



BHARAT INSTITUTE OF TECHNOLOGY

Mangalpally, Ibrahimpatnam, R.R. District, PIN-501510

(Affiliated to JNTUH, Approved by AICTE and PCI, New Delhi. Accredited by NAAC)

2.6 – Student Performance and Learning Outcomes

2.6.1 – Program and course outcome for all programs offered by the institution are stated and displayed on website and communicated to teachers and students.

Response:

Program Outcomes (POs) and Course Outcomes (COs) for all programs are stated and displayed in the institution website bitpharmacy.org

POs are displayed at strategic places in the institution.

- POs are defined to achieve our short term, long term goals and finally, the mission of the institution.
- POs are designed to identify different aspects of students learning skills such as knowledge, cognitive skills, analytical skills, modern tools and instruments usage, professional and social skills and development of an attitude toward lifelong learning.
- COs are central to our course curriculum. A Course Outcome (CO) is a measurable, observable, and specific statement that clearly indicates what a student would learn at the end of the course.

The following Program Outcomes (POs) are structured by the National Board of Accreditation (NBA) and are applied to all the programs.

- 1.PO1: Pharmacy knowledge
- 2.PO2: Planning abilities
- 3.PO3: Problem analysis
4. PO4: Modern tool usage
5. PO5: Leadership skills
6. PO6: Professional identity
7. PO7: Pharmaceutical ethics
8. PO8: Communication
9. PO9: The Pharmacist and society
10. PO10: Environment and sustainability
11. PO11: Life-long learning

Course Outcomes (COs) are stated and displayed in the college website:

- The process for defining the COs takes into consideration the inputs from various employers, faculty and alumni.
- A similar process is in place for defining the Program Specific Outcomes (PSOs).
- There are minimum of 4 COs defined for each course.
- Similarly, there are minimum of 3 PSOs defined for each Program.
- The COs are then mapped with the Program Outcomes (POs) and Program Specific Outcomes (PSOs).



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Program Outcome (POs);

PO no.	Program objective	Program Outcome
1	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.
2	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.
3	Problem Analysis	Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyse, evaluate and apply information systematically and shall make defensible decisions.
4	Modern tool usage	Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.
5	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 well-being.
6	Professional Identity	Understand, analyse and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).
7	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.
8	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.
9	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.
10	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.



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11	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- access and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.
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PROGRAMME SPECIFIC OUTCOMES (PSOs)

B.PHARMACY

PSO	Program Specific Outcomes
1	To develop the knowledge in technical or professional careers in various pharmaceutical industry and/ or institute and or Health' care' system through excellent real time exposure o rigorous education.
2	To apply the skills of manufacturing, formulation/preparation and quality control of various pharmaceutical preparations.
3	To design the modern tools to integrate health care systems, design an effective product with commercial advantage and societal benefit, perform risk analysis and become entrepreneur.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

M.PHARMACY

Pharmaceutics	
PSO	Program Specific Outcomes
1	Work in different divisions of pharmaceutical industry like manufacturing, quality control, quality assurance, analytical research, formulation research and regulatory affairs.
2	Become an entrepreneur in the areas of formulation research and development, pharmaceutical manufacturing, pharmaceutical consultancy services, drug sales and distribution.
3	Explore opportunities in different government and non-government organizations as drug analyst, academician, research scientist and drug inspector.
4	Explore opportunities in different government and non-government organizations as drug analyst, academician, research scientist and drug inspector.
Pharmacology	



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PSO	Program Specific Outcomes
1	Work in different divisions of pharmaceutical industry like manufacturing, quality assurance, analytical, preclinical research, pharmacovigilance and regulatory affairs.
2	Become an entrepreneur in the areas of clinical research, preclinical development, pharmaceutical consultancy services, drug sales and distribution.
3	Explore opportunities in different government and non-government organizations as clinical research associate, academican, research scientist and drug inspector.
Pharmacy Practice	
PSO	Program Specific Outcomes
1	Students elucidate patient care in performing medication counselling, medication history, medication chart review, drugs and poison information and interpretations of Clinical laboratory data which impacts on Pharmacotherapy.
2	Students assist physician to analyse and provide solution for the critical cases in hospitals/Clinics for improved therapy outcome and better patient compliance.
3	Students will Possess ethical and moral values in the delivery of health care in multifaceted environment.
Pharmaceutical Analysis	
PSO	Program Specific Outcomes
1	Work in different divisions of pharmaceutical industry like Spectrometric techniques for identification, characterization, quantification and structural elucidation of drugs by using the knowledge of UV, IR, Mass, NMR, Spectrofluorimetry and Flame emission techniques.
2	Students assist physician to analyse and provide solution for the critical cases in hospitals/Clinics for improved therapy outcome and better patient compliance.
3	Students will Possess the knowledge for research using Electrophoretic and X Ray Crystallography Techniques.
Pharmaceutical Chemistry	
PSO	Program Specific Outcomes
1	Work in different divisions of pharmaceutical industry like manufacturing, quality control, quality assurance, analytical research, active pharmaceutical ingredient synthesis and regulatory affairs.
2	Become an entrepreneur in the areas of new molecule development, analytical method development, pharmaceutical consultancy services, drug sales and distribution.
3	Explore opportunities in different government and non-government organizations as drug analyst, academican, research scientist and drug inspector.



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PROGRAMME SPECIFIC OUTCOMES (PSOs)

PHARM.D

PSO	Program Specific Outcomes
1	Work with medical practitioners in hospitals and clinics to improve pharmacotherapy for better patient compliance.
2	Explore opportunities with pharmaceutical industries and government organizations as medical writer, pharmacovigilance associate and clinical research associate.
3	Educate patients and other communities for safe and rational use of medications.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PHARM.D (P.B)

PSO	Program Specific Outcomes
1	Work with medical practitioners in hospitals and clinics to improve pharmacotherapy for better patient compliance.
2	Explore opportunities with pharmaceutical industries and government organizations as medical writer, pharmacovigilance associate and clinical research associate.
3	Educate patients and other communities for safe and rational use of medications.



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Program: Bachelors of Pharmacy

Duration: 4 year

Course Outcome

Ist year sem I

Sr. No.	Course Code	Course Title	Course Outcome
			<u>Upon completion of the course, the student should be able to</u>
1	PS101	Human Anatomy and Physiology I	<ul style="list-style-type: none">• Understand the gross morphology, structure, and functions of various organs of the human body are explained.• Analyze the various homeostatic mechanisms and their imbalances are illustrated.• Illustrate working pattern of different organs of each system.• Identify the functional coordination between the CNS & PNS.
2	PS102	Pharmaceutical Analysis I	<ul style="list-style-type: none">• The principles of volumetric and electro chemical analysis explained.• Describe different types of organic reagents, inductive effect and its applications.• Implement the Electro chemical method of analysis in Determination end points.• Perform gravimetric Analysis along with identification of impurities.
3	PS103	Pharmaceutics I	<ul style="list-style-type: none">• Understand the history of profession of pharmacy.• Understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations.• Describe historical background and development of pharmacy profession with special emphasis on prescriptions, dosage forms and Posology.• Identify stability problems and steps to overcome them along with an idea of monobasic liquids.• Define Classify, Prepare formulations such as suspensions and emulsions.
4	PS104	Pharmaceutical Inorganic Chemistry-I	<ul style="list-style-type: none">• Understanding the medicinal and pharmaceutical importance of inorganic compounds.• Learning about radioactive substances.• Comprehend the ideal properties and mechanism of action of gastrointestinal



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			<p>agents.</p> <ul style="list-style-type: none">• Define, prepare following the principles and procedures involved in assay of expectorants, emetics, haematinic.• Apprehend theories of acids and bases, buffer capacity and buffer action, extra and intracellular electrolytes and dental products.
5	HS 105	Communication skills	<ul style="list-style-type: none">• Understand the behavioural needs for a Pharmacist to function effectively in the areas of pharmaceutical operation.• Able to communicate professionally with regional as well non-residential persons.• Learn elements of communication and communication styles.• Develop Listening skills required for communication.
6	BS107	Remedial Mathematics	<ul style="list-style-type: none">• Know the theory and their application in Pharmacy.• Solve the different types of problems by applying theory.• Appreciate the important application of mathematics in Pharmacy.• Define and study limits and continuity of calculus.
7	PS108	Human Anatomy and Physiology-I lab	<ul style="list-style-type: none">• Identified the various tissues and organs of different systems of human body.• Performed the various experiments related to special senses and nervous system.• Study handling of simple and compound microscope.• Observe microscopically epithelial, connective, muscular and nervous tissue.
8	PS109	Pharmaceutical Analysis I lab	<ul style="list-style-type: none">• Carry out various volumetric and electrochemical titrations.• Developed analytical skills.• Prepare and standardize different compounds.• Work on electro chemical method of analysis by calculation of potential and conductivity.
9	PS110	Pharmaceutics lab	<ul style="list-style-type: none">• Understand the professional way of handling the prescription Preparation of various conventional dosage forms.• Preparing the various formulations.• Experiencing the formulations of various dosage forms and quality testing of the formulations.• Prepare suppositories, semi-solids and



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			gargles and mouthwashes.
10	PS111	Pharmaceutical Inorganic Chemistry lab	<ul style="list-style-type: none">• Know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals.• Perform the limit test for chlorides, sulphates, lead, iron, heavy metal and arsenic.• Perform swelling power of Bentonite.• Perform neutralizing capacity of aluminum hydroxide gel.
11	HS112	Communication skills lab	<ul style="list-style-type: none">• Communicate effectively (Verbal and Non-Verbal).• Effectively manage the team as a team player.• Develop interview skills. Develop Leadership qualities and essentials.• Learn presentation skills and mailing skills.

Ist year sem II

14	PS201	Human Anatomy and Physiology II	<ul style="list-style-type: none">• Explained the gross morphology, structure, and functions of various organs of the human body.• Described the various homeostatic mechanisms and their imbalances.• Understand coordinated working pattern of different organs of each system.• Understand the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body.
15	PS202	Pharmaceutical Organic Chemistry-I	<ul style="list-style-type: none">• Studied the structure, name and the type of isomerism of the organic compounds.• Studied the reaction, name the reaction and orientation of reactions.• Write various reactions and uses of aldehyde and ketones.• Explain Nucleophilic substitution reactions in alkyl halides.
16	BS203	Biochemistry	<ul style="list-style-type: none">• Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.• Understand the metabolism of nutrient molecules in physiological and pathological conditions.• Understand the genetic organization of



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			<p>mammalian genome and functions of DNA in the synthesis of RNAs and proteins.</p> <ul style="list-style-type: none">• Acquire knowledge on properties nomenclature, classification of enzymes along with enzyme kinetics, enzyme inhibitors regulation of enzyme.
17	BS204	Pathophysiology	<ul style="list-style-type: none">• Describe the etiology and pathogenesis of the selected disease states.• Name the signs and symptoms of the diseases.• Mention the complications of the diseases.• Know and understand the basic principles of cell injury and adaption as well as the basic mechanism involved in the process of inflammation and repair.• Outline and describe the signs and symptoms, etiology, pathogenesis and complications of diseases like infectious and sexually transmitted diseases.
18	CS205	Computer Applications in Pharmacy	<ul style="list-style-type: none">• Know the various types of application of computers in pharmacy.• Know the various types of databases.• Know the various applications of databases in pharmacy.• Apply concepts of Number system, Information systems and Software.• Have an idea of Bioinformatics on databases and concepts of bioinformatics in Vaccine discovery.
19	PS206	Human Anatomy and Physiology II lab	<ul style="list-style-type: none">• Identify the various tissues and organs of different systems of human body.• Perform the haemoglobin AL tests like blood cell counts, haemoglobin estimation, bleeding/clotting time etc.• Record B.P by sphygmomanometer and basal mass index.• Aware of using family planning devices and pregnancy diagnose test.
20	PS207	Pharmaceutical Organic Chemistry-I Lab	<ul style="list-style-type: none">• Explained the reactivity/stability of compounds.• Identify/confirm the identification of organic compound.• Identify unknown compound using melting and boiling point.• Construct Molecular models.
21	BS208	Biochemistry lab	<ul style="list-style-type: none">• Qualitative analysis of carbohydrate, protein, and various sugars.• Determination of various haemoglobin constituents.



