OBE DOCUMENT

School of Pharmacy

Pharm.D.

Program Code: SOP0104

(2024 - 2030)

School of Pharmacy

Programme Structure: 2024-30
Program: Pharm.D.

S. No	Course Code	Course Name	Category		Hours (L+T+P)	
Year - I						
1	PDP101	Human Anatomy and Physiology - Theory	Core		3+1+0 = 4	
2	PDP102	Pharmaceutics - Theory	Core		2+1+0 = 3	
3	PDP103	Medicinal Biochemistry - Theory	Core		3+1+0 = 4	
4	PDP104	Pharmaceutical Organic Chemistry - Theory	Core		3+1+0 = 4	
5	PDP105	Pharmaceutical Inorganic Chemistry - Theory	Core		2+1+0 = 3	
6	PDP106	Remedial Mathematics - Theory	Elective		3+1+0 = 4	
7	PDP107	Remedial Biology - Theory	Elective		3+1+0 = 4	
8	PDP108	Human Anatomy and Physiology - Practical	Core		0+0+3 = 3	
9	PDP109	Pharmaceutics - Practical	Core		0+0+3 = 3	
10	PDP110	Medicinal Biochemistry - Practical	Core		0+0+3 = 3	
11	PDP111	Pharmaceutical Organic Chemistry - Practical	Core		0+0+3 = 3	
12	PDP112	Pharmaceutical Inorganic Chemistry - Practical	Core		0+0+3 = 3	
13	PDP113	Remedial Biology - Practical	Elective		0+0+3 = 3	
Year - II						
1	PDP201	Pathophysiology - Theory	Core		3+1+0 = 4	
2	PDP202	Pharmaceutical Microbiology - Theory	Core		3+1+0 = 4	
3	PDP203	Pharmacognosy and Phytopharmaceuticals - Theory	Core		3+1+0 = 4	
4	PDP204	Pharmacology- I - Theory	Core		3+1+0 = 4	
5	PDP205	Community Pharmacy - Theory	Core		2+1+0 = 3	
6	PDP206	Pharmacotherapeutics- I - Theory	Core		3+1+0 = 4	
7	PDP207	Pharmaceutical Microbiology - Practical	Core		0+0+3 = 3	
8	PDP208	Pharmacognosy and Phytopharmaceuticals - Practical	Core		0+0+3 = 3	
9	PDP209	Pharmacotherapeutics- I - Practical	Core		0+0+3 = 3	
Year - III						
1	PDP301	Pharmacology- II - Theory	Core		3+1+0 = 4	
2	PDP302	Pharmaceutical Analysis - Theory	Core		3+1+0 = 4	
3	PDP303	Pharmacotherapeutics- II - Theory	Core		3+1+0 = 4	
4	PDP304	Pharmaceutical Jurisprudence - Theory	Core		2+0+0 = 2	
5	PDP305	Medicinal Chemistry - Theory	Core		3+1+0 = 4	

6	PDP306	Pharmaceutical Formulations - Theory	Core		2+1+0 = 3	
7	PDP307	Pharmacology- II - Practical	Core		0+0+3 = 3	
8	PDP308	Pharmaceutical Analysis - Practical	Core		0+0+3 = 3	
9	PDP309	Pharmacotherapeutics- II - Practical	Core		0+0+3 = 3	
10	PDP310	Medicinal Chemistry - Practical	Core		0+0+3 = 3	
11	PDP311	Pharmaceutical Formulations - Practical	Core		0+0+3 = 3	
Year - IV						
1	PDP401	Pharmacotherapeutics- III - Theory	Core		3+1+0 = 4	
2	PDP402	Hospital Pharmacy - Theory	Core		2+1+0 = 3	
3	PDP403	Clinical Pharmacy - Theory	Core		3+1+0 = 4	
4	PDP404	Biostatistics and Research Methodology - Theory	Core		2+1+0 = 3	
5	PDP405	Biopharmaceutics and Pharmacokinetics - Theory	Core		3+1+0 = 4	
6	PDP406	Clinical Toxicology - Theory	Core		2+1+0 = 3	
7	PDP407	Pharmacotherapeutics- III - Practical	Core		0+0+3 = 3	
8	PDP408	Hospital Pharmacy - Practical	Core		0+0+3 = 3	
9	PDP409	Clinical Pharmacy - Practical	Core		0+0+3 = 3	
10	PDP410	Biopharmaceutics and Pharmacokinetics - Practical	Core		0+0+3 = 3	
Year - V						
1	PDP501	Clinical Research - Theory	Core		3+1+0 = 4	
2	PDP502	Pharmacoepidemiology and Pharmacoeconomics - Theory	Core		3+1+0 = 4	
3	PDP503	Clinical Pharmacokinetics and Pharmacotherapeutic Drug Monitoring - Theory	Core		2+1+0 = 3	
4	PDP504	Clerkship	Core		0+1+0 = 1	
5	PDP505	Project work (Six Months)	Core		0+0+20= 20	
Year - VI						
1	PDP601	Internship	Core			

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP101
2	Course Title	Human Anatomy & Physiology (Theory)
3	Credits	-
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	Upon completion of the course the student shall be able to: ● Describe the structure (gross and histology) and functions of various organs of the human body; ● Describe the various homeostatic mechanisms and their imbalances of various systems; ● Identify the various tissues and organs of the different systems of the human body; ● Perform the hematological tests and also record blood pressure, heart rate, pulse and Respiratory volumes; ● Appreciate coordinated working pattern of different organs of each system; and ● Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body.
6	Course Outcomes	Upon completion of this course the student should be able to: CO1: Understand structural organization of the human body, including the identification and description of major organs, and systems. CO2: Analyze the physiological processes that underlie human functions, such as cellular metabolism and homeostasis. CO3: Apply knowledge of anatomical and physiological principles to explain the relationships and interactions between different organ systems within the human body. CO4: Utilize anatomical terminology to communicate effectively about the human body's structure and function. CO5: Evaluate the impact of external and internal factors on human health, environment, and other factors influence anatomical and physiological conditions. CO6: Evaluate anatomical dissections, physiological experiments, and interpret data to draw conclusions about human anatomy and physiology.

