

## 1. Course Outcomes of Pharm.D First Year

S.No	Course Name with code	Co Number	Course Outcome
<b>Pharm.D First Year</b>			
1	Human Anatomy and Physiology	C01	<u>Describe</u> Scope of anatomy and physiology, basic terminologies used in this subject, Structure of cell – its components and their functions, about Elementary tissues of the human body: epithelial, connective, Muscular and nervous tissues-their sub-types and characteristics, skeletal system. (REMEMBER)
		C02	<u>Describe</u> about Haemopoetic System, Lymph, Cardiovascular system. (REMEMBER)
		C03	<u>Describe</u> about Respiratory system and Digestive system. (REMEMBER)
		C04	<u>Explain</u> Nervous system, Urinary system. (UNDERSTAND)
		C05	<u>Describe</u> about Endocrine system and Reproductive system. (REMEMBER)
		C06	<u>Demonstrate</u> Sense organs, Skeletal system and Sports physiology. (UNDERSTAND)

2	Pharmaceutics	CO1	Describe the history of profession of pharmacy, different dosage forms, professional way of handling the prescription along with they can also understand dose calculation for paediatrics based on different factors (Remember)
		CO2	Explain about the basics of different pharmacopoeia and national formulary (Understand)
		CO3	Demonstrate the different measuring systems and Preparation of various conventional dosage forms and their stability studies (Understand)
		CO4	Discuss the various preparation methods and stability evaluations of biphasic liquid dosage forms (Understand)
		CO5	Assess the Preparation of semisolid dosage forms for body cavity, evaluations. (Evaluate)
		CO6	Explain the basics of pharmaceutical calculations, excipients used in different dosage forms (Understand)
		CO7	Demonstrate various extraction methods by using different equipment's and surgical aids (Understand)
		CO8	Classify various types of pharmaceutical incompatibilities and their overcoming methods (Analyse)
3	Medicinal Biochemistry	CO1	Summarise Cell and its biochemical organization.
		CO2	Characterise the catalytic activity of enzymes and importance of isoenzymes in diagnosis of diseases.
		CO3	State the metabolic process of bio molecules in health and illness (metabolic disorders).
		CO4	Justify the genetic organization of mammalian genome, protein synthesis, replication, mutation and repair mechanism.
		CO5	Illustrate the biochemical principles of organ function tests of kidney, liver and endocrine gland.
		CO6	Describe the qualitative analysis and determination of bio molecules in the body fluids.
4	Pharmaceutical Organic Chemistry	CO1	Explain Nomenclature of organic compound belonging to the following classes Alkanes, Alkenes, Dienes, Alkynes, Alcohols, Aldehydes, Ketones, Amides, Amines, Phenols, Alkyl Halides, Carboxylic Acid, Esters, Acid Chlorides And Cycloalkanes.
		CO2	Enumerate Some important physical properties of organic compounds
		CO3	Explain Free radical/ nucleophilic [alkyl/ acyl/ aryl] / electrophilic substitution, free radical/ nucleophilic / electrophilic addition, elimination, oxidation and reduction reactions with mechanism, orientation of the reaction, order of reactivity, stability of compounds.
		CO4	Develop knowledge on some named organic reactions with Mechanism of aldol condensation, claisen condensation, cannizzaro reaction, crossed aldol condensation, crossed cannizzaro reaction, benzoin condensation, perkin condensation. Knoevenagel,

			Reformatsky reaction, Wittig reaction, Michael addition.
		CO5	Describe methods of preparation of test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

		CO6	Study of the following official compounds- preparation, test for purity, assay and medicinal uses
5	Pharmaceutical Inorganic Chemistry	CO1	The study of inorganic pharmaceutical errors and volumetric analysis and perform the acid base titrations
		CO2	Learn about the different types titrations and how to prepare solutions acid-base titrations, redox titrations, non aqueous titrations, complexometric titrations
		CO3	To know the theory of indicators and gravimetry and know about the different types limit tests
		CO4	Understand the different types of medicinal gasses and various preparations of acidifiers and antacids
		CO5	know the cathartics and importance of electrolyte replenishers
		CO6	Understand the different types of antimicrobials ,pharmaceutical aids and various radio pharmaceuticals and their importance
6	Remedial Mathematics/ Biology	CO1	To apply the fractions, logarithms, functions.
		CO2	To determine the regarding matrices and determinants
		CO3	To solve about calculus and differentiation
		CO4	To solve the analytical geometry, straight line and integration
		CO5	To integrate the differential equations
		CO6	To integrate the laplace transform.