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			<ul style="list-style-type: none">• Study effect of temperature and substrate concentration on salivary amylase activity.• Understand the effect of enzymatic hydrolysis of starch.
22	CS209	Computer Applications in Pharmacy lab	<ul style="list-style-type: none">• Retrieve the information of a drug and its adverse effects using online tools.• Generating report and printing the report from patient database.• Export tables, Queries, forms and reports to web pages and XML Pages.• Create a HTML web page and database in MS Access to store patient information.

IInd year sem I

23	PS301	Pharmaceutical Organic Chemistry-II	<ul style="list-style-type: none">• Studied the structure, name and the type of isomerism of the organic compound.• Studied the reaction, name the reaction and orientation of reactions.• Explain the concepts and theories in alkanes, alkenes and conjugated dienes.• Explain Nucleophilic substitution reactions in alkyl halides.
24	PS302	Physical Pharmaceutics-I	<ul style="list-style-type: none">• Learned physicochemical properties of drug molecules in formulation research and development.• Know the principles of chemical kinetics & to use them in assigning expiry date for formulation.• To analyze the micromeritic properties of powders and their characteristics.• To determine the pH of different solutions and buffers in pharmaceutical and biological systems.
25	BS303	Pharmaceutical Microbiology	<ul style="list-style-type: none">• Explaining the Importance of sterilization in microbiology and pharmaceutical industry.• Understanding the cell culture technology and its applications in pharmaceutical industries.• Outline disinfectants and their evaluation tests, sterility testing of different pharmaceutical substances.• Apprehend the concepts of aseptic area, laminar air flow equipment, microbiological assays. Standardization of antibiotics, vitamins, amino acids and general aspects of environmental cleanliness.• Relate the cell culture technology and its



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			applications in pharmaceutical industries.
26	PC304	Pharmaceutical Engineering	<ul style="list-style-type: none">To know various unit operations used in Pharmaceutical industries.To understand the material handling techniques.To understand and comprehend significance of plant lay out design for optimum use of resources.Acquire knowledge on different types of dryers; EMC, FMC, DRC. Acquire knowledge on Distillation techniques.Gain the knowledge on the various equipment which are used in the pharmaceutical industry.
27	PS305	Pharmaceutical Organic Chemistry-II Lab	<ul style="list-style-type: none">Knowledge for reactivity/stability of compounds.Synthesis of organic compounds.Preparation of Various organic compounds using Acylation, Halogenation, Nitration, Oxidation, Hydrolysis and Coupling Reactions.Prepare Cinnamic acid from benzaldehyde by Perkin reaction.
28	PS306	Physical Pharmaceutics-I Lab	<ul style="list-style-type: none">Demonstrate use of physicochemical properties in evaluation of dosage forms.Understand various physicochemical properties of drug molecules in the designing the dosage form.Determine % composition of NaCl in a solution using phenol-water system by CST method.Determine pKa value by Half Neutralization/ Henderson HasselBalch equation.
29	BS307	Pharmaceutical Microbiology Lab	<ul style="list-style-type: none">Understanding methods of identification, cultivation and preservation of various microorganisms.Learned sterility testing of pharmaceutical products.Microbiological standardization of Pharmaceuticals.Determine motility of microorganism and bacteriological analysis of water.
30	PC308	Pharmaceutical Engineering Lab	<ul style="list-style-type: none">To perform various processes involved in pharmaceutical manufacturing process.To carry out various test to prevent environmental pollution.To appreciate the various preventive



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			<p>methods used for corrosion control in Pharmaceutical industries.</p> <ul style="list-style-type: none">• Determine the radiation constant of brass, iron, unpainted glass, various techniques of distillation and to gain knowledge about overall heat transfer mechanism.• Gain the knowledge on the various equipment which is used in the pharmaceutical industry.
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IInd year sem II

31	PS401	Pharmaceutical Organic Chemistry-III	<ul style="list-style-type: none">• Understanding the methods of preparation and properties of organic compounds.• Explained the stereo chemical aspects of organic compounds and stereo chemical reactions.• Know the medicinal uses and other applications of organic compounds.• Synthesize and recall the medicinal uses of some heterocyclic compounds.• Write the reaction mechanisms of some named reactions.
32	PC402	Physical Pharmaceutics-II	<ul style="list-style-type: none">• Understand various physicochemical properties of drug molecules in the designing the dosage form.• Explaining the principles of chemical kinetics & to use them in assigning expiry date for Formulation.• Explain physical stability of emulsions and their preservation.• Recall Classification of dispersed systems & their general characteristics.
33	PS403	Pharmacology-I	<ul style="list-style-type: none">• Explained the mechanism of drug action at organ system/sub cellular/ macromolecular levels.• Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.• Understand the correlation of pharmacology with other bio medical sciences.• Apply mechanism of drug action and its relevance in the treatment of different ANS diseases.• List out various neurotransmitters and their role in CNS Disorders.
34	PC404	Pharmacognosy and	<ul style="list-style-type: none">• Understanding the techniques in the cultivation and production of crude drugs.



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		Phytochemistry-I	<ul style="list-style-type: none">• Understanding the evaluation techniques for the herbal drugs.• To carry out the microscopic and morphological evaluation of crude drugs.• Describe basic concepts of pharmacognosy with emphasis on sources of drugs, their classification and quality control tests.• Discuss the role of Pharmacognosy and secondary metabolites in allopathy and traditional systems of medicine.
35	PS405	Pharmaceutical Jurisprudence	<ul style="list-style-type: none">• The Pharmaceutical legislations and their implications in the development and marketing.• Understand the various Indian pharmaceutical Acts and Laws.• Knowledge about the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals.• Practicing the code of ethics during the pharmaceutical practice.
36	PC406	Physical Pharmaceutics-II Lab	<ul style="list-style-type: none">• Appreciate physicochemical properties of drug molecules in formulation research and Development.• Demonstrate use of physicochemical properties in evaluation of dosage forms.• Determine of HLB number of a surfactant by saponification method & know the acid base values.• Determine viscosity of semisolids by using Brookfield viscometer& know the viscosity of various liquids.• Design Accelerated stability studies.
37	PS407	Pharmacology-I Lab	<ul style="list-style-type: none">• Understand the pharmacological actions of different categories of drugs.• Observe the effect of drugs on animals by simulated experiments.• Measure the effect of drug on Ciliary motility of frog oesophagus.• Observe the effects of drugs on locomotor activity using actophotometer.
38	PC408	Pharmacognosy and Phytochemistry-I Lab	<ul style="list-style-type: none">• Understand the crude drugs, their uses and chemical nature.• Carry out the microscopic and morphological evaluation of crude drugs.• Carry out Isolation of herbal extraction by using TLC method.• Perform Extraction and Detection of various volatile oils by TLC.



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IIIrd year sem I

39	PS501	Medicinal Chemistry I	<ul style="list-style-type: none">• Understanding the chemistry of drugs with respect to their pharmacological activity.• Understanding the drug metabolic pathways, adverse effect and therapeutic value of drugs.• Explaining the Structural Activity Relationship (SAR) of different class of drugs.• Gain knowledge on Classification, Mechanism of action, uses and synthesis of Anti diabetic and Local Anesthetic agents.• Answer the Nomenclature, Stereochemistry, Degradation, Adverse effects and therapeutic value of Drugs acting on Endocrine system.
40	PS502	Industrial Pharmacy - I	<ul style="list-style-type: none">• Know the various pharmaceutical dosage forms and their manufacturing techniques.• Know various considerations in development of pharmaceutical dosage forms.• Gain knowledge on formulation requirements and in process quality control tests for capsules and pellets with emphasis on special techniques.• Design a layout on parenteral and ophthalmic product with emphasis on evaluation studies.• List out the types of Parenteral Products, Formulation of injections, Containers and closures, Ophthalmic Preparations.
41	PS503	Pharmacology II	<ul style="list-style-type: none">• Understanding the mechanism of drug action and its relevance in the treatment of different diseases.• Know the correlation of pharmacology with related medical sciences.• Apply the concepts of inflammatory mediators and their role in the management of inflammation.• Identify endocrine glands & treatment strategies in the management of endocrine imbalances.
42	PS504	Pharmacognosy and Phytochemistry - II	<ul style="list-style-type: none">• To know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents.• To understand the herbal drug interactions• Understand and explain different crude drugs under the category of tannins and



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			<p>Resins.</p> <ul style="list-style-type: none">Isolate, Identify and analyze Phyto-constituents belonging to Alkaloids, Glycosides, Terpenoids and Resins.
43	PS508	Cosmetic science	<ul style="list-style-type: none">Upon completion of the course the student shall be able to know the regulations pertaining to cosmetics and cosmetic excipients.They will be knowing the preparations of various skin care products like creams, anti-perspirants, deodorants, hair care products etc.They also know about the role of herbs in sunscreens.Understanding the various physical and chemical test required for the cream formulation.
44	PC509	Medicinal Chemistry I Lab	<ul style="list-style-type: none">Performed the chemical synthesis of some drugs.Assay of drugs.Gain the knowledge of, Mechanism of action, uses and synthesis of Anti diabetic and Local Anesthetic agents.Learned Chemistry, Metabolism and Uses of Coagulant, Anticoagulants and Drugs used in Congestive Heart Failure.
45	PS510	Industrial Pharmacy – I lab	<ul style="list-style-type: none">Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality.Understand to perform the pre-formulation parameters of drug substance.Formulate and evaluate tabletsDevelop skills on filling and evaluation of capsules.
46	PS511	Pharmacology - II lab	<ul style="list-style-type: none">Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments.Demonstrate the various receptor actions using isolated tissue preparation.Conduct DRC using frog rectus abdominal muscle by acetylcholineObserve the diuretic activity of drugs using rats and mice.
47	PS512	Pharmacognosy and Phytochemistry - II lab	<ul style="list-style-type: none">To understand the preparation and development of herbal formulation.To carryout isolation and identification of phytoconstituents.Determine morphology, histology, extraction and detection of different powder crude drugs of Alkaloids.