7	Course Description	This course deals with the fundamentals of structure and functions of human body systems.
8	**Lecture wise program: Topics**	
	UNIT 1	
	a.	Scope of anatomy and physiology, basic terminologies used in this subject (Description of the body as such planes and terminologies).
	b.	Structure of cell – its components and their functions.
	c.	Elementary tissues of the human body: epithelial, connective, Muscular and nervous tissues-their sub-types and characteristics- i. Osseous system - structure, composition and functions of the Skeleton. (Done in practical classes - 6hrs) ii. Classification of joints, Types of movements of joints and disorders of joints (Definitions only)
	UNIT 2	
	a.	Haemopoetic System i. Composition and functions of blood ii. Haemopoesis and disorders of blood components (definition of disorder) iii. Blood groups iv. Clotting factors and mechanism v. Platelets and disorders of coagulation
	b.	Lymph i. Lymph and lymphatic system, composition, formation and circulation. ii. Spleen: structure and functions, Disorders iii. Disorders of lymphatic system (definition only)
	c.	Cardiovascular system

		i. Anatomy and functions of heart ii. Blood vessels and circulation (Pulmonary, coronary and systemic circulation) iii. Electrocardiogram (ECG) iv. Cardiac cycle and heart sounds v. Blood pressure – its maintenance and regulation vi. Definition of the following disorders: Hypertension, Hypotension, Arteriosclerosis, Atherosclerosis, Angina, Myocardial infarction, Congestive heart failure, Cardiac arrhythmias
UNIT 3		
	a.	Respiratory system i. Anatomy of respiratory organs and functions ii. Mechanism / physiology of respiration and regulation of respiration iii. Transport of respiratory gases iv. Respiratory volumes and capacities, and Definition of: Hypoxia, Asphyxia, Dysbarism, Oxygen therapy and resuscitation.
	b.	Digestive system i. Anatomy and physiology of GIT ii. Anatomy and functions of accessory glands of GIT iii. Digestion and absorption iv. Disorders of GIT (definitions only)
	c.	Nervous system i. Definition and classification of nervous system ii. Anatomy, physiology and functional areas of cerebrum iii. Anatomy and physiology of cerebellum iv. Anatomy and physiology of midbrain v. Thalamus, hypothalamus and Basal Ganglia vi. Spinal cord: Structure and reflexes – mono-poly-

		planter vii. Cranial nerves – names and functions viii. ANS – Anatomy and functions of sympathetic and parasympathetic N.S.
	UNIT 4	
	a.	Urinary system i. Anatomy and physiology of urinary system ii. Formation of urine iii. Renin Angiotensin system – Juxtaglomerular apparatus - acid base Balance iv. Clearance tests and micturition
	b.	Endocrine system i. Pituitary gland ii. Adrenal gland iii. Thyroid and Parathyroid glands iv. Pancreas and gonads
	c.	Reproductive system i. Male and female reproductive system ii. Their hormones – Physiology of menstruation iii. Spermatogenesis & Oogenesis iv. Sex determination (genetic basis) v. Pregnancy and maintenance and parturition vi. Contraceptive devices
	UNIT 5	
	a.	*Sense organs* *i. Eye* *ii. Ear* *iii. Skin* *iv. Tongue and Nose*
	b.	*Skeletal muscles* *i. Histology* *ii. Physiology of Muscle contraction* *iii. Physiological properties of skeletal muscle and their disorders (definitions)*
	c.	Sports physiology i. Muscles in exercise, Effect of athletic training on muscles and muscle performance, ii. Respiration in exercise, CVS in exercise, Body heat in exercise, Body fluids and salts in exercise iii. Drugs and athletic
	Mode of Examination	Theory

	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
			30	70
	Text book/s*	**Textbooks** 1. Tortora Gerard J. and Nicholas, P., "Principles of Anatomy and Physiology" Harpercollins college: New York. 2. Wilson, K.J.W. Ross and Wilson's, "Foundations of anatomy and physiology" Churchill Livingstone: Edinburg. **Reference Books** 1. Guyton arthur, C., "Physiology of human body" Holtsaunders. 2. Chatterjee,C.C., "Human physiology" Medical allied agency: Calcutta. 3. Peter L. Williams, Roger Warwick, Mary Dyson and Lawrence, H., 4. "Gray's anatomy" Churchill Livingstone: London.		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP102
2	Course Title	Pharmaceutics (Theory)
3	Credits	-
4	Contact Hours (L-T-P)	2-1-0
	Course Type	Compulsory
5	Course Objective	Upon the completion of the course the student should be able to: • Know the formulation aspects of different dosage forms. • Do different pharmaceutical calculations involved in formulation. • Formulate different types of dosage forms; and • Appreciate the importance of good formulation for effectiveness.
6	Course Outcomes	Upon completion of this course the student should be able to: CO1: Understand pharmaceutical principles of formulation, and manufacturing of various dosage forms. CO2: Apply knowledge of pharmaceutics to design drug delivery systems, considering physiochemical factors. CO3: Analyze the physicochemical properties of drugs and their impact on pharmaceutical formulation, ensuring drug stability. CO4: Evaluate various pharmaceutical dosage forms and their suitability for different routes of administration. CO5: Demonstrate about quality control and assurance measures in pharmaceutical manufacturing, ensuring adherence to regulatory standards and guidelines. CO6: Apply principles of pharmaceutics related to drug formulation, fostering critical thinking and problem-solving skills in pharmaceutical practice.
7	Course Description	This course deals with the fundamentals of formulation and development of different dosage forms.
8	**Lecture wise program: Topics**	
	UNIT 1	a. Introduction to dosage forms - classification and definitions b. Prescription: definition, parts and handling c. Posology: Definition, Factors affecting dose selection. Calculation of children and infant doses.
	UNIT 2	a. Historical back ground and development of profession of pharmacy and pharmaceutical industry in brief. b. Development of Indian Pharmacopoeia and introduction to other Pharmacopoeias such as BP, USP, European Pharmacopoeia, Extra pharmacopoeia and Indian national formulary.
		c. Weights and measures, Calculations involving percentage solutions, allegation, proof spirit, isotonic solutions etc.