## 2. Course Outcomes of Pharm.D Second Year

S.No	Course Name with code	Co Number	Course Outcome
<b>Pharm.D Second Year</b>			
1	Pathophysiology	CO1	Describe abnormal physiologic processes associated with common disease processes (REMEMBER)
		CO2	Explain the most common etiology and predisposing factors associated with human disease (UNDERSTAND)
		CO3	Identify the mechanisms that cause alterations in hormone secretion (REMEMBER)

	CO4	Identify the classification of tumors and stages of cancer spread. Explain the difference between benign and malignant neoplasms (REMEMBER)
	CO5	Describe the structure and function of cells and tissues (REMEMBER)
	CO6	State the Cellular adaptations that result from environmental stresses (REMEMBER)

2	Pharmaceutical Microbiology	CO1	Discuss about Introduction, Major divisions, Classification of microbes and Nutritional Requirements for growth of microbes.(UNDERSTAND)
		CO2	List out identification methods for isolation, methods of sterilization and brief info about validation
		CO3	Describe Various disinfectants, evaluation of disinfectants in pharmaceutical preparations. (UNDERSTAND)
		CO4	Discuss in detail about Immunology, describe the various diagnostic tests (UNDERSTAND)
		CO5	Describe Microbial Culture sensitivity testing (REMEMBER)
		CO6	Explain about study of various infectious diseases (REMEMBER)
3	Pharmacognosy & Phytochemistry	CO1	Introduction, Definition, history and scope of Pharmacognosy.
		CO2	Understand the basic cultivation, collection and storage of crude drugs. Classification of crude drugs. Detailed method of cultivation of crude drugs. Microscopical and powder Microscopical study of crude drugs.
		CO3	Detailed study of various cell constituents. Study of cell wall constituents and cell inclusions. Study of natural pesticides.
		CO4	Detailed study carbohydrates containing drugs. Carbohydrates and related products
		CO5	Definition sources, method extraction, chemistry and method of analysis of lipids. Detailed study of oils
		CO6	Definition sources, method extraction, chemistry and method of analysis of lipids. Detailed study of oils. Definition, classification, chemistry and method of analysis of protein. Study of plants fibers used in surgical dressings and related products. Different methods of adulteration of crude drugs
4	Pharmacology-I	CO1	Explain the basics concepts of drug toxicity, preclinical evaluation and drug interactions, Receptors(Understand)
		CO2	Discuss Classification of Drugs acting on ANS and able to understand the actions of drugs(Understand)
		CO3	Apply knowledge on various cardiovascular disorders & able to treat the condition with the drugs(Apply)
		CO4	Interpret & get an overview on various CNS disorders & know the classifications of CNS acting drugs(Understand)
		CO5	State knowledge on Respiratory problems, causes and their treatment(Remember)
		CO6	Describe the Pharmacology of Hormones and Hormone antagonists(Remember)
		CO7	Explain the release of various autocoids & drug therapy to antagonize actions of autocoids(Understand)