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			<ul style="list-style-type: none">• Perform Quality control tests of crude drugs.
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IIIrd year sem II

46	PS601	Medicinal Chemistry - II	<ul style="list-style-type: none">• Understand the importance of drug design and different techniques of drug design.• Understand the chemistry of drugs with respect to their biological activity.• Know the metabolism, adverse effects and therapeutic value of drugs.• Know the importance of SAR of drugs.• Analyze the chemistry of drugs with respect to their biological activity
47	PS602	Pharmacology - III	<ul style="list-style-type: none">• Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases.• Comprehend the principles of toxicology and treatment of various poisonings and appreciate correlation of pharmacology with related medical sciences.• Identify the drug of choice in the management of different viral and fungal infections.• Define the principles of toxicology and can list out the treatment options for various poisoning conditions.
48	PS603	Herbal Drug Technology	<ul style="list-style-type: none">• Know the WHO and ICH guidelines for evaluation of herbal drugs.• Knowledge of patenting of herbal drugs and their GMP.• Apply the fundamentals of herbal raw materials in biodynamic farming techniques.• Correlate the insights of nutraceuticals and herbal food interactions.• Demonstrate the regulations that applies to protection of traditional knowledge against infringement
49	PS604	Biopharmaceutics and Pharmacokinetics	<ul style="list-style-type: none">• Understand the basic concepts in biopharmaceutics and pharmacokinetics.• Use plasma data and derive the pharmacokinetic parameters to describe the process of drug absorption, distribution, metabolism and elimination.• Critically evaluate biopharmaceutic studies involving drug product equivalency.• Acquire knowledge on basic metabolic



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			<p>pathways, renal excretion and protocols for bioequivalence studies.</p> <ul style="list-style-type: none">• Compute various pharmacokinetic parameters from plasma and urinary excretion data by applying compartment and non-compartment modelling.
50	PS605	Pharmaceutical Quality Assurance	<ul style="list-style-type: none">• Understand the cGMP aspects in a pharmaceutical industry.• Appreciate the importance of documentation.• Understand the scope of quality certifications applicable to pharmaceutical industries.• Understand the responsibilities of QA & QC departments.• Describe QC tests for containers, closures and secondary packaging materials.
51		Medicinal chemistry - II lab	<ul style="list-style-type: none">• Performed the Synthesis of various drug intermediates.• Completed Assay of various drugs.• Determine physicochemical properties such as logP, clogP, MR, Molecular weight, Hydrogen bond donors and acceptors for class of drugs.• Synthesize medicinally important compounds and intermediates by using microwave irradiation technique.
52	PS610	Pharmacology - III lab	<ul style="list-style-type: none">• Biostatistics methods in experimental pharmacology (student's t test, ANOVA).• Calculation of pharmacokinetic parameters from a given data.• Calculate the dose for different pharmacological experiments.• Apply the concepts of pharmacological screening methods for determining the therapeutic effect of different drugs.
53	PS611	Herbal Drug Technology lab	<ul style="list-style-type: none">• Know the herbal cosmetics, natural sweeteners, nutraceuticals.• Understand raw material as source of herbal drugs from cultivation to herbal drug product.• Carry out phytochemical screening for crude drugs• Incorporate and evaluate natural extract in shampoos and creams.
54	PS612	Biopharmaceutics and Pharmacokinetics Lab	<ul style="list-style-type: none">• Design and evaluate dosage regimens of the drugs using pharmacokinetic and biopharmaceutical parameters.• Detect potential clinical pharmacokinetic problems and apply basic pharmacokinetic



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			<p>principles to solve them.</p> <ul style="list-style-type: none">• Familiarize with two compartment open model and IV bolus Kinetics of multiple dosing and their significance.• Detect the causes of nonlinearity and compute K_m and V_{max} by Michaelis menton equation using graphical methods.
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IVth year sem I

56	PS701	Instrumental Methods of Analysis	<ul style="list-style-type: none">• Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis.• Fundamental knowledge on the principles and instrumentation of spectroscopic and chromatographic technique.• Write the Principles, Instrumentation and Applications of HPLC and GC.• Explain the principles, instrumentation and applications of electrophoresis.• Describe the principles, instrumentation and applications of Ion exchange and Gel Chromatographic Techniques and Affinity chromatography.
57	PS702	Industrial Pharmacy-II	<ul style="list-style-type: none">• Know the process of pilot plant and scale up of pharmaceutical dosage forms.• Understanding the process of technology transfer from lab scale to commercial batch.• Know different laws and acts that regulate pharmaceutical industry in India and US.• Understanding the approval process and regulatory requirements for drug products.• Explore the functions and responsibilities of regulatory agencies in drug approval.
58	PS703	Pharmacy Practice	<ul style="list-style-type: none">• Know various drug distribution methods in a hospital.• Appreciate the pharmacy stores management and inventory control.• Monitor drug therapy of patient through medication chart review and clinical review• Know pharmaceutical care services.• Do patient counselling in community pharmacy.
59	PS704	Medicinal Chemistry - III	<ul style="list-style-type: none">• Understanding the importance of drug design and different techniques of drug design.• Understanding the chemistry of drugs with respect to their biological activity.



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			<ul style="list-style-type: none">• Know the metabolism, adverse effects and therapeutic value of drugs.• Know the importance of SAR of drugs.
60	PS707	Pharmacovigilance	<ul style="list-style-type: none">• History and development of pharmacovigilance.• National and international scenario of pharmacovigilance.• International standards for classification of diseases and drugs.• Adverse drug reaction reporting systems and communication in pharmacovigilance.• Data during pre-clinical, clinical and post approval.• Pharmacovigilance Program of India (PvPI)• ICH guidelines for ICSR, PSUR, expedited reporting, pharmacovigilance planning.
61	PS709	Instrumental Methods of Analysis Lab	<ul style="list-style-type: none">• Understand the chromatographic separation and analysis of drugs.• Perform quantitative & qualitative analysis of drugs using various analytical instruments.• Estimate compounds by Flame photometry and nepheloturbidimetry.• Carry out the separation of compounds by paper, column and thin layer chromatography.• Perform the analysis of compounds by colorimetry, UV and Fluorimetry.
62	PS710	Practice School	<ul style="list-style-type: none">• Interact with executives to facilitate the process of learning by observations and discussions duly aided by checklist.• Visit the hospitals and work on some case studies like cardiovascular, diabetes and chronic diseases.• Collect the data from different pharmacy shops related to the most prescribed medicines in that area, prescription patterns, medical audit.• Collect and analyze the regulatory affairs of some important cases filed by drug control officers to be analyzed and reported.
63	PS711	Industrial Training	<ul style="list-style-type: none">• Visit Industries and get exposed to various equipment's used for formulations/ Preparations in industries.• Get exposure to basic facilities required for an industry.• Understand GMP/GLP of Industries by



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			<p>practically observing them in industry.</p> <ul style="list-style-type: none"> Learn applications of theory which they have studied in their subject theoretically.
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IVth year sem II

64	PS801	Biostatistics and Research Methodology	<ul style="list-style-type: none"> Know the operation of M.S. Excel, SPSS, R and MINITAB®, DoE (Design of Experiment). Know the various statistical techniques to solve statistical problems. Appreciate statistical techniques in solving the problems.
65	PS802	Social and Preventive Pharmacy	<ul style="list-style-type: none"> Acquire high consciousness/realization of current issues related to health and pharmaceutical problems within the country and worldwide. Have a critical way of thinking based on current healthcare development. Evaluate alternative ways of solving problems related to health and pharmaceutical issues.
66	PS803	Novel Drug Delivery System	<ul style="list-style-type: none"> Understand various approaches for development of novel drug delivery systems. Understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems, their formulation and evaluation. Know the concepts of microencapsulation, mucosal drug delivery system and implantable drug delivery system.
67	PS805	Nano Technology	<ul style="list-style-type: none"> Knowledge about insight into the fundamentals of Nano-science and Nanotechnology Understand the basics of nanostructures and different types of nanostructures. Learned the information about different thin film deposition techniques and transport phenomena.
68	PS808	Novel Drug Delivery System Lab	<ul style="list-style-type: none"> To understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems, their formulation and evaluation. The students should be able to select the right kind of materials, able to develop nano formulations with appropriate technologies, evaluate the product related test and for identified diseases. Preparation and Evaluation of Osmotic Drug



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			Delivery Systems.
69	24801	Project Work	<ul style="list-style-type: none">• Learn basic level of research like literature collection, literature review by visiting online journals and reading offline journals and books.• Learn to select an area of research for their project work keeping, in view of their subject of interest.• Get exposure to Experimental works beyond regular laboratory studies in curriculum along with operation of equipment's.• Acquire knowledge on basics of all subjects in a nutshell and new techniques in various departments of Pharmacology.• Learn techniques involved in documentation of results obtained, interpretation of results and thesis writing.• Learn presentation skills with emphasis on ppt preparation and communication skills.



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Program: M. Pharm (Pharmaceutics)

Duration: 2 years

COURSE OUTCOMES

I YEAR I Semester

Sr. No.	Course Code	Course Title	Course Outcome
1	Professional Core – I	Modern Pharmaceutics-I	<ul style="list-style-type: none">Understand the science of Preformulation studies before developing a novel drug delivery system.Apply ICH guidelines and evaluate drug excipient compatibility.Understand formulation and development of various solid dosage forms and capsules.Learn optimization techniques and able to apply the statistical design in different formulations.
2	Professional Core – II	Applied Biopharmaceutics and Pharmacokinetics	<ul style="list-style-type: none">Understand the factors affecting the bioavailability and stability of dosage form. Student is able to know bioequivalence studies.Know the parameters for the drug disposition.Know the parameters for the absorption of drugs.Know the Michaelis-Menton constants for nonlinear kinetics and Clinical Pharmacokinetics.Learn about the time dependent pharmacokinetics and drug interactions.
3	Professional Elective – I	Drug Regulatory affairs	<ul style="list-style-type: none">Students will come to know the different competent regulatory authorities globally.Students will be aware of technical aspects pertaining to the marketing authorization application (MAA).The regulatory guidelines and directions framed by the regulatory authorities will be helpful to place the drug products in market for marketing approvals.Increasing the knowledge regarding the regulatory aspects in the pharmaceutical industries.
4	Professional Elective – II	Cosmetics and Cosmeceuticals	<ul style="list-style-type: none">Learned about the Key ingredients used in cosmetics and cosmeceuticals.Getting Knowledge about Key building blocks for various formulations.Introducing with Current technologies in the market.



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			<ul style="list-style-type: none"> • Various key ingredients and basic science to develop cosmetics and cosmeceuticals. • Scientific knowledge to develop cosmetics and cosmeceuticals with desired Safety, stability, and efficacy.
5		Research Methodology and IPR	<ul style="list-style-type: none"> • Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity. • Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasise the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular. • Analyze research related information. • Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.
6	Laboratory-I	Modern Pharmaceutics-I Lab	<ul style="list-style-type: none"> • Carry out Pre-formulation studies on solid dosage forms. • Study the effect of particle size and various binders on in vitro release of drug. • Determine the rate constants of acid and alkaline hydrolysis. • Formulate and evaluate beta-cyclodextrin complexes of new drugs. • prepare paracetamol tablets and compare the in vitro release with marketed formulation.
7	Laboratory-II	Applied Biopharmaceutics and Pharmacokinetics Lab	<ul style="list-style-type: none"> • Compare dissolution studies of two different marketed products of same drug. • Perform Protein binding studies of a drug and Calculation of bioavailability. • Calculate the Pharmacokinetic parameters like K_a, K_e, $t_{1/2}$, C_{max}, AUC, AUMC, MRT etc. from blood profile data. • Calculate Bioavailability and Bioequivalence Studies. • Perform Permeation studies and Drug Release from semisolid.
8	Audit Course - I	Personality Development through Life Enlightenment Skills	<ul style="list-style-type: none"> • To learn to achieve the highest goal happily. • To become a person with stable mind, pleasing personality and determination. • To awaken wisdom in students.