	UNIT 3	a. Powders and Granules: Classification advantages and disadvantages, Preparation of simple, compound powders, Insufflations, Dusting powders, Eutectic and Explosive powders, Tooth powder and effervescent powders and granules.		
		b.Monophasic Dosage forms: Theoretical aspects of formulation including adjuvant like stabilizers, colorants, flavours with examples. Study of Monophasic liquids like gargles, mouth washes, Throat paint, Ear drops, Nasal drops, Liniments and lotions, Enemas and collodions.		
		c.Biphasic dosage forms: Suspensions and emulsions, Definition, advantages and disadvantages, classification, test for the type of emulsion, formulation, stability and evaluation.		
	UNIT 4	a.Suppositories and pessaries: Definition, advantages and disadvantages, types of base, method of preparation, Displacement value and evaluation		
		b.Galenicals: Definition, equipment for different extraction processes like infusion, Decoction, Maceration and Percolation, methods of preparation of spirits, tinctures and extracts.		
	UNIT 5	a.Pharmaceutical calculations.		
		b.Surgical aids: Surgical dressings, absorbable gelatin sponge, sutures, ligatures and medicated bandages		
		c.Incompatibilities: Introduction, classification and methods to overcome the incompatibilities.		
	Mode of Examination	Theory		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
			30	70
	Text book/s*	**Textbooks** 1. Cooper and Gunns Dispensing for pharmacy students. 2. A text book Professional Pharmacy by N.K.Jain and S.N.Sharma. **Reference Books**		
		1. Introduction to Pharmaceutical dosage forms by Howard C. Ansel. 2. Remington's Pharmaceutical Sciences. 3. Register of General Pharmacy by Cooper and Gunn. 4. General Pharmacy by M.L.Schroff.		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP103
2	Course Title	Medicinal Biochemistry (Theory)
3	Credits	-
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	Upon the completion of the course the student should be able to: ● Understand the catalytic activity of enzymes and importance of isoenzymes in diagnosis of diseases; ● Know the metabolic process of biomolecules in health and illness (metabolic disorders); ● Understand the genetic organization of mammalian genome; protein synthesis; replication; mutation and repair mechanism; ● Know the biochemical principles of organ function tests of kidney, liver and endocrine gland; and ● Do the qualitative analysis and determination of biomolecules in the body fluids.
6	Course Outcomes	Upon completion of this course the student should be able to: CO1: Understand the importance of metabolism of substrates. CO2: Apply chemistry and biological importance of biological macromolecules. CO3: Analyse qualitative and quantitative estimation of the biological macromolecules. CO4: Analyse the interpretation of data emanating from a Clinical Test. CO5: Analyse physiological conditions influence the structures and reactivity's of biomolecules. CO6: Apply the basic principles of biochemicals.
7	Course Description	This course deals with the study of chemical aspects of human life in health and illness and the application of chemical laboratory methods to diagnosis, control of treatment, and prevention of diseases.
8	**Lecture wise program: Topics**	
	UNIT 1	a.Introduction to biochemistry: Cell and its biochemical organization, transport process across the cell membranes. b.Energy rich compounds; ATP, Cyclic AMP and their biological significance.
		c.Enzymes: Definition; Nomenclature; IUB classification; Factor affecting enzyme activity; Enzyme action; enzyme inhibition. Isoenzymes and their therapeutic and diagnostic applications; Coenzymes and their biochemical role and deficiency diseases.

	UNIT 2	a.Carbohydrate metabolism: Glycolysis, Citric acid cycle (TCA cycle), HMP shunt, Glycogenolysis, gluconeogenesis, glycogenesis. Metabolic disorders of carbohydrate metabolism (diabetes mellitus and glycogen storage diseases); Glucose, Galactose tolerance test and their significance; hormonal regulation of carbohydrate metabolism.
		b.Lipid metabolism: Oxidation; Ketogenesis and ketolysis; biosynthesis of fatty acids, lipids; metabolism of cholesterol; Hormonal regulation of lipid metabolism. c.Defective metabolism of lipids (Atheroslerosis, fatty liver,hypercholesterolmiea).
	UNIT 3	a.Biological oxidation: Coenzyme system involved in Biological oxidation. Electron transport chain (its mechanism in energy capture; regulation and inhibition); Uncouplers of ETC; Oxidative phosphorylation;
		b.Protein and amino acid metabolism: protein turn over; nitrogen balance; Catabolism of Amino acids (Transamination, deamination and decarboxylation). Urea cycle and its metabolic disorders; production of bile pigments; hyperbilirubinemia, porphoria, jaundice. Metabolic disorder of Amino acids.
		c.Nucleic acid metabolism: Metabolism of purine and pyrimidine nucleotides; Protein synthesis; Genetic code; inhibition of protein synthesis; mutation and repair mechanism; DNA replication (semiconservative /onion peel models) and DNA repair mechanism.
	UNIT 4	a.Introduction to clinical chemistry: Cell; composition; malfunction; Role of the clinical chemistry laboratory.
		b.The kidney function tests: Role of kidney; Laboratory tests for normal function includes- 1. Urine analysis (macroscopic and physical examination, quantitative and semiquantitative tests.) 2. Test for NPN constituents. (Creatinine /urea clearance, determination of blood and urine creatinine, urea and uric acid) 3. Urine concentration test 4. Urinary tract calculi. (stones)
		c. Liver function tests: Physiological role of liver, metabolic, storage, excretory, protective, circulatory functions and function in blood coagulation. 1. Test for hepatic dysfunction-Bile pigments metabolism. 2. Test for hepatic function test- Serum bilirubin, urine bilirubin, and urine urobilinogen. 3. Dye tests of excretory function. 4. Tests based upon abnormalities of serum proteins. 5. Selected enzyme tests.
	UNIT 5	a.Lipid profile tests: Lipoproteins, composition, functions. Determination of serum lipids, total cholesterol, HDL cholesterol, LDL cholesterol and triglycerides.