5	Community Pharmacy	CO1	<u>Explain</u> Roles and responsibilities of Community pharmacist in managing and maintenance business of a community pharmacy.(UNDERSTAND)
		CO2	<u>Describe</u> the parts of prescription, legality & identification of medication related problems like drug interactions (REMEMBER)
		CO3	<u>Discuss</u> various methods of inventory management (UNDERSTAND)
		CO4	<u>Enumerate</u> Gain knowledge on pharmaceutical care, patient medication adherence, health screening services and OTC medication (REMEMBER)
		CO5	<u>Explain</u> the concept of health education as per WHO, study about commonly occurring communicable diseases, causative agents, clinical presentations and prevention of communicable diseases, balanced diet, and treatment & prevention of deficiency disorders, family planning.(UNDERSTAND)
		CO6	<u>Identify</u> symptoms of minor ailments and provide appropriate medication (REMEMBER)
		CO7	<u>Summarize</u> the role of pharmacist in promoting rational drug, Understand the code of ethics for community pharmacists (UNDERSTAND)
6	Pharmacotherapeutics- I	CO1	Discuss the Pathophysiology and management of cardiovascular diseases. (UNDERSTAND)
		CO2	Recognize the Pathophysiology and management of respiratory and endocrine diseases. (UNDERSTAND)
		CO3	Demonstrate the general prescribing guidelines and rational use of drugs of Paediatric patients Geriatric patients, Pregnancy and breast feeding. (UNDERSTAND)
		CO4	Able to express Pathophysiology and management of Glaucoma, Conjunctivitis- viral & bacterial.(UNDERSTAND)
		CO5	Discuss the role of pharmacist in essential and rational drug use. (UNDERSTAND)
		CO6	Describe the pathophysiology of drug induced pulmonary diseases. (UNDERSTAND)

### 3. Course Outcomes of Pharm.D Third Year

S.No	Course Name with code	Co Number	Course Outcome
<b>Pharm.D Third Year</b>			
	Pharmacology -II	CO1	Gain knowledge on Pharmacology of Drugs acting on Blood and blood forming agents

1		CO2	Gain knowledge on Pharmacology of drugs acting on Renal System
		CO3	Gain knowledge on Chemotherapy
		CO4	Gain knowledge on Immunopharmacology
		CO5	To Understand about Principles of Animal toxicology
		CO6	Gain Knowledge on The dynamic cell: The structures and functions of the components of the cell
		2	Pharmaceutical Analysis
CO2	<u>Develop</u> chromatographic techniques with relevant examples of pharmaceutical products involving principles and techniques of separation of drugs from excipients. (CREATE)		
CO3	<u>Summarize</u> on theoretical aspects, instrumentation, interpretation of data/spectra and analytical applications of Electrochemical methods of analysis (UNDERSTAND)		
CO4	<u>Enumerate</u> theoretical aspects, instrumentation, elements of interpretation of data/spectra and application of analytical spectroscopy (REMEMBER)		
CO5	<u>Explain</u> theoretical aspects, instrumentation, elements of interpretation of data/spectra and application of polarimetry and X-ray diffraction techniques (UNDERSTAND)		
CO6	<u>Describe</u> theoretical aspects, instrumentation, elements of interpretation of data/spectra and application of Thermal analysis (REMEMBER)		
3	Pharmacotherapeutics-II	CO1	Explain the pathophysiology of selected disease states and the rationale drug therapy of TB, Meningitis, RTI, Gastroenteritis and septicaemia. (Understand).
		CO2	Explain the pathophysiology of Urinary tract infections, viral, protozoal, Fungal infections AND sexually transmitted disease. (Understand).
		CO3	Enumerate the therapeutic approach to Musculoskeletal disorders (Remember).
		CO4	Explain the Pharmacotherapy of Renal system (Understand).
		CO5	Identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy on Oncology (Remember).
		CO6	Illustrate the evidence based medicine on Dermatology (Understand).
	Pharmaceutical Jurisprudence	CO1	<u>Explain</u> the Professional ethics and to understand the various concepts of the pharmaceutical legislation in India( UNDERSTAND)
		CO2	<u>Discuss</u> the various parameters in the Drug and Cosmetic Act and