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			<ul style="list-style-type: none"> Educating students for the various advantages and need of stress management.
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I YEAR II Semester

Sr. No.	Course Code	Course Title	Course Outcome
9	Professional Core – III	Modern Pharmaceutics - II (Professional Core – III)	<ul style="list-style-type: none"> Understand the planning of pilot plant techniques used for pharmaceutical dosage forms – tablets and capsules Understand the planning of pilot plant techniques used for pharmaceutical dosage forms - parenteral Understand the planning of pilot plant techniques used for pharmaceutical dosage forms - aerosols Understand the planning of pilot plant techniques used for pharmaceutical dosage forms - cosmetics and nutraceuticals.
10	Professional Core – IV	Advanced Drug Delivery Systems (Professional Core – IV)	<ul style="list-style-type: none"> Understand drug delivery system through detailed information of transporting a pharmaceutical compound in the body as needed to safely achieve its desired therapeutic effect. To study about basic knowledge of the pharmacokinetic and pharmacodynamic principles in the design of CDDS. Understand recent developments in protein and peptide for parenteral delivery approaches. Understand approaches, formulations, technologies, and systems for suitable drug delivery. To identify a suitable drug delivery system based on the physicochemical characteristics of drug and selects a suitable polymer for formulation of the drug delivery system. Understand approaches, formulations, technologies and evaluation for bioadhesive, Nasal, colon drug delivery systems. Understand recent developments in design, formulation and evaluation of various particulate systems including nanoparticles, liposomes, microspheres, niosomes and resealed erythrocytes.
11	Professional Elective – III	Industrial Pharmacy (Professional Elective)	<ul style="list-style-type: none"> Explain the machinery involved in milling, mixing, filtration and drying. Gain knowledge of materials used in the



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		– III)	<p>construction of machinery and packaging materials.</p> <ul style="list-style-type: none">• Learn salient features of GMP, TQM applicable in industry.• Understand the effluent treatments and prevent the pollution.• Evaluate the validation of analytical methods and processes.
12	Professional Elective – IV	Nano based Drug Delivery Systems (Professional Elective-IV)	<ul style="list-style-type: none">• Able to apply the properties to the fabrication of nanopharmaceutical, evaluate the intensity of dosage forms and availability for targeting and controlled delivery.• The students should be able to select the right kind of materials, able to develop nano formulations with appropriate technologies, evaluate the product related test and for identified diseases.• Learned the methods for synthesis of Gold nanoparticles, Magnetic nanoparticles, Polymeric nanoparticles.
13	Laboratory-III	Modern Pharmaceutics-II Lab	<ul style="list-style-type: none">• Perform scale up calculations from R&D to pilot plant for the unit operations.• Prepare Injectables, Ampoules, Vials, Ophthalmic products, Eye drops, Eye ointments and Dry powder Inhalations.• Do Formulation Development and Demonstration of function of DPI of marketed products and Aerosol products.
14	Laboratory-IV	Advanced Drug Delivery System Lab	<ul style="list-style-type: none">• Design formulates and evaluates microparticulate formulations.• Formulate and evaluate sustained release systems.• Know the effect of drug diffusion through various types of polymeric membranes.• Compare various marketed formulations by in vitro drug release studies.• Formulate and evaluate enteric coated tablets.
15	Audit Course- II	Stress Management by Yoga	<ul style="list-style-type: none">• To achieve overall health of body and mind.• To overcome stress.• Develop healthy mind in a healthy body thus improving social health.• Improve efficiency.



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II YEAR I Semester

Sr. No.	Course Code	Course Title	Course Outcome
16	Professional Elective-V	Scale up and Technology Transfer	<ul style="list-style-type: none"> • Manage the scale up process in pharmaceutical industry. • Assist in technology transfer. • To establish safety guidelines, which prevent industrial hazards. • Trained the students to be on scale up, technology transfer process and industrial safety issues.
17	Open Elective	Cosmetics science	<ul style="list-style-type: none"> • Understand the properties and uses of various cosmetics on various parts of the body. • Learned to suggest the proper usage of cosmetics. • Understand the properties and evaluation of these cosmetics by analytical methods. • To know various cosmetics, their preparation, properties, MOA, uses etc.

Program: M. Pharm (Pharmacology)

Duration: 2 years

COURSE OUTCOMES

I YEAR I Semester

Sr. No.	Course Code	Course Title	Course Outcome
18	Professional Core – I	Advanced Pharmacology- I	<ul style="list-style-type: none"> • Discuss pathophysiology and pharmacology of specific disorders. • Understand how drugs function at the cellular and molecular level. • Recognise the Adverse effects, contraindications, and clinical applications of medications used to treat disorders.
19	Professional Core – II	Clinical Pharmacology and Pharmacotherapeutics	<ul style="list-style-type: none"> • Understand the pathophysiology of selected disease states and the rationale for drug therapy • Understand the controversies in drug therapy • understand the importance of preparation of individualized therapeutic plans based on diagnosis • Understand the needs to identify the patient-specific parameters relevant in initiating drug therapy



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			<ul style="list-style-type: none">• Understand the monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects)• Summarize the therapeutic approach to management of these diseases including reference to the latest available evidence
20	Professional Elective – I	Clinical Research and Pharmacovigilance	<ul style="list-style-type: none">• Explain the regulatory requirements for conducting clinical trial.• Demonstrate the types of clinical trial designs.• Explain the responsibilities of key players involved in clinical trials.• Execute safety monitoring, reporting and close-out activities.• Explain the principles of Pharmacovigilance.• Detect new adverse drug reactions and their assessment.• Perform the adverse drug reaction reporting systems and communication in pharmacovigilance.
21	Professional Elective – I I	Principles of Toxicology	<ul style="list-style-type: none">• Explained the various toxicologies.• EXplained various toxicologies of lungs, liver, gentic etc.• Appreciated the importance and mechanism of skin and reproductive toxicology.• Explained various mechanisms and affects of pesticides.
22		Research Methodology and IPR	<ul style="list-style-type: none">• Understand research problem formulation.• Analyze research related information• Follow research ethics.• Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.• Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasise the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
23	Laboratory- I	Advanced pharmacology- I Lab	<ul style="list-style-type: none">• Know various routes of drug administration.• Study techniques of blood sampling, anaesthesia and euthanasia of experimental animals.• Plot CRC of agonists.



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			<ul style="list-style-type: none"> Interpolate bioassay, three and four point bioassay. Calculate of PA2 value.
24	Laboratory-II	Clinical Pharmacology and Pharmacotherapeutics Lab	<ul style="list-style-type: none"> Prepare SOAPs and Case presentation. Knowing rational uses of medicines in special population. Calculate Bioavailability and Bioequivalence from the given data. Interpret Therapeutic Drug Monitoring reports of a given patient.
25	Audit Course - I	Personality Development through Life Enlightenment Skills	<ul style="list-style-type: none"> To learn to achieve the highest goal happily. To become a person with stable mind, pleasing personality and determination. To awaken wisdom in students. Educating students for the various advantages and need of stress management.

I YEAR II Semester

Sr. No.	Course Code	Course Title	Course Outcome
26	Professional Core – III	Advanced Pharmacology- II	<ul style="list-style-type: none"> Learned the fabrication, design, evaluation and application of various drug delivery systems. Knowing the pharmacokinetic and pharmacodynamic on the basis of CDDS. Know the design evaluation and application related to oral, parenteral, transdermal, implants, bioadhesives and targeted drug delivery systems.
27	Professional Core – IV	Pharmacological Screening Methods and Toxicology	<ul style="list-style-type: none"> Design the drug dosage regimen for individual patients Interpret and correlate the plasma drug concentrations with patients' therapeutic outcomes Recommend dosage adjustment for patients IV Infusion to Oral dosing Recommend dosage adjustment depending on patient's response Know application of pharmacokinetic parameters in analytical determination
28	Professional Elective – III	Advanced Drug Delivery Systems	<ul style="list-style-type: none"> Understand the pathophysiology of selected disease states and the rationale for drug therapy Understand the controversies in drug therapy understand the importance of preparation



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			<p>of individualized therapeutic plans based on diagnosis</p> <ul style="list-style-type: none">• Understand the needs to identify the patient-specific parameters relevant in initiating drug therapy• Understand the monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects• Summarize the therapeutic approach to management of these diseases including reference to the latest available evidence
29	Professional Elective – IV	Pharmacokinetic and Therapeutic Drug Monitoring	<ul style="list-style-type: none">• Explain the regulatory requirements for conducting clinical trial.• Demonstrate the types of clinical trial designs.• Explain the responsibilities of key players involved in clinical trials.• Execute safety monitoring, reporting and close-out activities.• Explain the principles of Pharmacovigilance.• Detect new adverse drug reactions and their assessment.• Perform the adverse drug reaction reporting systems and communication in pharmacovigilance.
30	Laboratory- III	Advanced Pharmacology- II Lab	<ul style="list-style-type: none">• Record CRC of agonist.• Effect of agonist and antagonist on CRC• Bioassay – Interpolation three and four point.• Effect of drugs on Frog heart.
31	Laboratory- IV	Pharmacological Screening Methods and Toxicology Lab	<ul style="list-style-type: none">• Screen various pharmacological activities.• Learn guidelines of CPCSEA, OECD.• Screen psychopharmacological, anti-inflammatory and analgesic activities.
	Audit Course- II	Stress Management by Yoga	<ul style="list-style-type: none">• To achieve overall health of body and mind.• To overcome stress.• Develop healthy mind in a healthy body thus improving social health.• Improve efficiency.



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II YEAR I Semester

Sr. No.	Course Code	Course Title	Course Outcome
32	Professional Elective-V	Hospital and Community Pharmacy	<ul style="list-style-type: none">• 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.
33	Open Elective	Cosmeticology	<ul style="list-style-type: none">• Explained the physiological structures of skin, hair, nail and eye.• It gives the knowledge about rheological property determination.• Explained the evaluation process, safety use of cosmetics and new technology development.• Explained the principals involved in liposomes, multiple emulsions and creams.

Program: M. Pharm (Pharmacy Practice)

Duration: 2 years

COURSE OUTCOMES

I YEAR I Semester

Sr. No.	Course Code	Course Title	Course Outcome
34	Professional Core – I	Pharmacotherapeutics- I (Professional Core - I)	<ul style="list-style-type: none">• Describe and explain the rationale for drug therapy.• Summarize the therapeutic approach for management of various disease conditions including reference to the latest available evidence.• Discuss the clinical controversies in drug therapy and evidence-based medicine.• Prepare individualized therapeutic plans based on diagnosis.
35	Professional Core – II	Clinical Pharmacy Practice (Professional	<ul style="list-style-type: none">• Understand the elements of pharmaceutical care and provide comprehensive patient care services.



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		Core - II)	<ul style="list-style-type: none">• Interpret the laboratory results to aid the clinical diagnosis of various disorders.• Provide integrated, critically analyzed medicine and poison information to enable adverse effects.
36	Professional Elective – I	Hospital and Community Pharmacy (Professional Elective – I)	<ul style="list-style-type: none">• 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.
37	Professional Elective – I I	Drug Regulatory Affairs (Professional Elective – II)	<ul style="list-style-type: none">• Students will come to know the different competent regulatory authorities globally.• Students be aware of technical aspects pertaining to the marketing authorization application (MAA).• The regulatory guidelines and directions framed by the regulatory authorities will be helpful to place the drug products in market for marketing approvals.• Perform the adverse drug reaction reporting systems and communication in pharmacovigilance.
38		Research methodology and IPR	<ul style="list-style-type: none">• Understand research problem formulation.• Analyze research related information• Follow research ethics.• Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.• Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis.
39	Laboratory-I	Pharmacotherapeutics – I Lab	<ul style="list-style-type: none">• Discuss the controversies in drug therapy, therapeutic plans based on diagnosis.• Discuss the preparation of individualized therapy.• Identify the patient-specific parameters relevant in initiating drug therapy.• Monitoring of drug therapy (including alternatives, time course of clinical and laboratory indices of therapeutic response and adverse effects).



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40	Laboratory-II	Clinical Pharmacy Practice Lab	<ul style="list-style-type: none"> Assess prescriptions for drug interaction and answer drug information query. Perform patient counselling on medication and conduct medication history interview. Analyse and interpret the data obtained through laboratory tests. Conduct planned experiments and prepares laboratory report in a standard format.
41	Audit Course - I	Personality Development through Life Enlightenment Skills	<ul style="list-style-type: none"> To learn to achieve the highest goal happily. To become a person with stable mind, pleasing personality and determination. To awaken wisdom in students. Educating students for the various advantages and need of stress management.