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<tr><td></td><td></td><td colspan="3">b.Immunochemical techniques: for determination of hormone levels and protein levels in serum for endocrine diseases and infectious diseases. Radio immuno assay (RIA) and Enzyme Linked Immuno Sorbent Assay (ELISA)</td></tr>
<tr><td></td><td></td><td colspan="3">c.Electrolytes: Body water, compartments, water balance, and electrolyte distribution. Determination of sodium, calcium potassium, chlorides, bicarbonates in the body fluids.</td></tr>
<tr><td></td><td>Mode of Examinati on</td><td colspan="3">Theory</td></tr>
<tr><td rowspan="2"></td><td rowspan="2">Weightage Distribu tio n</td><td>Continuous Mode Assessment</td><td>Sessional Exam</td><td>ESE</td></tr>
<tr><td></td><td>30</td><td>70</td></tr>
<tr><td></td><td>Text book/ s*</td><td colspan="3">Textbooks
1. Harpers review of biochemistry - Martin
2. Textbook of biochemistry – D. Satyanarayana
3. Textbook of clinical chemistry- Alex kaplan and Laverve L. Szabo
Reference Books
1. Principles of biochemistry -- Lehninger
2. Textbook of biochemistry -- Ramarao
3. Practical Biochemistry-David T.Plummer.
4. Practical Biochemistry-Pattabhiraman.</td></tr>
</table>

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP104
2	Course Title	Pharmaceutical Organic Chemistry (Theory)
3	Credits	-
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	Upon completion of the course the student shall be able to • Write the structure, name and the type of isomerism of the organic compound • Write the reaction, name the reaction and orientation of reactions. • Account for reactivity/stability of compounds. • Identify/ confirm the identification of organic compound.
6	Course Outcomes	Upon completion of this course the student should be able to: CO1: To define important physical & chemical properties of organic compounds CO2: To Understand various nomenclature systems of organic compounds. CO3: To apply the mechanism of organic chemical reactions. CO4: To analyses methods of preparation, tests for purity, assay, medicinal uses of important organic compounds. CO5: Evaluate and explain quantitative and qualitative method in organic chemistry. CO6: Create and evaluate new methods of synthesis of organic compounds.
7	Course Description	This course deals with the fundamentals of Organic chemistry and principles of drug
8	Outline syllabus	

	UNIT-I	a.Structures and Physical properties: i.Polarity of bonds, polarity of molecules, M.P, Inter molecular forces, B.P, Solubility, non-ionic & ionic solutes, protic and aprotic Solvents, ion pairs, ii.Acids and bases, Lowry bronsted and Lewis theories, iii.Isomerism. b.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. c. Free radicals chain reactions of alkane: Mechanism, relative reactivity and stability.
	UNIT –II	a.Alicyclic compounds: Preparations of cyclo alkanes, Bayer strain theory and orbital picture of angle strain. b.Nuclophilic aliphatic substitution mechanism: Nucleophiles and leaving groups, kinetics of second and first order reaction, mechanism and kinetics of SN2 reactions. c.Stereochemistry and steric hindrance, role of solvents, phase transfer catalysis, mechanism and kinetics of SN1 reactions, stereochemistry, carbocation and their stability, rearrangement of carbocation, role of solvents in SN1 reaction, Ion dipole bonds, SN2 versus SN1 solvolyses, nucleophilic assistance by the solvents.
	UNIT-III	a.Dehydro halogenation of alkyl halides: 1,2 elimination, kinetics, E2 and E1 mechanism, elimination via carbocation, evidence for E2 mechanism, absence of rearrangement isotope effect, absence hydrogen exchange, the element effect, orientation and reactivity, E2 versus E1, elimination versus substitution, dehydration of alcohol, ease of dehydration, acid catalysis, reversibility, orientation. b.Electrophillic and free radicals addition: Reactions at carbon-carbon, double bond, electrophile, hydrogenation, heat of hydrogenation and stability of alkenes, markownikoff rule, addition of hydrogen halides, addition of hydrogen bromides, peroxide effect, electrophillic addition, mechanism, rearrangement, absence of hydrogen exchange, orientation and reactivity, addition of halogen, mechanism, halohydin formation, mechanism of free radicals additon, mechanism of peroxide initiated addition of hydrogen bromide, orientation of free addition, additions of carbene to alkene, cyclo addition reactions. c.Carbon-carbon double bond as substituents: Free radical halogenations of alkenes, comparision of free radical substitution with free radical addition, free radical substitution in alkenes, orientation and reactivity, allylic rearrangements.

	UNIT-IV	a.Theory of resonance: Allyl radical as a resonance hybrid, stability, orbital picture, resonance stabilization of allyl radicals, hyper conjugation, allyl cation as a resonance hybrid, nucleophilic substitution in allylic substrate, SN1 reactivity, allylic rearrangement, SN2 nucleophilic substitution in vinylic substrate, vinylic cation, stability of conjugated dienes, resonance in alkenes, ease of formation of conjugated dienes, orientation of elimination, electrophilic addition to conjugated dienes, 1,4- addition, 1,2-versus 1,4-addition, rate versus equilibrium, orientation and reactivity of free radical addition to conjugated dienes. b.Elecrophilic aromatic substitution: Effect of substituent groups, determination of orientation, determination of relative reactivity, classification of substituent group, mechanism of nitration, sulphonation, halogenation, friedel craft alkylation, friedel craft acylation, reactivity and orientation, activating and deactivating O,P,M directing groups, electron release via resonance, effect of halogen on electrophilic aromatic substitution in alkyl benzene, side chain halogination of alkyl benzene, resonance stabilization of benzyl radical. c. Nucleophilic addition reaction: Mechanism, ionisation of carboxylic acids, acidity constants, acidity of acids, structure of carboxylate ions, effect of substituent on acidity, nucleophilic acyl substitution reaction, conversion of acid to acid chloride, esters, amide and anhydride. Role of caboxyl group, comparison of alkyl nucleophilic substitution with acyl nucleophilic substitution.

<table>
<tr><td></td><td>UNIT-V</td><td colspan="3">a.Mechanism of aldol condensation, claisen condensation, cannizzaro reaction, crossed aldol condensation, crossed cannizzaro reaction, benzoin condensation, perkin condensation. Knoevenagel & Reformatsky reactions, Wittig reaction and Michael addition.
b.Hoffman rearrangement: Migration to electron deficient nitrogen, Sandmeyer’s reaction, basicity of amines, diazotization and coupling, acidity of phenols, Williamson synthesis, Fries rearrangement, Kolbe reaction, Reimer tieman’s reactions
c.Nucleophilic aromatic substitution: Bimolecular displacement mechanisms, orientation, comparison of aliphatic nucleophilic substitution with that of aromatic type.
Oxidation reduction reaction.
d.Study of the following official compounds- preparation, test for purity, assay and medicinal uses of Chlorbutol, Dimercaprol, Glyceryl trinitrate, Urea, Ethylene diamine dihyrate, Vanillin, Paraldehyde, Ethylene chloride, Lactic acid, Tartaric acid, citric acid, salicylic acid, aspirin, methyl salicylate, ethyl benzoate, benzyl benzoate, dimethyl pthalate, sodium lauryl sulphate, saccharin sodium, mephensin..</td></tr>
<tr><td></td><td>Mode

of examina tio n</td><td colspan="3">Theory</td></tr>
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<tr><td></td><td>30</td><td>70</td></tr>
<tr><td></td><td>Text book/ s*</td><td colspan="3">Robert Thornton Morrison and Robert Neilson Boyd, Organic chemistry, 2nd Ed, New Delhi: Prentice-Hall, 1971.
L. M. Atherden, Bentley and river, Text book of Pharmaceutical chemistry, 8th edition, Delhi: Oxford university press,1998.</td></tr>
</table>