4			rules and to understand the functions various officers comes under D & C act , labelling requirements and packaging guidelines for drugs and cosmetics( UNDERSTAND)
		CO3	<u>Describe</u> the various rules and educational regulations, constitution & functions of PCI as well as registration process for pharmacist described under Pharmacy act (REMEMBER)
		CO4	<u>Define</u> the various parameters , construction , design of bonded and non-bonded laboratory manufacturing, warehousing and storage procedure for alcoholic and non alcoholic in mentioned under medicinal and toilet preparation act ( REMEMBER)
		CO5	<u>Discuss</u> about Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and regulations ( UNDERSTAND)
		CO6	<u>Express</u> the knowledge on prohibited and exempted classes of advertisements relating drugs and magic remedies described under act (UNDERSTAND)
		CO7	<u>Explain</u> the Drug policy, DPCO, Patent and design act, Understand the procedure for experimentation , breeding and stocking of animals under the Prevention Of Cruelty to animals Act, Learn about various types Various prescription and non-prescription products, Learn about various types Various prescription and non-prescription products ( UNDERSTAND)
5	Medicinal chemistry	CO1	Interpret (Understand) the chemistry of drugs with respect to their pharmacological activity, the drug metabolic pathways, adverse effect and therapeutic value of drugs
		CO2	Explain (Understand) the importance of drug design and different techniques of drug design and the principles of metabolism, adverse effects and therapeutic value of drugs..
		CO3	Interpret (Understand)the Structural Activity Relationship (SAR) of different class of drugs.
		CO4	Synthesize (Create) the chemical synthesis of drugs and intermediates, and reaction conditions.
		CO5	Prepare (Create) the green chemistry techniques involved in the preparation of synthetic compounds.
		CO6	Perform (Create) the compound workout techniques, and purification techniques, the application of TLC techniques for product conformation and purification
6	Pharmaceutical Formulations	CO1	Explain about the manufacturing of tablets (Understand).
		CO2	Formulate hard Gelatin capsules (Create).
		CO3	Describe the manufacture of Parenteral (Remember).
		CO4	Evaluate the Parenteral (Evaluate).

	C05	Explain about types of liquid orals (Understand).
	C06	Discuss about the formulation of semi solids (Understand).
	C07	Define and explain the concepts of cosmetic preparations (Remember).

#### 4. Course Outcomes of Pharm.D Fourth Year

S.No	Course Name with code	Co Number	Course Outcome
<b>Pharm.D Fourth Year</b>			
1	Pharmacotherapeutics-III	CO1	Describe the Etiopathogenesis of selected disease states(Remember)
		CO2	Discuss the various methods involved in the diagnosis of selected disease state(Understand)
		CO3	Interpret and analyze the selected laboratory results of specific disease states(Understand)
		CO4	Describe the therapeutic approach to manage the selected diseases(Remember)
		CO5	Discuss the rationale for drug therapy of the selected disease(Understand)
		CO6	Describe evidence based medicine and Pain management(Remember)
2	Hospital Pharmacy	CO1	<b>Discuss</b> about Hospital - its organization and functions, Hospital Pharmacy-Organization and management. ( <b>UNDERSTAND</b> )
		CO2	<b>Explain</b> the Knowledge about Budget – Preparation and implementation, Hospital drug policy. ( <b>UNDERSTAND</b> )
		CO3	To <b>Illustrate</b> about Hospital pharmacy services. ( <b>UNDERSTAND</b> )
		CO4	<b>Develop</b> to understand Manufacture of Pharmaceutical preparation ( <b>CREATE</b> ).
		CO5	<b>Describe</b> the continuing professional development programs. ( <b>REMEMBER</b> )
		CO6	<b>Explain</b> Radio Pharmaceuticals – Handling and packaging, Professional Relations and practices of hospital pharmacist ( <b>UNDERSTAND</b> )
3	Clinical Pharmacy	CO1	Explain the roles and responsibilities of clinical pharmacist ( <b>UNDERSTAND</b> )
		CO2	Analyse and interpret the laboratory test results for clinical diagnosis ( <b>ANALYSE</b> )
		CO3	Recommend medication history and perform patient counselling ( <b>EVALUATE</b> )
		CO4	Identify, monitor, assess, manage, prevent, document and report suspected adverse drug reactions ( <b>REMEMBER</b> )
		CO5	Assess drug and poison information through critical analysis ( <b>EVALUATE</b> )
		CO6	Recognise the potential sources of medication errors and act for its prevention ( <b>UNDERSTAND</b> )