I YEAR II Semester

Sr. No.	Course Code	Course Title	Course Outcome
42	Professional Core – III	Pharmacotherapeutics – II	<ul style="list-style-type: none"> Describe and explain the rationale for drug therapy. Summarize the therapeutic approach for management of various disease conditions including reference to the latest available evidence. Discuss the clinical controversies in drug therapy and evidence-based medicine. Prepare individualized therapeutic plans based on diagnosis.
43	Professional Core – IV	Clinical Pharmacokinetics and Drug monitoring	<ul style="list-style-type: none"> 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.
44	Professional Elective – III	Clinical Research Pharmacy	<ul style="list-style-type: none"> 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.



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45	Professional Elective – IV	Nutraceuticals (Professional Elective – IV)	<ul style="list-style-type: none"> Students will come to know the different competent regulatory authorities globally. Students be aware of technical aspects pertaining to the marketing authorization application (MAA). The regulatory guidelines and directions framed by the regulatory authorities will be helpful to place the drug products in market for marketing approvals. Perform the adverse drug reaction reporting systems and communication in pharmacovigilance.
46	Laboratory- III	Pharmacotherapeutics – II Lab	<ul style="list-style-type: none"> Importance of Evidence Based Medicine and Use of Ra Drug Use in patient care Case study on neurology, oncology Importance of Serum drug concentration. Understanding the soap format in pharmacotherapeutics.
47	Laboratory- IV	Clinical Pharmacokinetics and Drug Monitoring Lab	<ul style="list-style-type: none"> Importance of inventory control Importance of drug information services pharmacovigilance medication errors and its importance in patient care
48	Audit Course- II	Stress Management by Yoga	<ul style="list-style-type: none"> To achieve overall health of body and mind. To overcome stress. Develop healthy mind in a healthy body thus improving social health. Improve efficiency.

II YEAR I Semester

Sr. No.	Course Code	Course Title	Course Outcome
49	Professional Elective-V	Pharmacoepidemiology and Pharmacoeconomics	<ul style="list-style-type: none"> Understand the various epidemiological methods and their applications Understand the fundamental principles of Pharmacoeconomics. Identify and determine relevant cost and consequences associated with pharmacy products and services. Perform the key Pharmacoeconomics analysis methods Understand the Pharmacoeconomic decision analysis methods and its applications. Describe current Pharmacoeconomic methods and issues.



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			<ul style="list-style-type: none">Understand the applications of Pharmacoeconomics to various pharmacy settings.
50	Open Elective	Safety and Hazardous Management (Open Elective)	<ul style="list-style-type: none">Understand about environmental problems among learners.Impart basic knowledge about the environment and its allied problems.Develop an attitude of concern for the industry environment and ensure safety standards in pharmaceutical industry.Provide comprehensive knowledge on the safety management.Empower an ideas to clear mechanism and management in different kinds of hazard management system and teach the method of Hazard assessment, procedure, methodology for provide safe industrial atmosphere.

Program: M. Pharm (Pharmaceutical chemistry)

Duration: 2 years

COURSE OUTCOMES

I YEAR I Semester

Sr. No.	Course Code	Course Title	Course Outcome
51	Professional Core – I	Advanced Organic Chemistry-I	<ul style="list-style-type: none">Know the Stereochemistry of organic compounds and Asymmetric synthesis and stereo – selective synthesis.Understand the reaction Intermediates and concepts of aromaticity and anti-aromaticity.Learn the mechanisms of organic reactions.Understands the concepts of Elimination Reactions.
52	Professional Core – II	Advanced Medicinal Chemistry-I	<ul style="list-style-type: none">Know the methods of Drug discovery in detail with the knowledge of Target and its Validation.Gain knowledge about QSAR parameters, quantitative models and their applications.Learn different methods of CADD. They will be able to explain different virtual



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			<p>screening methods of drugs and molecular modeling techniques.</p> <ul style="list-style-type: none">• Learn the role of Natural products in Drug discovery mainly, CNS, Anti-cancer and CVS drugs.• Gain knowledge on Structure based drug design of different classes of drugs like Thrombin inhibitors, HIV-1 inhibitors etc.
53	Professional Elective – I	Drug Regulatory Affairs	<ul style="list-style-type: none">• Students will come to know the different competent regulatory authorities globally.• Students be aware of technical aspects pertaining to the marketing authorization application (MAA).• The regulatory guidelines and directions framed by the regulatory authorities will be helpful to place the drug products in market for marketing approvals.• Perform the adverse drug reaction reporting systems and communication in pharmacovigilance.
54	Professional Elective – II	Drug Discovery & Design	<ul style="list-style-type: none">• Explain the various stages of drug discovery.• Appreciate the importance of the role of genomics, proteomics and bioinformatics in drug discovery.• Explain various targets for drug discovery.• Explain various lead seeking method and lead optimization.• Appreciate the importance of the role of computer aided drug design in drug discovery.
55		Research methodology and IPR	<ul style="list-style-type: none">• Understand research problem formulation.• Analyze research related information• Follow research ethics.• Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.• Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis.
56	Laboratory-I	Advanced Organic Chemistry – I Lab	<ul style="list-style-type: none">• Synthesize various organic compounds.• Characterize the synthesized compound.
57	Laboratory-II	Advanced Medicinal	<ul style="list-style-type: none">• Synthesize Analgesics, NSAIDS, antipyretics, CNS and CVS drugs.



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		Chemistry – I Lab	<ul style="list-style-type: none">Perform QSAR Studies by using software.
58	Audit Course - I	Stress Management by Yoga	<ul style="list-style-type: none">To learn to achieve the highest goal happily.To become a person with stable mind, pleasing personality and determination.To awaken wisdom in students.Educating students for the various advantages and need of stress management.

I YEAR II Semester

Sr. No.	Course Code	Course Title	Course Outcome
59	Professional Core – III	Advanced Organic Chemistry-II	<ul style="list-style-type: none">Know the Synthetic Reagents & Applications and concepts of Green Chemistry.Understand the different catalytic reactions.Learn the mechanisms of organic reactions.Learn the Molecular Rearrangements & their applications.Understands the concepts of Coupling reactions in peptide synthesis b. Principles of solid phase peptide synthesis.Gain knowledge of Combinatorial Chemistry.
60	Professional Core – IV	Advanced Medicinal Chemistry-II	<ul style="list-style-type: none">Know the chemistry of Enzyme Inhibitors like Prostaglandin Synthase, PDE, Carbonic Anhydrase Inhibitors and B- Secretase.Gain knowledge about the chemistry of Enzyme Inhibitors like ACE, Ach E, HMG-CoA and Proteas.Learn different Antipsychotic AgentsLearn the Peptidmimetic agents & Prodrugs.Biotechnologically produced drugs and Recombinant drug products.
61	Professional Elective – III	Clinical Research and Pharmacovigilance	<ul style="list-style-type: none">To understand new drug development process.To understand clinical studies scenario in Indian and other countries.To understand the regulatory and ethical



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			<p>requirement in clinical trials.</p> <ul style="list-style-type: none">• To know the role and responsibilities of clinical trial personnel.• To know the designing of clinical trial documents.• To know safety monitoring and reporting in clinical trials.
62	Professional Elective – IV	Herbal Drug Technology	<ul style="list-style-type: none">• Apply the fundamentals of herbal raw materials in biodynamic farming techniques.• Correlate the insights of nutraceuticals and herbal food interactions.• Improve knowledge of herbal formulation preparation and evaluation.• Explain the role of cosmetic excipients and building blocks in cosmetic formulation.• Demonstrate the regulation that applies to protection of traditional knowledge against infringement.• Describe the herbal drug industry's present and future prospects, as well as the components of Good Manufacturing Practice (GMP) for Indian medical systems.
63	Laboratory-III	Advanced Organic Chemistry – II Lab	<ul style="list-style-type: none">• Perform the following reactions of synthetic importance Purification of organic solvents, column chromatography• Analyse the Pharmacopoeial compounds and their formulations by instrumental techniques• Learn the ssynthesis of medicinally important compounds involving more than one step along with purification and Characterization• Know the typical degradation reactions on selected plant constituent
64	Laboratory-IV	Advanced Medicinal Chemistry – II Lab	<ul style="list-style-type: none">• Synthesize and characterize the drugs• Determine the partition coefficient .
65	Audit Course - II	Personality Development through Life Enlightenment Skills	<ul style="list-style-type: none">• To learn to achieve the highest goal happily.• To become a person with stable mind, pleasing personality and determination.• To awaken wisdom in students.• Educating students for the various advantages and need of stress



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management.

II YEAR I Semester

Sr. No.	Course Code	Course Title	Course Outcome
66	Professional Elective-V	Scale-up and Technology Transfer	<ul style="list-style-type: none">• Discuss the pilot plant and scale-up processes for pharmaceutical dosage forms, as well as the SUPAC guidelines.• Categorize the different aspects of technology transfer involved from research and development to manufacture.• Comprehend and implement different responsibilities and regulatory requirements for drug approval.• Communicate different laws and acts that regulate pharmaceutical industry in India and US.• Explore the functions and responsibilities of regulatory agencies in drug approval.
67	Open Elective	Hazards and safety management	<ul style="list-style-type: none">• Understand about environmental problems among learners.• Impart basic knowledge about the environment and its allied problems.• Develop an attitude of concern for the industry environment and ensure safety standards in pharmaceutical industry.• Provide comprehensive knowledge on the safety management.• Empower an ideas to clear mechanism and management in different kinds of hazard management system and teach the method of Hazard assessment, procedure, methodology for provide safe industrial atmosphere.



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Program: M. Pharm (Pharmaceutical Analysis)

Duration: 2 years

COURSE OUTCOMES

I YEAR I Semester

Sr. No.	Course Code	Course Title	Course Outcome
68	Professional Core – I	Modern Pharmaceutical Analytical Techniques	<ul style="list-style-type: none">Gain the knowledge in the Modern Analytical Techniques like chromatography w.r.t analysis of various bulk drugs and their formulations.Gain the knowledge in the GC, HPLC and HPTLC Analytical Techniques like chromatography w.r.t analysis of various bulk drugs and their formulations.Gain the knowledge in the UV-Visible and IR spectroscopic Analytical Techniques like chromatography w.r.t analysis of various bulk drugs and their formulations.Gain the knowledge in the NMR Analytical Techniques like chromatography w.r.t analysis of various bulk drugs and their formulations.Gain the knowledge in the Mass Spectroscopic Analytical Techniques like chromatography w.r.t analysis of various bulk drugs and their formulations.
69	Professional Core – II	Pharmaceutical Food Analysis	<ul style="list-style-type: none">To learn the analysis of food constituents and finished food products.To get the ability to recognize and recall the main characteristics and principles of different food components.Learn the instrumental analysis in the determination of pesticides in variety of food products.
70	Professional Elective – I	Advanced Pharmaceutical Analysis	<ul style="list-style-type: none">Gain knowledge of principles and procedures for the determination of various pharmaceuticalTo learn the applications of the important reagents like MBTH, FC, PDAB etc. in the determination of the pharmaceuticals.Students learned how to use spectroscopic techniques to solve structure problems and understand pharmaceutical quality control and assurance.
71	Professional Elective – I I	Pharmaceutical Validation	<ul style="list-style-type: none">Explain the aspects of validation and qualification of equipment.Perform qualification of analytical instruments and glass wares.



