lead optimization • They would have learnt the importance of the role of computer aided drug design in drug discovery.
7		Clinical Pharmacology	• The students would appreciate the knowledge on the clinical research. • They would get a better understanding in the regulatory requirements for conducting clinical trial. • They would have understand the types of clinical trial designs. • They would have studied the responsibilities of key players involved in clinical trials • They would have an understand on the safety monitoring, reporting and close-out activities. • They would have studied the principles of Pharmacovigilance

7. Pharmaceutical Analysis

Sl. No.	Name of the Program	Name of the Course	Course Outcome
1	M. Pharm.	Modern Pharmaceutical Analytical Techniques	• To understand the basic knowledge on assay of single and multiple component pharmaceuticals by using various analytical instruments • To develop basic practical skills using instrumentation techniques • Skills in selecting the suitable techniques for analysis of drugs and pharmaceuticals • To expand the theoretical knowledge on various instrumental techniques available for analysis of organic substances • To apply the knowledge learnt in developing new procedures of their own design • Comparing various methods of analysis and their outcomes
2		Advanced Pharmaceutical Analysis	• The student Will understand the concepts of Impurity profiling • The students will gain appropriate knowledge about appropriate analytical skills required for the analysis of impurities in the bulk drugs and various formulations. • The subject supply enough idea on the categorizing the impurities LIKE (INORGANIC, ORGANIC AND RESIDUAL SOLVENTS) • It supports to understand the official and non official methods to analyses the related substance.
3		Pharmaceutical Validation	• The Students learn on the importance of validation. • The student learns on the importance of patent and intellectual property rights. • The students are trained on the qualification aspects of instruments. • The importance of calibration to be performed for the instruments. • The various validation aspects to be carried out in the industry. • The students gain knowledge on how validation are carried for various components. Such as instrument

			validation, cleaning validation and process validation.
4		Food Analysis	• Student shall be able to understand various analytical techniques in the determination of Food constituents • Student shall be able to understand various analytical techniques in the determination of Food additives, • Student shall be able to understand various analytical techniques in the determination of Finished food products • Student shall be able to understand various analytical techniques in the determination of Pesticides in food • Student shall be able to understand various analytical techniques in the determination of knowledge on food regulations • Student shall be able to understand various analytical techniques in the determination of food legislations
5		Advanced Instrumentation Techniques	The student will know about • The detailed interpretation pattern for the organic substances • Theoretical aspects of the HPLC and GC techniques • Practical aspects and troubleshooting techniques for HPLC and GC techniques • Knowledge and skills in advanced instrumentation techniques for drug analysis • Theoretical aspects of hyphenated analytical techniques • Critical analysis of analytical problem and selection of appropriate analytical tool for the quantification of chemicals and excepients
6		Modern Bio-analytical Techniques	• The subject provides enough knowledge to conduct bioequivalence studies • It upgrade the method to conduct bioequivalence study for formulations by utilizing the proper regulatory guidelines • It improvers ideas and updating information on the current trend in GCP and GLP • Pupil will be exposed to both theoretical and practical knowledge on quantification

			of analyte present in the biological fluids • The subject content presents better understanding on different analyte enrichment technique as well the instrumentation technique.
7		Quality control and Quality Assurance	• Student shall be able to understand the cGMP aspects in a pharmaceutical industry • Student shall be able to understand the importance of documentation • Student shall be able to understand the scope of quality certifications applicable to Pharmaceutical industries • Student shall be able to understand the responsibilities of QA department • Student shall be able to understand the responsibilities of QC department • Student shall be able to understand GLP and regulatory Affairs
8		Herbal and cosmetic analysis	• Student shall be able to understand the determination of herbal remedies • Student shall be able to understand various herbal regulations • Student shall be able to understand various analytical techniques in the determination of herbal products • Student shall be able to understand the herbal monographs • Student shall be able to understand various herbal drug interactions • Student shall be able to understand various performance evaluation of cosmetic products

8. Pharmaceutical Quality Assurance

Sl. No.	Name of the Program	Name of the Course	Course Outcome
1	M. Pharm.	Quality Management System	• The student will understand the quality parameters and quality attribute in Pharmaceutical industry sectors • By studying and practicing the guidelines iso, nabl and other regulatory agencies student will predicts the current need of changes. • It provide the idea in the customers expectations in the quality pharmaceutical product. • student will know the importance of the quality of medicines in the public. • The subject will afford methodology in the regulatory body requirements for the import and export pharmaceutical products.
2		Quality control and Quality Assurance	• Student shall be able to understand the cGMP aspects in a pharmaceutical industry • Student shall be able to understand the importance of documentation • Student shall be able to understand the scope of quality certifications applicable to Pharmaceutical industries • Student shall be able to understand the responsibilities of QA department • Student shall be able to understand the responsibilities of QC department • Student shall be able to understand GLP and regulatory Affairs
3		Product development and Technology Transfer	• To apply the knowledge to develop new procedures of their own design of Pilot layouts • Student shall be able to understand the Quality by design practices of sterile and non sterile dosage forms • Student shall be able to understand the practices of packaging technology • Student shall be understand the Regulatory