	Reference Book	1. *D. J. Cram, Hammond, George S, Organic chemistry, New York: Mcgraw Hill,1964.* 2. *William Henry Brown, Introduction to organic chemistry, 4th ed., Pacific Grove: Brooks/ Cale Publishing, 1988.* 3. *Jerry March, Advanced organic chemistry: reactions, mechanisms, and structure ,Ed.4th, University of Michigan, Wiley Interscience.1992.* 4. *Donald J Cram, Hammond, George S, Organic Chemistry, Mcgraw Hill Book Co.,1959.* 5. *L. Finer- Organic chemistry, Lonodn: English Language Book Society,1959.*

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP105
2	Course Title	Pharmaceutical Inorganic Chemistry (Theory)
3	Credits	-
4	Contact Hours (L-T-P)	2-1-0
	Course Type	Compulsory
5	Course Objective	Upon completion of the course student shall be able to: • Understand the principles and procedures of analysis of drugs and also regarding the application of inorganic pharmaceuticals; • Know the analysis of the inorganic pharmaceuticals their applications; and • Appreciate the importance of inorganic pharmaceuticals in preventing and curing the disease.
6	Course Outcomes	Upon completion of this course the student should be able to: CO1: Develop a thorough understanding of the fundamental principles of pharmaceutical inorganic chemistry, including the properties and applications of inorganic compounds. CO2: Apply knowledge of inorganic chemistry to analyze the physicochemical properties of drugs, and other inorganic compounds used in pharmaceutical formulations. CO3: Analyse proficiency in the synthesis and characterization of pharmaceutical inorganic compounds. CO4: Evaluate the role of inorganic elements and their compounds in medicinal applications, considering their impact on drug stability and bioavailability. CO5: Analyze the interactions between inorganic drugs and biological systems, including mechanisms of action, pharmacokinetics, and potential toxicological effects. CO6: Apply knowledge in compliance with standards in the synthesis and production of inorganic pharmaceuticals.
7	Course Description	This course deals with the fundamentals of Organic chemistry and principles of drug
8	Outline syllabus	

	UNIT-I	Errors Volumetric analysis Acid-base titrations Redox titrations
	UNIT –II	Non aqueous titrations Precipitation titrations Complexometric titrations Theory of indicators
	UNIT-III	Gravimetry Limit tests Medicinal gases Acidifiers Antacids
	UNIT-IV	Cathartics Electrolyte replenishers Essential Trace elements Antimicrobials
	UNIT-V	Pharmaceutical aids Dental Products Miscellaneous compounds Radio Pharmaceuticals

	Mode of examination	Theory		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
			30	70
	Text book/s*	a. A text book Inorganic medicinal chemistry by Surendra N. Pandeya b. A. H. Beckett and J. B. Stanlake's Practical Pharmaceutical chemistry Vol-I & Vol-II c. Inorganic Pharmaceutical Chemistry III-Edition P.Gundu Rao		
	Reference Book	a. Inorganic Pharmaceutical Chemistry by Anand & Chetwal b. Pharmaceutical Inorganic chemistry by Dr.B.G.Nagavi c. Analytical chemistry principles by John H. Kennedy d. I.P.1985 and 1996, Govt. of India, Ministry of health		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP108
2	Course Title	Human anatomy & Physiology (Practical)
3	Credits	-
4	Contact Hours (L-T-P)	0-0-3
	Course Type	Compulsory
5	Course Objective	Upon completion of the course the student shall be able to: ● Describe the structure (gross and histology) and functions of various organs of the human body; ● Describe the various homeostatic mechanisms and their imbalances of various systems; ● Identify the various tissues and organs of the different systems of the human body; ● Perform the hematological tests and also record blood pressure, heart rate, pulse and Respiratory volumes; ● Appreciate coordinated working pattern of different organs of each system; and ● Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body
6	Course Outcomes	Upon completion of this course the student should be able to: CO1: Describe the structure and functions of various organs of the human body. CO2: Describe the various homeostatic mechanisms and their imbalances of various systems. CO3: Identify the various tissues and organs of the different systems of the human body. CO4: Perform the hematological tests and also record blood pressure, heart rate, pulse and Respiratory volumes. CO5: Apply coordination pattern of different organs of various systems. CO6: Apply the interlinked mechanisms in the maintenance of normal functioning of human body.

7	Course Description	This course deals with the fundamentals of structure and functions of human body systems.
8	List of Experiments:	
	1	Study of tissues of human body a. Epithelial tissue. b. Muscular tissue.
	2	Study of tissues of human body a. Connective tissue. b. Nervous tissue.
	3	Study of appliances used in hematological experiments.
	4	Determination of W.B.C. count of blood.
	5	Determination of R.B.C. count of blood.
	6	Determination of differential count of blood
	7	Determination of a. Erythrocyte Sedimentation Rate. b. Hemoglobin content of Blood. c. Bleeding time and Clotting time.
	8	Determination of a. Blood Pressure. b. Blood group.
	9	Study of various systems with the help of charts, models and specimens a. Skeleton system part I-axial skeleton. b. Skeleton system part II- appendicular skeleton. c. Cardiovascular system. d. Respiratory system e. Digestive system. f. Urinary system. g. Nervous system. h. Special senses.