4	Biostatistics & Research Methodology	CO1	Design the experiment and research hypothesis for a project
		CO2	Explain the appropriate framework for research studies
		CO3	List the various statistical methods to solve different types of problems
		CO4	Demonstrate various statistical software packages
		CO5	Appraise the importance of Computer in hospital and Community Pharmacy
		CO6	Appraise the statistical technique in solving the pharmaceutical problems
5	Biopharmaceutics & Pharmacokinetics	CO1	<b>Demonstrate</b> and <b>Explain Absorption</b> of drugs from gastro intestinal tract. Drug distribution, Drug elimination ( <b>UNDERSTAND</b> )
		CO2	<b>Describe</b> about pharmacokinetic mathematical models, drug levels in blood, pharmacokinetic model, compartment models, pharmacokinetic study ( <b>REMEMBER</b> )
		CO3	<b>Enumerate</b> one compartment open model intravenous injection, intravenous infusion. Multi compartment models two compartment open model, iv bolus, iv infusion and oral administration. ( <b>REMEMBER</b> )
		CO4	<b>Discuss</b> multi dosage regimens. Repetitive intravenous injections-repetitive extravascular dosing-one compartment open model, multi dose regimen-two compartment open model. ( <b>UNDERSTAND</b> )
		CO5	<b>Develop</b> Non-linear pharmacokinetics-factors causing non-linearity, Michaelis-Menten method of estimating parameters. ( <b>CREATE</b> )
		CO6	<b>Illustrate</b> non compartmental pharmacokinetics-statistical moment theory, MRT for various compartment models, physiological pharmacokinetic model. ( <b>UNDERSTAND</b> )
		CO7	<b>Summarize</b> bio availability and bio equivalence- bio availability study protocol, methods of assessment of bio availability. ( <b>UNDERSTAND</b> )
6	Clinical Toxicology	CO1	Explain the general principles involved in the management of poisoning, Antidotes and supportive care. ( <b>Understand</b> ).
		CO2	Explain the Gut Decontamination, Elimination Enhancement techniques & Toxicokinetics. ( <b>Understand</b> ).
		CO3	Describe about clinical symptoms and management of acute and chronic poisoning ( <b>Remember</b> )
		CO4	Describe & understand various Families of venomous snakes and know symptoms, first aid & treatment ( <b>Remember</b> )
		CO5	Describe about Plant, Food poisoning and Envenomations. ( <b>Remember</b> )
		CO6	Illustrate on the signs and symptoms of substance abuse and treatment of dependence. ( <b>Understand</b> )



## 5. Course Outcomes of Pharm.D Fifth Year

S.No	Course Name with code	Co Number	Course Outcome
<b>Pharm.D Fifth Year</b>			
1	Clinical Research	CO1	<u>Contrast</u> the drug development process. (UNDERSTAND)
		CO2	<u>Discuss</u> the clinical trials. (UNDERSTAND)
		CO3	<u>Compare</u> the clinical research process in India and other countries. (UNDERSTAND)
		CO4	<u>Interpret</u> the regulatory environment in USA, Europe and India. (UNDERSTAND)
		CO5	<u>Demonstrate</u> the ethical guidelines in Clinical Research. (UNDERSTAND)
		CO6	<u>Interpret</u> the roles and responsibilities of clinical trial personnel. (UNDERSTAND)
2	Pharmacoepidemiology and Pharmacoeconomics	CO1	<u>Compare</u> different study designs. (UNDERSTAND)
		CO2	<u>Explain</u> Origin and evolution of pharmacoepidemiology. (UNDERSTAND)
		CO3	<u>Explain</u> Prevalence and incidence rate. (UNDERSTAND)
		CO4	<u>Summarize</u> theoretical aspects of various methods. (UNDERSTAND)
		CO5	Play the role in formulary management decisions
		CO6	<u>Discuss</u> pharmacoeconomic evaluation methods. (UNDERSTAND)
3	Clinical Pharmacokinetics & Pharmacotherapeutic Drug monitoring	CO1	Demonstrate nomograms and tabulations and their applications in designing dosage regimens in specific populations
		CO2	Apply the principles of pharmacokinetics in identifying the drug interactions
		CO3	Develop the skills on individualization of drug dosage regimen in special population by considering TDM indications.
		CO4	Analyse GFR, creatinine clearance, extracorporeal removal of drugs and pharmacokinetic considerations in dosing renal and hepatic diseases.
		CO5	Discuss Bayesian theory, adaptive methods.

		CO6	Explain genetic Polymorphism, Drug transport mechanisms and assess pharmacogenetics in developing drug dosage regimens.
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