			requirements in drug development stages • Students shall understand the phase of technology transfer
4		Hazards and Safety Management	• To understand the energy resources in the to make eco-friendly industry environment • The course knowledge useful to Find hazards in work atmosphere • It creates the passage to understand, Determine and to take control measures to eliminate or minimize the level of the risks • It support the student to recognize the control measures to eliminate or minimize the level of the risks • It provides platform for formal process for hazard identification, risk assessment and control to effectively manage workplace and safety hazards • It develop proper understanding in the stages of risk assesment
5		Pharmaceutical Validation	• The Students learn on the importance of validation. • The student learns on the importance of patent and intellectual property rights. • The students are trained on the qualification aspects of instruments. • The importance of calibration to be performed for the instruments. • The various validation aspects to be carried out in the industry. • The students gain knowledge on how validation are carried for various components. Such as instrument validation, cleaning validation and process validation.
6		Audit and Regulatory Compliance	• The student gain knowledge on the importance of auditing in pharmaceutical preparation. • The various forms of auditing are and how an audit process happens are briefed to the students. • Preparation of various audit checklist for the auditing. • when and what are the areas the auditing to be carried is taught to the student. • The Reporting form of the auditing process

			is taught to the student. • The student practices the auditing process and reporting process.
7		Pharmaceutical Manufacturing Technology	• Student shall be able to understand the common practice in the pharmaceutical industry developments • Student shall be able to understand the practices of aseptic process technology • Student shall be able to understand the practices of non sterile • manufacturing technology • Student shall be able to understand the practices of packaging technology • Student shall be able to understand understanding of principles and implementation of Quality by design (QbD) • Student shall be able to understand understanding of principles and implementation of process analytical technology (PAT) in pharmaceutical manufacturing

9. Pharmaceutical Biotechnology

Sl. No.	Name of the Program	Name of the Course	Course Outcome
1.	M. Pharm.	Microbial and Cellular Biology	• The students shall have knowledge in area of advanced microbiology which plays a crucial role in determining its future use and applications in medicine, drug discovery and in pharmaceutical industry**.** • The students will have an understanding on importance of microorganisms in Industry • The students would learn the structure and functions of cell, its communication ad Central dogma of molecular biology • The students shall understand the Cell culture technology, toxicity studies and procedures and its applications in pharmaceutical industries. • The students would learn and understand the concept of Microbial pathogenesis in disease control and prevention.
2		Bioprocess Engineering and Technology	• The student should develop skills to modify, design and operate different types of fermenters, to understand and implement various fermentation procedures. • Understand basics and design of fermentation technology • Scale up and scale down processing of fermentation technology • Bioprocessing of the industrially important microbial metabolites for the growth of microorganisms in industries and R & D organizations. • Regulation governing the manufacturing of biological products • Understand and conduct fermentation process kinetics.
3		Advanced Pharmaceutical Biotechnology	• This course imparts a comprehension of advanced skills necessary for developing novelty work in the field of biotechnology • Students will be gaining advanced concepts in biotechnology that leads to understanding of the principles and practices of biotechnology. • Students can able to evaluate different pharmaceutical parameters of the current and future biotechnology related products

			on the market. • Students can able to develop optimized skills on the delivery of peptides and proteins by the parenteral, oral, transdermal and nasal routes of administration • This course also makes students to become responsible biotechnologists that can work within the interdisciplinary framework of biotechnology and related fields. • This course ensures the students to effectively communicate with biotech and other interdisciplinary professionals.
4		Proteins and Protein Formulation	• Students can identify structural, function and membrane proteins and develop skills on various techniques used in functional proteomics such as mRNA expression and miRNA expression and Interpret data obtained through high throughput expression studies. • This course develops practical skills of the students who want to work in core facilities and commercial biological laboratories as well as in higher studies. • Students can analyze and correctly interpret the molecular mechanisms operating in living beings and identify their applications. • Students can identify and use bioinformatics tools to solve problems in biochemistry, molecular biology and biomedicine. • Students also gain troubleshooting errors in new or little-known situations within broader (or multidisciplinary) contexts related to the field of proteomics study • Students can able use the different methodologies, techniques and tools commonly used in protein sequencing, assembly and annotation, interatomic and metabolomics.
5		Immunotechnology	• At the end of the course the student is expected to have knowledge on production and engineering of antibodies, the application of antigens, the design of (recombinant) vaccines, strategies for immune intervention. • Understand the techniques like immunodiagnostic tests, • Characterization of lymphocytes, purification of antigens and