		i. Reproductive system		
	10	Study of different family planning appliances.		
	11	To perform pregnancy diagnosis test.		
	12	Study of appliances used in experimental physiology.		
	13	To record simple muscle curve using gastroenemius sciatic nerve preparation.		
	14	To record simple summation curve using gastroenemius sciatic nerve preparation.		
	15	To record simple effect of temperature using gastroenemius sciatic nerve preparation.		
	16	To record simple effect of load and after load using gastroenemius sciatic nerve preparation.		
	17	To record simple fatigue curve using gastroenemius sciatic nerve preparation.		
	Mode of Examination	Practical		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
			30	70
	Text book/s*	**Textbooks** 1. Goyal, R. K, Natvar M.P, and Shah S.A, Practical anatomy, physiology and biochemistry, latest edition, Publisher: B.S Shah Prakashan, Ahmedabad. **Reference books** 1. Ranade VG, Textbook of practical physiology, Latest edition, Publisher: PVG, Pune Anderson Experimental Physiology, Latest edition, Publisher: NA		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP109
2	Course Title	Pharmaceutics (Practical)
3	Credits	-
4	Contact Hours (L-T-P)	0-0-3
	Course Type	Compulsory
5	Course Objective	Upon the completion of the course the student should be able to: • Know the formulation aspects of different dosage forms. • Do different pharmaceutical calculations involved in formulation. • Formulate different types of dosage forms; and • Appreciate the importance of good formulation for effectiveness. • Evaluate different parameters of formulations. • Know the different characteristics of dosage forms.
6	Course Outcomes	Upon completion of this course the student should be able to: CO1: Apply the formulation aspects of different dosage forms. CO2: Apply pharmaceutical calculations involved in formulation. CO3: Demonstrate the importance of good formulation for effectiveness. CO4: Develop a preparation of the drug which is both stable and acceptable to the patient. CO5: Evaluate basics of incompatibilities related to different dosage forms. CO6: Demonstrate the use of various dosage forms as per their need.
7	Course Description	This course deals with the fundamentals of formulation and development of different dosage forms.
8	**List of Experiments:**	
	1	Syrups a. Simple Syrup I.P b. Syrup of Ephedrine Hcl NF c. Syrup Vasaka IP d. Syrup of ferrous Phosphate IP e. Orange Syrup
	2	Elixir a. Piperizine citrate elixir BP b. Cascara elixir BPC c. Paracetamol elixir BPC
	3	Linctus Simple Linctus BPC Pediatric simple Linctus BPC
	4	Solutions a. Solution of cresol with soap IP b. Strong solution of ferric chloride BPC c. Aqueous Iodine Solution IP d. Strong solution of Iodine IP Strong solution of ammonium acetate IP

	5	Liniments Liniment of turpentine IP* Liniment of camphor IP		
	6	Suspensions* Calamine lotion Magnesium Hydroxide mixture BP		
	7	Emulsions* Cod liver oil emulsion Liquid paraffin emulsion		
	8	Powders ♣ Eutectic powder a. Explosive powder b. Dusting powder Insufflations		
	9	Suppositories♣ Boric acid suppositories Chloral suppositories		
	10	Incompatibilities Mixtures with Physical Chemical & Therapeutic incompatibilities		
Note: * colourless bottles required for dispensing ♣ Paper envelope (white), butter paper and white paper required for dispensing.				
	12	Incompatibilities: Introduction, classification and methods to overcome the incompatibilities.		
	Mode of Examination	Practical		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
			30	70
	Text book/s*	1. Physical Pharmacy by Alfred Martin 2. Experimental Pharmaceutics by Eugene, Parott. 3. Tutorial Pharmacy by Cooper and Gunn. 4. Stocklosam J. Pharmaceutical Calculations, Lea &Febiger, Philadelphia. 5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3,		

		MarcelDekkar Inc. 6. Liberman H.A, Lachman C, Pharmaceutical Dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc. 7. Physical Pharmaceutics by Ramasamy C and ManavalanR. 8. Laboratory Manual of Physical Pharmaceutics, C.V.S. Subramanyam, J. Thimma settee 9. Physical Pharmaceutics by C.V.S. Subramanyam 10. Test book of Physical Phramacy, by Gaurav Jain & Roop K. Khar

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP110
2	Course Title	Medicinal Biochemistry (Practical)
3	Credits	-
4	Contact Hours (L-T-P)	0-0-3
	Course Type	Compulsory
5	Course Objective	Upon the completion of the course the student should be able to: ● Understand the catalytic activity of enzymes and importance of isoenzymes in diagnosis of diseases; ● Know the metabolic process of biomolecules in health and illness (metabolic disorders); ● Understand the genetic organization of mammalian genome; protein synthesis; replication; mutation and repair mechanism; ● Know the biochemical principles of organ function tests of kidney, liver and endocrine gland; and ● Do the qualitative analysis and determination of biomolecules in the body fluids.
6	Course Outcomes	Upon completion of this course the student should be able to: CO1: Understand the importance of metabolism of substrates. CO2: Analyse chemistry and biological importance of biomolecules. CO3: Apply knowledge in qualitative and quantitative estimation of the biological macromolecules. CO4: Analyse the interpretation of data emanating from a Clinical Test. CO5: Analyse physiological conditions influence the structures and reactivity's of biomolecules. CO6: Apply the basic principles of biomolecules.
7	Course Description	This course deals with the study of chemical aspects of human life in health and illness and the application of chemical laboratory methods to diagnosis, control of treatment, and prevention of diseases.
8	**Title of the Experiment:**	
	1	Qualitative analysis of normal constituents of urine.*
	2	Qualitative analysis of abnormal constituents of urine.*
	3	Quantitative estimation of urine sugar by Benedict's reagent method.**
	4	Quantitative estimation of urine chlorides by Volhard's method.**
	5	Quantitative estimation of urine creatinine by Jaffe's method.**