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			<ul style="list-style-type: none">• Learn about validation of utility systems and understand the importance of cleaning validation.• Develop proper understanding of analytical method validation ICH guidelines, USP and computerized system validation.• Learn the information about the patent laws, intellectual property rights and drug regulation in India and abroad is gained by the students.
72		Research methodology and IPR	<ul style="list-style-type: none">• Understand research problem formulation.• Analyze research related information• Follow research ethics.• Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.• Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis.
73	Laboratory-I	Modern Pharmaceutical Analytical Techniques lab	<ul style="list-style-type: none">• Perform assay of single components and multi components by UV Spectrophotometry.• Do experiments by HPLC.• Perform Incompatibility studies, identification and functional groups – Determination by FTIR.• Perform separation of compounds by using paper chromatography, TLC, HPTLC Technique.• Calibrate apparatus and instruments.
74	Laboratory-II	Pharmaceutical food Analysis Lab	<ul style="list-style-type: none">• Understand various analytical techniques in the determination of finished food products.• Have the knowledge on food regulations and legislations.
75	Audit Course - I	Stress Management by Yoga	<ul style="list-style-type: none">• To learn to achieve the highest goal happily.• To become a person with stable mind, pleasing personality and determination.• To awaken wisdom in students.• Educating students for the various advantages and need of stress management.



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I YEAR II Semester

Sr. No.	Course Code	Course Title	Course Outcome
76	Professional Core – III	Advanced Instrumental Analysis - I	<ul style="list-style-type: none">• Describe concepts of UV & Visible Spectrophotometry and Fluorimetry.• Describe the principle, instrumentation and applications of IR and Atomic absorption spectra.• Explain the Principles, Instrumentation and Applications of TLC and paper chromatography.• Explain the principles, instrumentation and applications of electrophoresis.• Write the Principles, Instrumentation and Applications of HPLC and GC.
77	Professional Core – IV	Pharmaceutical Quality Control & Quality Assurance	<ul style="list-style-type: none">• Understand the importance of TQM, GMP, ISO, organization, personnel, premises, equipment purchase specifications of raw materials in Pharmaceutical industries.• Gain knowledge about different record, documentation, SOPs, audit, quality control test for packaging materials and Good Laboratory practices.• Explored into importance of finished product release, Good warehousing practice and distribution of records. Students learn about evaluation of complaints, Recall procedures and waste disposal procedure.• Have the knowledge on regulatory aspects of pharmaceuticals, Loan License Auditing and recent amendments of drugs and cosmetics act, certification procedures.• Understand about globalization of drug industry, patent regimen and regulatory affairs.
78	Professional Elective – III	Modern Bio-analytical Techniques	<ul style="list-style-type: none">• To get detailed knowledge about the importance of analysis of drugs in biological matrices.• To understand Extraction of drugs from biological samples• To understand the Separation of drugs from biological samples using different techniques.• To know the Guidelines for BA/BE



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			studies.
79	Professional Core – IV	Clinical Research and Pharmacovigilance	<ul style="list-style-type: none"> History and development of pharmacovigilance. National and international scenario of pharmacovigilance. International standards for classification of diseases and drugs. Adverse drug reaction reporting systems and communication in pharmacovigilance. Data during pre-clinical, clinical and post approval. Pharmacovigilance Program of India (PvPI) ICH guidelines for ICSR, PSUR, expedited reporting, pharmacovigilance planning.
80	Laboratory-III	Advanced Instrumental Analysis I Lab	<ul style="list-style-type: none"> Perform the analysis of compounds by colorimetry, UV and Fluorimetry. Determine absorption maxima of organic compounds. Estimate compounds by Flame photometry and nepheloturbidimetry. Carry out the separation of compounds by paper, column and Thin layer chromatography. Analyze the compounds by HPLC & GC.
81	Laboratory -IV	Pharmaceutical Quality Control & Quality Assurance Lab	<ul style="list-style-type: none"> Perform QC tests for tablets and oral liquids and parenterals. Physicochemical tests for water 9. Solubility studies of weakly acidic and weakly basic drugs. Conduct Forced degradation studies of some drugs. Interpret spectra by IR, NMR and MASS. Assay of drug formulations using UV/Visible-Spectrophotometry. To perform physicochemical tests for water and Solubility studies of weakly acidic and weakly basic drugs. .
82	Audit Course - II	Personality Development through Life Enlightenment Skills	<ul style="list-style-type: none"> To learn to achieve the highest goal happily. To become a person with stable mind, pleasing personality and determination. To awaken wisdom in students. Educating students for the various advantages and need of stress



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			management.
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II YEAR I Semester

Sr. No.	Course Code	Course Title	Course Outcome
83	Professional Elective-V	Scale-up and Technology Transfer	<ul style="list-style-type: none">• Discuss the pilot plant and scale-up processes for pharmaceutical dosage forms, as well as the SUPAC guidelines.• Categorize the different aspects of technology transfer involved from research and development to manufacture.• Comprehend and implement different responsibilities and regulatory requirements for drug approval.• Communicate different laws and acts that regulate pharmaceutical industry in India and US.• Explore the functions and responsibilities of regulatory agencies in drug approval.
84	Open Elective	Hazards and safety management	<ul style="list-style-type: none">• Understand about environmental problems among learners.• Impart basic knowledge about the environment and its allied problems.• Develop an attitude of concern for the industry environment and ensure safety standards in pharmaceutical industry.• Provide comprehensive knowledge on the safety management.• Empower an ideas to clear mechanism and management in different kinds of hazard management system and teach the method of Hazard assessment, procedure, methodology for provide safe industrial atmosphere.



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Program: Doctor of Pharmacy

Duration: 6 years

COURSE OUTCOMES

First Year Pharm D

Sr. No.	Course Code	Course Title	Course Outcome
1	PH101	PH101 Human Anatomy and Physiology-I (Theory)	<ul style="list-style-type: none">To describe the structure (gross and histology) and functions of various organs of the human body.To describe various homeostatic mechanisms and their imbalances of various systems.To describe haematological tests and also record blood pressure, heart rate, pulse and Respiratory volumes.To understand coordinated working pattern of different organs of each system and to enhance the understanding of how the drugs act on the various body systems in correcting the disease state of the organs.
2	PH108	Human Anatomy and Physiology-I (Practical)	<ul style="list-style-type: none">To identify the various tissues of the different systems of the human body.To study and identify different organs in different systems of the human body.To perform the haematological tests and also record blood pressure, heart rate, pulse and Respiratory volumes.To perform the various experiments related to special senses and nervous system.
3	PH102	Pharmaceutics (Theory)	<ul style="list-style-type: none">To understand the formulation of different dosage forms.To understand the basics of the applied field of pharmacy.To understand different pharmaceutical calculation involved in formulation specifically for children.To understand the importance of good formulation and effectiveness.
4	PH109	Pharmaceutics (Practical)	<ul style="list-style-type: none">To understand the formulation of different dosage forms like solid, liquid and semisolid dosage forms.To understand the packaging of the different formulations.To know about the label, storage,



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			<p>application and handling of the dosage forms.</p> <ul style="list-style-type: none">To understand different types of incompatibilities of different dosage forms.
5	PH103	Medicinal Biochemistry (Theory)	<ul style="list-style-type: none">To understand the catalytic activity of enzymes and importance of iso-enzymes in diagnosis of diseases.To know the metabolic process of enzymes.To understand the genetic organization of mammalian genome; protein synthesis; replication; mutation and repair mechanism.To know the biochemical principles of organ function tests of kidney, liver and endocrine gland.
6	PH110	Medicinal Biochemistry (Practical)	<ul style="list-style-type: none">To perform qualitative analysis and determination of biomolecules in the body fluids.To perform quantitative analysis and determination of electrolytes.To estimate SGOT, SGPT, Urea & protein in serumTo study factors affecting enzyme activity and preparation, pH measurement of standard buffer solution functional groups.
7	PH104	Pharmaceutical Organic Chemistry (Theory)	<ul style="list-style-type: none">To be able to write IUPAC/Common names of simple organic compounds belonging to different classes of organic compounds in organic chemistry.To achieve understanding of some important physical properties of pharmaceutical organic compounds.To acquire the knowledge and understanding of the Free radical/nucleophilic [alkyl/ acyl/ aryl] /electrophilic substitution, free radical/nucleophilic / electrophilic addition, elimination, oxidation and reduction reactions with mechanism, orientation of the reaction, along with order of reactivity, stability of compounds etc.To gain through knowledge of some named organic reactions with mechanisms.
8	PH111	Pharmaceutical Organic Chemistry (Practical)	<ul style="list-style-type: none">To acquire the knowledge and understanding of the basic experimental principles related to basic experimental techniques.To know about the synthesis of



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			<p>pharmaceutical organic molecules by mechanism and Principle.</p> <ul style="list-style-type: none">• To identify unknown pharmaceutical organic molecules by systemic qualitative analysis.• To construction of organic stereo models of simple organic molecules.
9	PH105	Pharmaceutical Inorganic Chemistry (Theory)	<ul style="list-style-type: none">• To understand applications of inorganic pharmaceuticals.• To achieve Knowledge about the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals by assay, semi-quantitative inorganic analysis methods.• To appreciate the importance of inorganic pharmaceuticals in preventing and curing the disease.• To have been introduced to a variety of inorganic drug classes.
10	PH112	Pharmaceutical Inorganic Chemistry (Practical)	<ul style="list-style-type: none">• To acquire the knowledge and understanding of the basic lab experimental techniques in Pharmaceutical Inorganic Chemistry.• To become well acquainted with the principles, procedures to make test, standard and reactions of limit tests of inorganic impurities.• To know about assay of drugs by different volumetric titration methods.• To gain knowledge of tests for identity, preparations and test for purity for inorganic pharmaceuticals.
11	PH106	Remedial Mathematics (Theory)	<ul style="list-style-type: none">• Apply mathematical concepts and principles to perform computations for Pharmaceutical Sciences.• Create, use and analyze mathematical representations and mathematical relationships.• Communicate mathematical knowledge and understanding to help in the field of Clinical Pharmacy.• Perform abstract mathematical reasoning
12	PH107	Remedial Biology (Theory)	<ul style="list-style-type: none">• Knowledge on composition of plant cell and its importance.• Knowledge on different cellular composition and its functions of different parts of plant and their modifications.• Know classification of plants based on its taxonomical characters.• Knowledge on taxonomical characters of



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			<p>specified families.</p> <ul style="list-style-type: none"> • Knowledge about structural composition of microorganisms. • Knowledge on structural composition of animal cell and its importance.
13	PH113	Remedial Biology (Practical)	<ul style="list-style-type: none"> • Get knowledge on instruments used in experimental biology and its operation. • Know the principles and procedures involved in staining techniques for the preparation of slide. • Grasp knowledge on different cellular composition and its importance in living organisms (Plants & Animal). • Get knowledge about morphological features and modified morphological features and its importance of different parts of plant. • Know about anatomical features and physiological features with reference to human by simulator model. • Grasp knowledge on different cellular composition of different parts of plant.

Pharm D Second Year

Sr. No.	Course Code	Course Title	Course Outcome
14	PH201	Pathophysiology (Theory)	<ul style="list-style-type: none"> • Describe the etiology of the selected diseases states. • Describe the Pathogenesis of the selected diseased states. • Name the signs and symptoms of the diseases. • Mention the complications of the diseases.
15	PH202	Pharmaceutical Microbiology (Theory)	<ul style="list-style-type: none"> • To understand the anatomy, identification, growth factors and sterilization of microorganisms. • To know the mode of transmission of disease causing microbes, symptoms of disease, and treatment. • To do estimation of RNA and DNA and there by identifying the source. • To do cultivation and identification of the microorganisms and their diagnostic test in the lab.
16	PH207	Pharmaceutical Microbiology (Practical)	<ul style="list-style-type: none"> • To study the apparatus used in microbiology & preparation, sterilization of glassware's and media.