			antibody, etc. • Access health problems with immunological background; • Develop approaches for the immune intervention of diseases
6		Bioinformatics and Computational Technology	• Students can able to interpret relationships among living things and analyze and solve biological problems, from the chemical to molecular level using bioinformatics concepts, grounded in foundational theories • Students can able to create computer programs that facilitate biological data analysis including protein, mRNA annotation • Students can able to start, conduct their own basic, fundamental bioinformatics research that solves most of the biological problems • Students will get knowledge and awareness of the basic principles and concepts of biology, computer science and mathematics • This course effectively make students to learn existing software to extract information from large databases and to use this information in computer modeling • Students can differentiate diverse intersection of the life and information sciences, the core of shared concepts, language and skills the ability to speak the language of structure-function relationships between two different proteins.
7		Biological Evaluation of Drug Therapy	• The student should have the knowledge to understand the importance of biological and evaluation of drug therapy of biological medicines. • Understand about the general concept of standardization of biological. • Understand the importance of transgenic animals and knockout animals. • Understand the biological medicines in development of various diseases. • Learn the biological evaluation of drugs *in vitro* and *in vivo*

10. Pharmacy Practice

Sl. No.	Name of the Program	Name of the Course	Course Outcome
1 and 2	M.Pharm	Pharmacotherapeutics I Pharmacotherapeutics II	• Establishing the Pharmacist - Patient Relationship • Developing Patient case based Assessment Skills • Improving Drug related-Problem Identification and Problem Solving Skills • Developing Therapeutic Decision Making Skills • Establishing a Desired Pharmacotherapeutic Outcomefor Each Drug and disease Related Problem • Determining Rational Pharmacotherapeutic Alternatives • Selecting and Individualizing the Therapeutic Regimen • Designing and Implementing a Therapeutic DrugMonitoring Plan • Improving Patient Education skills
3		Hospital & Community Pharmacy	• Understand the organizational structure of hospital pharmacy • Understand drug policy and drug committees • Know about procurement & drug distribution practices • Know the admixtures of radiopharmaceuticals • Understand the community pharmacy management • Know about value added services in community pharmacies
4		Clinical Research	• Know the new drug development process. • Understand the regulatory and ethical requirements. • Appreciate and conduct the clinical trials activities • Know safety monitoring and reporting in clinical trials • Manage the trial coordination process • Know the new drug development process.

			• Understand the regulatory and ethical requirements. • Appreciate and conduct the clinical trials activities • Know safety monitoring and reporting in clinical trials • Manage the trial coordination process
5		Principles of quality use of medicines	• Students will demonstrate an understanding of the principles and elements of Quality Use of Medicines • Students will briefly outline the benefits and risks of medicine use and apply it in profession of pharmacy. • Students will recognize regulatory aspects of quality use of medicines and will contribute to ongoing improvement. • Students will initiate and advocate solutions in response to medication related problems they identify. • Students will promote quality use of medicines • Students will apply principles of evidence-based medicine to determine clinical diagnoses, and formulate and implement appropriate treatment modalities.

6		Clinical Pharmacokinetics and Therapeutic Drug Monitoring	• Ability to apply the concepts of Pharmacokinetics to individualize the drug dosage regimen in clinical settings.
			• Ability to design a dosage regimen of a drug based on its route of administration
			• Ability to design and implement pharmacokinetic services such as
			  ○ Intravenous to Oral conversion of dosage regimens
			  ○ Therapeutic Drug Monitoring Services
			• Broader understanding about the significance of altered pharmacokinetics, Pharmacogenetics and Pharmacometrics
			• Ability to adjust the dosage regimen for patients with renal / hepatic impairments
			• Ability to assess the drug interaction

			issues in the clinical settings. • Ability to design and implement therapeutic drug monitoring services for various drugs • Ability to design a basic protocol for the conduct of BA/BE study and the interpretation of the BA/BE data
7		Pharmacoepidemiology and Pharmacoeconomics	• Describe the methods used in Pharmacoepidemiology. • Demonstrate competency in the design, conduct and evaluation of Pharmacoepidemiology studies. • Describe the methods used in Pharmacoeconomic analysis. • Demonstrate competency in the design, conduct and evaluation of Pharmacoeconomic studies.
8		Clinical pharmacy practice	• Understand the elements of pharmaceutical care and provide comprehensive patient care services • Interpret the laboratory results to aid the clinical diagnosis of various disorders • Provide integrated, critically analyzed medicine and poison information to enable healthcare professionals in the efficient patient management