	6	Quantitative estimation of urine calcium by precipitation method.**		
	7	Quantitative estimation of serum cholesterol by Libermann Burchard's method.**		
	8	Preparation of Folin Wu filtrate from blood.*		
	9	Quantitative estimation of blood creatinine.**		
	10	Quantitative estimation of blood sugar Folin-Wu tube method.**		
	11	Estimation of SGOT in serum.**		
	12	Estimation of SGPT in serum.**		
	13	Estimation of Urea in Serum.**		
	14	Estimation of Proteins in Serum.**		
	15	Determination of serum bilirubin**		
	16	Determination of Glucose by means of Glucoseoxidase.**		
	17	Enzymatic hydrolysis of Glycogen/Starch by Amylases.**		
	18	Study of factors affecting Enzyme activity. (pH and Temp.)**		
	19	Preparation of standard buffer solutions and its pH measurements (any two)*		
	20	Experiment on lipid profile tests**		
	21	Determination of sodium,calcium and potassium in serum.**		
	22	Determination of effect of pH, temperature and electrolyte on salivary amylase. **		
** indicate major experiments and * indicate minor experiments				
	Mode of Examination	Practical		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
			30	70
	Text book/s*	1. Practical Biochemistry by R.C. Gupta and S. Bhargavan. 2. Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition) 3. Practical Biochemistry for Medical students by Rajagopal and Ramakrishna. 4. Practical Biochemistry by Harold Varley		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP111
2	Course Title	Pharmaceutical Organic Chemistry (Practical)
3	Credits	-
4	Contact Hours (L-T-P)	0-0-3
	Course Type	Compulsory
5	Course Objective	Upon completion of this course the student will be able to: • Understanding laboratory techniques • Describe synthesis of organic Compounds. • Apply the concept of synthesis • Perform Analyses of the compounds • Understanding various stereo models of organic molecules.
6	Course Outcomes	Upon completion of this course the student should be able to: CO1: Describe various laboratory concepts in the synthesis of organic compounds. CO2: Apply the process of synthesis of organic Compounds. CO3: Apply the techniques being used in synthesis of organic compounds. CO4: Analyse the compounds through systematic qualitative analysis. CO5: Create various new molecules in organic chemistry. CO6: Demonstrate the synthesis of organic compound.
7	Course Description	This course deals with the fundamentals of Organic chemistry and principles of organic analysis of drug
8	Outline syllabus	

		1. Introduction to the various laboratory techniques through demonstration involving synthesis of the following compounds (at least 8 compounds to be synthesised): a. Acetanilde / aspirin (Acetylation b. Benzanilide / Phenyl benzoate (Benzoylation) c. P-bromo acetanilide / 2,4,6 – tribromo aniline (Bromination), Dibenzylidene acetone (Condensation),		
		2. Synthesis of the following compounds a. 1-Phenylazo-2-napthol (Diazotisation and coupling) Benzoic acid / salicylic acid (Hydrolysis of ester) b. M-dinitro benzene (Nitration) 8, 9, 10 – Antharaquinone (Oxidation of anthracene) c. preparation of benzoic acid from toluene or benzaldehyde M-phenylene diamine (Reduction of M- dinitrobenzene) / Aniline from nitrobenzene		
		3. Synthesis of the following compounds Benzophenone oxime Nitration of salicylic acid Preparation of picric acid Preparation of O-chlorobenzoic acid from O-chlorotolune Preparation of cyclohexanone from cyclohexano		
		4. Identification of organic compounds belonging to the following classes by: Systematic qualitative organic analysis including preparation of derivatives Phenols, amides, carbohydrates, amines, carboxylic acids, aldehyde and ketones, Alcohols, esters, hydrocarbons, anilides, nitrocompounds.		
		5 Introduction to the use of stereo models: Methane, Ethane, Ethylene, Acetylene, Cis alkene, Trans alkene and inversion of configuration		
	Modeof examinatio n	Practical		
	Weightage Distributio n	Continu ous Mode Asses sment	Sessional Exam	ESE
			30	70

	Text book/ s*	1. Mann P.G. & Saunders B.C.,(1936) *Practical Organic Chemistry*, ELBS/Longman, London. 2. Singh Harkrishan, Kapoor V.K.(2011), *Organic Pharmaceutical Chemistry*, Vallabh Prakashan, Delhi. 3. Furniss B.A., Hannaford A.J., Smith P.W.G. and Tatehell A.R(2007), V*ogel's Textbook of Practical Organic Chemistry* 5th ed., The ELBS/Longman,London

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP112
2	Course Title	Pharmaceutical Inorganic Chemistry (Practical)
3	Credits	-
4	Contact Hours (L-T-P)	0-0-3
	Course Type	Compulsory
5	Course Objective	Upon completion of this course the student will be able to- • Understand the principles of Limit tests • Know the assays of the Inorganic compounds • Understand identification of compounds • Estimation of compounds
6	Course Outcomes	Upon completion of this course the student should be able to: CO1: Understand various limit test and identification tests. CO2: Describe various Assays being used in the synthesis of inorganic compounds. CO3: Apply schematic qualitative analysis for identification of inorganic compounds. CO4: Analyse and estimate various inorganic compounds. CO5: Evaluate the concept used for identification of inorganic compounds. CO6: Apply the knowledge in the application of inorganic compounds.
7	Course Description	This course deals with the fundamentals of Inorganic chemistry and principles of Inorganic analysis of drug
8	Outline syllabus	

		1. Limit test (6 exercises) a. Limit test for chlorides b. Limit test for sulphates c. Limit test for iron d. Limit test for heavy metals e. Limit test for arsenic f. Modified limit tests for chlorides and sulphates		
		2. Assays (10 exercises) a. Ammonium chloride- Acid-base titration b. Ferrous sulphate- Cerimetry c. Copper sulpahte- Iodometry d. Calcilugluconate- Complexometry e. Hydrogen peroxide – Permanganometry f. Sodium benzoate – Nonaqueous titration g. Sodium chloride – Modified volhard's method h. Assay of KI – KIO3 titration i. Gravimetric estimation of barium as barium sulphate j. Sodium antimony gluconate or antimony potassium tartarate		
		3. Estimation of mixture (Any two exercises) a. Sodium hydroxide and sodium carbonate b. Boric acid and Borax c. Oxalic acid and sodium oxalate		
		4. Test for identity (Any three exercises) a. Sodium bicarbonate, Barium sulphate b. Ferrous sulphate c. Potassium chloride		
		5a. Test for purity (Any two exercises) a. Swelling power in Bentonite b. Acid neutralising capacity in aluminium hydroxide gel c. Ammonium salts in potash alum d. Adsorption power heavy Kaolin e. Presence of Iodates in KI 5b. Preparations (Any two exercises) a. Boric acids b. Potash alum c. Calcium lactate d. Magnesium suphate		
	Mode of n	Practical		
	Weightage Distribu tio n	Continuous Mode Assessment	Sessional Exam	ESE
			30	70

	Text book/ s*	• H. Beckett and J. B. Stanlake's (1988), Practical Pharmaceutical chemistry Vol-I &Vol-II, 3rd ed. Athlone, London. • Inorganic Pharmaceutical Chemistry III-Edition P. Gundu Rao (2008), Delhi Vallabh Prakashan • Kennedy John H. (1990**)** Analytical chemistry principles, 2nd editions, Saunders College Publication. New York • I.P.1985 and 1996, Govt. of India, Ministry of health