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			<ul style="list-style-type: none">To study different staining techniques, motility characters, enumeration of microorganism, method of isolation of pure culture and biochemical testing for identification of microorganism.To perform culture sensitivity testing, sterility testing for powder & liquid and determination of MIC.To perform microbiological assay of antibiotics, vitamins and determination of RWC, Widal, Malaria parasite.
17	PH203	Pharmacognosy and Phytopharmaceuticals (Theory)	<ul style="list-style-type: none">To know history, scope, sources, classification and quality control methods of natural origin, meaning and significance of Pharmacognostic parameters and Pharmacognostic scheme of study of crude drugs.To understand techniques of cultivation, collection, storage of crude drugs, morphology and anatomy of plant parts and know primary and secondary metabolites of crude drugs.To know the source, properties, methods of extraction, active constituents, uses of crude drugs, pharmaceutical and industrial applications of carbohydrates, natural fibres, lipids and proteins and their derived products.To understand adulteration and methods of adulteration of crude drugs.
18	PH208	Pharmacognosy and Phytopharmaceuticals (Practical)	<ul style="list-style-type: none">To understand cell wall constituents and cell inclusions.To understand morphology, microscopy and powder characteristics of crude drugs.To be able to determine the quality of lipids.To be able to identify unorganized drugs by chemical methods.
19	PH204	Pharmacology-I (Theory)	<ul style="list-style-type: none">Understand the pharmacological aspects of drugs falling under the above-mentioned chapters.Handle and carry out the animal experiments.Appreciate the importance of pharmacology subject as basis of therapeutics.Correlate and apply the knowledge therapeutically.
20	PH205	Community Pharmacy	<ul style="list-style-type: none">Students will provide patient centred care to diverse patients using the best available



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		(Theory)	<p>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.</p> <ul style="list-style-type: none">• Students will demonstrate knowledge of the business and professional practice management skills in community pharmacies.• Students will educate patients through counselling & provide health screening services to public.• Students will identify symptoms of minor ailments and provide appropriate medication.
21	PH206	Pharmacotherapeutics – I (Theory)	<ul style="list-style-type: none">• The Pathophysiology of selected disease states and the rationale for drug therapy and therapeutic approach to management of these diseases.• The controversies in drug therapy; The importance of preparation of individualized therapeutic plans based on diagnosis; 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).• Describe the Pathophysiology of selected disease states and explain the rationale for drug therapy.• Summarize the therapeutic approach to management of these diseases including reference to the latest available evidence; discuss the controversies in drug therapy.
22	PH209	Pharmacotherapeutics – I (Practical)	<ul style="list-style-type: none">• Discuss the controversies in drug therapy.• Discuss the preparation of individualized therapeutic plans based on diagnosis.• Identify the patient-specific parameters relevant in initiating drug therapy.• Monitoring of drug therapy (including alternatives, time- course of clinical and laboratory indices of therapeutic response and adverse effects).



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Pharm D Third Year

Sr. No.	Course Code	Course Title	Course Outcome
23	PH301	Pharmacology II (Theory)	<ul style="list-style-type: none">To understand the pharmacological aspects of drugs acting on blood and blood forming agents and pharmacology of drugs acting on renal system.To study pharmacology of chemotherapeutic agents, vitamins and essential minerals.To study immune system, pharmacology of autotoxins and hormones and to study principles of animal toxicology.To study the dynamic cell & genome structure and function.
24	PH307	Pharmacology II (Practical)	<ul style="list-style-type: none">To study various routes of drug administration, use of anaesthetics in laboratory animals and their handling.To learn the composition of physiological salt solutions and basic instruments used in experimental pharmacology.To perform isolated experiments using various isolated preparation and the effect of different drugs on the concentration response curves.To study the preclinical screening of various drugs.
25	PH302	Pharmaceutical Analysis (Theory)	<ul style="list-style-type: none">To understand validation of analytical instruments & methods as per ICH/ USP guidelines, concept of quality assurance and quality control techniques.To understand principles, instrumentation and application of various chromatographic techniques employed for the analysis of APIs and formulation.To understand principle, instrumentation and application of various Electrometric methods.To understand principle, instrumentation and application of UV- Vis, Atomic Absorption and Emission Spectroscopy, Flame Photometry, NMR, Mass spectroscopy, Fluorimetry, Thermal, X ray diffraction techniques.
26	PH308	Pharmaceutical Analysis (Practical)	<ul style="list-style-type: none">To perform separation and identification of samples using paper, thin layer chromatographic technique.To analyze the samples using UV visible spectrophotometer, study the effect of pH,



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			<p>solvent effect, derivatization on UV spectra.</p> <ul style="list-style-type: none">• To perform potentiometric, conductometric titrations, colorimetry, fluorimetry, nephelometry, flame photometric determination.• To study and demonstrate IR spectroscopy, HPLC, HPTLC, polarimeter etc.
27	PH304	Pharmacotherapeutics – II (Theory)	<ul style="list-style-type: none">• To know the pathophysiology of selected disease states and the rationale for drug therapy.• To understand the therapeutic approach for management of different diseases.• To know the importance of preparation of individualized therapeutic plans based on diagnosis & controversies in drug therapy.• To understand & identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy.
28	PH303	Pharmacotherapeutics – II (Practical)	<ul style="list-style-type: none">• To understand therapeutic goals of the drugs used in different diseases.• To check & analyze drug interactions, adverse drug reactions.• To understand dose and frequency of the medications.• To understand the time-course of clinical and laboratory indices of therapeutic response and adverse effects.
29	PH306	Pharmaceutical Jurisprudence (Theory)	<ul style="list-style-type: none">• To appreciate study Pharmaceutical Legislation, relevance and significance of jurisprudence to Pharmaceutical Sciences.• To know fundamentals of legislation to regulate import manufacture, distribution and sales of drug and cosmetics.• To know the various parameters in the Drug and Cosmetic Act and rules, Drug policy, Drug Price Control Order.• To understand the concepts of Narcotic Drugs and Psychotropic substances, Pharmacy Act and Excise duties Act.
30	PH305	Medicinal Chemistry (Theory)	<ul style="list-style-type: none">• Understand modern concept of rational drug design.• Learn development of the anti-infective drugs including structure activity relationship, mechanism of action, synthesis, chemical nomenclature, brand names and side effects of important compounds.• Understand classification, mechanism of



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			<p>action, structure activity relationship, synthesis, nomenclature and side effects of the drugs acting as antineoplastic agents.</p> <ul style="list-style-type: none">• Understand classification, mechanism of action, structure activity relationship, synthesis, nomenclature and side effects of the drugs acting as Cardiovascular agents, Hypoglycemic agents, Diuretics, Steroidal Hormones and Adrenocorticoids etc.
31	PH310	Medicinal Chemistry (Practical)	<ul style="list-style-type: none">• Learn assays of important drugs from the course.• Learn synthesis of medicinally important compounds / drug intermediates with recrystallization, TLC techniques.• Understand monograph analysis of important drugs.• Determine partition coefficients, dissociation constants and molar refractivity of compounds for QSAR analysis.
32	PH306	Pharmaceutical Formulation (Theory)	<ul style="list-style-type: none">• To understand the principle involved in formulation of various pharmaceutical dosage forms.• To prepare various pharmaceutical formulation.• To perform evaluation of pharmaceutical dosage forms.• To understand and appreciate the concept of bioavailability and bioequivalence, their role in clinical situation.
33	PH311	Pharmaceutical Formulation (Practical)	<ul style="list-style-type: none">• To inculcate various formulation skills.• To understand mechanisms behind• To evaluate various quality control analysis of developed formulations.• To understand clinical implications of the various dosage forms.

Pharm D Fourth Year

Sr. No.	Course Code	Course Title	Course Outcome
34	PD401	Pharmacotherapeutics III (Theory)	<ul style="list-style-type: none">• To understand the etiopathogenesis of selected disease states.• To understand the rationale for drug therapy of the selected disease.• To understand the importance of individualized therapeutic plans based on diagnosis and controversies in drug



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			<p>therapy.</p> <ul style="list-style-type: none">To learn the general prescribing guidelines for special population.
35	PD407	Pharmacotherapeutics - I II (Practical)	<ul style="list-style-type: none">To take part in hospital ward round and clinical discussionTo assess and justify the changes made in drug therapy in allotted patients.To identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy.To discuss the case presentation of the allotted case after discharge to take part in hospital ward round and clinical discussion.
36	PD402	Hospital Pharmacy (Theory)	<ul style="list-style-type: none">Able to know various drug distribution methods.To know the professional practice management skills in hospital pharmacies & appreciate the stores management and inventory control.To provide unbiased drug information to the doctors & appreciate the practice-based research methods.To know the manufacturing practices of various formulations in hospital set up.
37	PD408	Hospital Pharmacy (Practical)	<ul style="list-style-type: none">To analyse prescriptions for drug interaction.Formulate and prepare parenteral formulations and powders CO.3 Perform inventory analysis.Answer drug information queries through literature search.Conduct planned experiments and prepares laboratory report in a standard format.
38	PD403	Clinical Pharmacy (Theory)	<ul style="list-style-type: none">Describe general principles involved in the management of poisoning.Differentiate the clinical symptoms and management of various acute poisonings.Distinguish the clinical symptoms and management of chronic poisoning by heavy metals.Devise public and health care professionals in the management of emergency cases.Evaluate, minimize and prevent the substance abuse cases in local population.
39	PD409	Clinical Pharmacy (Practical)	<ul style="list-style-type: none">Assess prescriptions for drug interaction and answer drug information query.Perform patient counselling on medication



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			<ul style="list-style-type: none">and conduct medication history interview.Analyse and interpret the data obtained through laboratory tests.Conduct planned experiments and prepare laboratory report in a standard format.
40	PD404	Biostatistics & Research Methodology (Theory)	<ul style="list-style-type: none">Recognise the importance of biostatistics in pharmacy.Understand the research methodology in the design of pharmacoepidemiological study.Discuss the methods of collection of data and its analysis and Interpretation.Discuss and evaluate various software's for statistical analysis of data.
41	PD405	Biopharmaceutics & Pharmacokinetics (Theory)	<ul style="list-style-type: none">To Know the Cause, Etiopathogenesis, Risk factors, Clinical presentation and diagnostic methods of the selected disease states.Knowledge about the pathophysiology of the selected disease states and the rationale for the drug therapy and approaches to manage the disease.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 responses and adverse effects).To know the importance of preparation of individualized therapeutic plan.
42	PD410	Biopharmaceutics & Pharmacokinetics (Practical)	<ul style="list-style-type: none">Enhance dissolution characteristics of slightly soluble drugs by co-solvency, solid dispersion and use of surfactant.Compare dissolution studies of two different marketed products of same drug.Perform Protein binding studies of a drug and Calculation of bioavailability.Calculate the Pharmacokinetic parameters like K_a, K_e, $t_{1/2}$, C_{max}, AUC, AUMC, MRTetc. From blood profile data. CO.5 Calculate bioavailability from urinary excretion data for two drugs.
43	PD406	Clinical Toxicology (Theory)	<ul style="list-style-type: none">Able to answer drug information questions.Able to perform patient medication counselling.Able to solve case studies related to laboratory investigations.Able to conduct patient medication history interview.



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			<ul style="list-style-type: none">To understand and appreciate the concept of bioavailability and bioequivalence, their role in clinical situation.
44	PD407	Pharmacotherapeutics - III (Practical)	<ul style="list-style-type: none">To take part in hospital ward round and clinical discussion.To assess and justify the changes made in drug therapy in allotted patients.To identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy.To discuss the case presentation of the allotted case after discharge.

Pharm D Fifth Year

Sr. No.	Course Code	Course Title	Course Outcome
45	PD501	Clinical research (Theory)	<ul style="list-style-type: none">To Understand new drug development process.To understand clinical studies scenario in Indian and other countries.To understand the regulatory and ethical requirement in clinical trials.To know the role and responsibilities of clinical trial personnel.To know the designing of clinical trial documents.
46	PD407	Pharmacotherapeutics - I II (Practical)	<ul style="list-style-type: none">To Compare and contrasts different study designs.To distinguish methods of data collection and recording.To understand issues involved in selecting sample and recruiting participants.To Discuss threats to validity and issues of interpretationsTo discuss applications of pharmacoepidemiological concepts and methods to pharmacy practice.To explain measures of disease occurrence and association.
47	PD503	Clinical Pharmacokinetics & Pharmacotherapeutic drug monitoring (Theory)	<ul style="list-style-type: none">To Apply PK-PD principles in cases using patient data to optimize pharmacotherapy and drug dosing for maximal efficacy and minimal toxicity.To recognise, document and manage drug dosing in cases involving significant



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			<p>patient pharmacokinetic variability due to physiology or disease (eg age, obesity, pregnancy, malabsorption, organ dysfunction, critical illness, therapeutic target site).</p> <ul style="list-style-type: none">• To recognize, characterize and manage cases with clinically significant PK-PD drug interactions.• To demonstrate appropriate therapeutic drug management (TDM) in cases with medications for which concentrations can be measured or predicted from available PK research data.
48	PD504	Clerkship	<ul style="list-style-type: none">• To discuss the role of Pharmacist in clinical pharmacy services.• To demonstrate the skills of a clinical Pharmacist.• To discuss the available therapeutic options in the management of diseases.• To prepare a pharmaceutical care plan for a given case.• To detect, Interpret and report medication errors and drug interactions.
49	PD505	Project Work	<ul style="list-style-type: none">• To address a problem related to Pharmacy practice in hospital, community service or clinical set up with a wider perspective and generality.• To address a problem related to Pharmacy practice in hospital, community service or clinical set up with a wider perspective and generality.• To define the problem to be addressed and translate it into a statement of aim, objectives, scope and plan for the project• To carry out and report information survey and take account of findings in executing project.• To evaluate, select and apply relevant theories and techniques from the full range of courses studied using conceptual models and frameworks to enhance depth of understanding.



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Pharm D Sixth Year

COURSE NAME	COURSE OUTCOME STATEMENT
Internship	<ul style="list-style-type: none">• To provide patient care in cooperation with patients, prescribers and other members of an inter-professional health care team-based health care team based upon sound therapeutic principles and evidence-based data, taking into account relevant legal, ethical, social cultural, economic and professional issues, emerging technologies and evolving biomedical, pharmaceutical, social or behavioural or administrative and clinical sciences that may impact therapeutic outcomes.• To manage and use resources of the health care system in cooperation with patients, prescribers, other health care providers, administrative and supportive personnel to promote health, to provide, assess and coordinate safe, accurate and time sensitive medication distribution and to improve therapeutic outcome of medication use.• To promote health improvement, wellness and prevention in co-operation with patients, communities, at risk population, and other members of inter professional team of health care providers.• To demonstrate skills in monitoring of the national health programs and schemes oriented to provide preventive and promotive health care services to the community.• To develop leadership qualities to function effectively as a member of the health care team organized to deliver the health and family welfare services in existing socio-economic, political and cultural environment.• To communicate effectively with patients and the community.



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Program: Doctor of Pharmacy -PB (Post Baccalaureate)

Duration: 3 years

COURSE OUTCOMES

First Year Pharm D (PB)

Sr. No.	Course Code	Course Title	Course Outcome
50	PH401	Pharmacotherapeutics III (Theory)	<ul style="list-style-type: none">To understand the etiopathogenesis of selected disease statesTo understand the rationale for drug therapy of the selected disease.To understand the importance of individualized therapeutic plans based on diagnosis and controversies in drug therapy.To learn the general prescribing guidelines for special population.
51	PH407	Pharmacotherapeutics III (Practical)	<ul style="list-style-type: none">To take part in hospital ward round and clinical discussion.To assess and justify the changes made in drug therapy in allotted patients.To identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy.To discuss the case presentation of the allotted case after discharge.
52	PH402	Hospital Pharmacy (Theory)	<ul style="list-style-type: none">Able to know various drug distribution methods.To know the professional practice management skills in hospital pharmacies & appreciate the stores management and inventory control.To provide unbiased drug information to the doctors & appreciate the practice-based research methods.To know the manufacturing practices of various formulations in hospital set up.
53	PH408	Hospital Pharmacy (Practical)	<ul style="list-style-type: none">To analyse prescriptions for drug interaction.Formulate and prepare parenteral formulations and powders.Perform inventory analysis.Answer drug information queries through literature search.Conduct planned experiments and prepare laboratory report in a standard format.



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54	PH403	Clinical Pharmacy (Theory)	<ul style="list-style-type: none">Describe general principles involved in the management of poisoning.Differentiate the clinical symptoms and management of various acute poisonings.Distinguish the clinical symptoms and management of chronic poisoning by heavy metals.Devise public and health care professionals in the management of emergency cases.Evaluate, minimize and prevent the substance abuse cases in local population.
55	PH409	Clinical Pharmacy (Practical)	<ul style="list-style-type: none">Assess prescriptions for drug interaction and answer drug information query.Perform patient counselling on medication and conduct medication history interview.Analyse and interpret the data obtained through laboratory tests.Conduct planned experiments and prepare laboratory report in a standard format.
56	PH404	Biostatistics & Research Methodology (Theory)	<ul style="list-style-type: none">Recognise the importance of biostatistics in pharmacy.Understand the research methodology in the design of pharmacoepidemiological study.Discuss the methods of collection of data and its analysis and Interpretation.Discuss and evaluate various software's for statistical analysis of data.
57	PH405	Biopharmaceutics & Pharmacokinetics (Theory)	<ul style="list-style-type: none">To Know the Cause, Etiopathogenesis, Risk factors, Clinical presentation and diagnostic methods of the selected disease states.Knowledge about the pathophysiology of the selected disease states and the rationale for the drug therapy and approaches to manage the disease.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 responses and adverse effects).To know the importance of preparation of individualized therapeutic plan based on patient.
58	PH410	Biopharmaceutics & Pharmacokinetics (Practical)	<ul style="list-style-type: none">Enhance dissolution characteristics of slightly soluble drugs by co-solvency, solid dispersion and use of surfactant.Compare dissolution studies of two



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			<p>different marketed products of same drug.</p> <ul style="list-style-type: none">• Perform Protein binding studies of a drug and Calculation of bioavailability.• Calculate the Pharmacokinetic parameters like K_a, K_e, $t_{1/2}$, C_{max}, AUC, AUMC, MRT etc. from blood profile data.• Perform absorption studies in animal inverted intestine using various drugs.
59	PH406	Clinical Toxicology (Theory)	<ul style="list-style-type: none">• Able to answer drug information questions.• Able to perform patient medication counselling.• Able to solve case studies related to laboratory investigations.• Able to conduct patient medication history interview.
60	PH411	Pharmacotherapeutics I & II (Theory)	<ul style="list-style-type: none">• The Pathophysiology of selected disease states and the rationale for drug therapy. And therapeutic approach to management of these diseases.• The controversies in drug therapy; The importance of preparation of individualized therapeutic plans based on diagnosis; 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).• Describe the Pathophysiology of selected disease states and explain the rationale for drug therapy.• Summarise the therapeutic approach to management of these diseases including reference to the latest available evidence; discuss the controversies in drug therapy.
61	PH412	Pharmacotherapeutics I & II (Practical)	<ul style="list-style-type: none">• Discuss the controversies in drug therapy.• Discuss the preparation of individualized therapeutic plans based on diagnosis.• Identify the patient-specific parameters relevant in initiating drug therapy.• Monitoring of drug therapy (including alternatives, time course of clinical and laboratory indices of therapeutic response and adverse effects).• To understand therapeutic goals of the drugs used in different diseases.• To check & analyze drug interactions, adverse drug reactions.



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Second Year Pharm D (PB)

Sr. No.	Course Code	Course Title	Course Outcome
62	PH501	Clinical research (Theory)	<ul style="list-style-type: none">To Understand new drug development process.To Understand clinical studies scenario in Indian and other countries.To understand the regulatory and ethical requirement in clinical trials.To know the role and responsibilities of clinical trial personnel.To know the designing of clinical trial documents.
63	PH502	Pharmacoepidemiology & Pharmacoeconomics (Theory)	<ul style="list-style-type: none">To Compare and contrasts different study designs.To distinguish methods of data collection and recording.To understand issues involved in selecting sample and recruiting participants.To discuss threats to validity and issues of interpretations.To discuss applications of pharmacoepidemiological concepts and methods to pharmacy practice.To explain measures of disease occurrence and association.
64	PH503	Clinical pharmacokinetics & Pharmacotherapeutic drug monitoring (Theory)	<ul style="list-style-type: none">To Apply PK-PD principles in cases using patient data to optimize pharmacotherapy and drug dosing for maximal efficacy and minimal toxicity.To recognise, document and manage drug dosing in cases involving significant patient pharmacokinetic variability due to physiology or disease (eg age, obesity, pregnancy, malabsorption, organ dysfunction, critical illness, therapeutic target site).To recognize, characterize and manage cases with clinically significant PK-PD drug interactions.To demonstrate appropriate therapeutic drug management (TDM) in cases with medications for which concentrations can be measured or predicted from available PK research data.
65	PH504	Clerkship	<ul style="list-style-type: none">To discuss the role of Pharmacist in clinical pharmacy services.To demonstrate the skills of a clinical Pharmacist.



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			<ul style="list-style-type: none">• To discuss the available therapeutic options in the management of diseases.• To prepare a pharmaceutical care plan for a given case CO.5 To detect, Interpret and report medication errors and drug interactions.
66	PH505	Project Work	<ul style="list-style-type: none">• To address a problem related to Pharmacy practice in hospital, community service or clinical set up with a wider perspective and generality.• To address a problem related to Pharmacy practice in hospital, community service or clinical set up with a wider perspective and generality.• To define the problem to be addressed and translate it into a statement of aim, objectives, scope and plan for the project• To carry out and report an information survey and take account of findings in executing project.• To evaluate, select and apply relevant theories and techniques from the full range of courses studied using conceptual models and frameworks to enhance depth of understanding.• To select appropriate methodology for investigative work, taking into account the pros and cons of the alternatives available and develop solution proposals based on reasoned judgement.



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Third year Pharm D (PB)

Course Title	Course Outcome
Internship	<ul style="list-style-type: none">• To provide patient care in cooperation with patients, prescribers and other members of an inter-professional health care team-based health care team based upon sound therapeutic principles and evidence-based data, taking into account relevant legal, ethical, social cultural, economic and professional issues, emerging technologies and evolving biomedical, pharmaceutical, social or behavioural or administrative and clinical sciences that may impact therapeutic outcomes.• To manage and use resources of the health care system in cooperation with patients, prescribers, other health care providers, administrative and supportive personnel to promote health, to provide, assess and coordinate safe, accurate and time sensitive medication distribution and to improve therapeutic outcome of medication use.• To promote health improvement, wellness and prevention in co-operation with patients, communities, at risk population, and other members of inter professional team of health care providers.• To demonstrate skills in monitoring of the national health programs and schemes oriented to provide preventive and promotive health care services to the community.• To develop leadership qualities to function effectively as a member of the health care team organized to deliver the health and family welfare services in existing socio- economic, political and cultural environment.• To communicate effectively with patients and the community.