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP106
2	Course Title	Remedial Mathematics (Theory)
3	Credits	-
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Elective
5	Course Objective	Upon completion of this course the student should be able to • Know Trignometry, Analytical geometry, Matrices, Determinant, Integration, Differential equation, Laplace transform and their applications; • Solve the problems of different types by applying theory; and • Appreciate the important applications of mathematics in pharmacy.
6	Course Outcomes	Upon completion of this course the student should be able to: CO1: To define the basic concepts of mathematical theory and formulae. CO2: To understand various mathematical functions and their applications in Pharmacy. CO3: To apply formula to solve the different types of pharmaceutical calculations. CO4: To analyze differential equations and their coefficient. CO5: To evaluate clinical Data using mathematical knowledge and understanding. CO6: To create abstract mathematical reasoning.
7	Course Description	This is an introductory course in mathematics. The subjects deals with the introduction to matrices, determinants, trigonometry, analytical geometry, differential calculus, integral calculus, differential equations, laplace transform.
8	Outline syllabus	

	UNIT1:	**Basic Concepts in Mathematics** a) Algebra: Determinants, Matrices b) Trigonometry: Sides and angles of a triangle, solution of triangles c) Analytical Geometry: Points, Straight line, circle, parabola		
	UNIT 2:	**Differential calculus:** Limit of a function, Differential calculus, Differentiation of a sum, Product, Quotient Composite, Parametric, exponential, trigonometric and Logarithmic function. Successive differentiation, Leibnitz's theorem, Partial differentiation, Euler's theorem on homogeneous functions of two variables		
	UNIT 3:	**Integral Calculus**: Definite integrals, integration by substitution and by parts, Properties of definite integrals		
	UNIT 4:	**Differential equations:** Definition, order, degree, variable separable, homogeneous, Linear, heterogeneous, linear, differential equation with constant coefficient, simultaneous linear equation of second order		
	UNIT 5:	**Laplace transform**: Definition, Laplace transform of elementary functions, Properties of linearity and shifting		
	Mode of examination	Theory		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
			30	70

	Text book/s*	**Text books** Narayan Shanti 2005, Differential calculus S. Chand Publishing New Delhi Sreenivas B.M., Text book of Mathematics for second year pre-university Excellent Educational Enterprises **Reference books** Shanthinarayan , Mittal P.K 2005 Integral calculus S Chand & Co Ltd New Delhi Grewal B. S. Higher Engineering Mathematics 2004, Khanna Publishers

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP107
2	Course Title	Remedial Biology (Theory)
3	Credits	-
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Elective
5	Course Objective	Upon completion of the course, the student shall be able to • Know the classification and salient features of life • Understand the basic components of anatomy & physiology of plant • Know understand the basic components of anatomy & physiology of animal species.
6	Course Outcomes	Upon completion of this course the student should be able to CO1: Define fundamental understanding of basic biological concepts. CO2: Apply basic biological principles to analyze and interpret biological information in various biological contexts. CO3: Demonstrate the use and application of biological concepts. CO4: Identify conceptual understanding of biological processes. CO5: Develop effective strategies for studying and retaining biological information, active learning techniques, and the utilization of available resources. CO6: Apply remedial biology knowledge to subsequent academic and practical areas, ensuring a application in various biological disciplines.
7	Course Description	To learn and understand the components of living world, structure and functional system of plant and animal kingdom. Scope: To learn and understand the components of living world, structure and functional system of plant and animal kingdom.
8	Outline syllabus	

	UNIT 1:	Introduction General organization of plants and its inclusions Plant tissues Plant kingdom and its classification		
	UNIT 2:	Morphology of plants Root, Stem, Leaf and Its modifications Inflorescence and Pollination of flowers		
	UNIT 3:	Morphology of fruits and seeds Plant physiology Taxonomy of Leguminosae, umbelliferae, Solanaceae, Lilliaceae, Zinziberaceae, Rubiaceae		
	UNIT 4:	Study of Fungi, Yeast, Penicillin and Bacteria Study of Animal cell Study animal tissues		
	UNIT 5:	Detailed study of frog Study of Pisces, Raptiles, Aves Genearal organization of mammals Study of poisonous animals		
	Mode of examination	Theory		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
			30	70
	Text book/s*	**Text books** a. Text book of Biology by S.B.Gokhale b. A Text book of Biology by Dr.Thulajappa and Dr. Seetaram **Reference books** a. A Text book of Biology by B.V.Sreenivasa Naidu b. A Text book of Biology by Naidu and Murthy c. Botany for Degree students By A.C.Dutta. d. Outlines of Zoology by M.Ekambaranatha ayyer and T.N.Ananthakrishnan. e. A manual for pharmaceutical biology practical by S.B.Gokhale and C.K.Kokate.		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP113
2	Course Title	Remedial Biology (Practical)
3	Credits	-
4	Contact Hours (L-T-P)	0-0-3
	Course Type	Elective
5	Course Objective	Upon completion of the course, the student shall be able to • To Study morphology and microscopy of Stem, Root, Leaf, seed, fruit, flower and their modifications. • To Study about various animal species and their characteristics.
6	Course Outcomes	Upon completion of this course the student should be able to CO1: Define the fundamental understanding of basic biological concepts. CO2: Apply basic biological principles to analyze and interpret biological information in various biological contexts. CO3: Demonstrate proficiency in the use of scientific methods and application of biological concepts. CO4: Analyse conceptual understanding of biological processes. CO5: Develop effective strategies for studying and retaining biological information, active learning techniques, and the utilization of available resources. CO6: Apply remedial biology knowledge to subsequent academic and practical areas, ensuring a application in various biological disciplines.
7	Course Description	Practical is complimentary to the theoretical discussions remedial biology and allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals and plants. This is helpful for developing an insight on the subject.
8	Outline syllabus	
	List of Experiments	

		1.Introduction of biology experiments 2. Study of cell wall constituents and cell inclusions		
		3.Study of Stem modifications 4.Study of Root modifications 5.Study of Leaf modifications		
		6.Identification of Fruits and seeds 7.Preparation of Permanent slides 8.T.S. of Senna, Cassia, Ephedra, Podophyllum		
		9.Simple plant physiological experiments 10.Identification of animals		
		11.Detailed study of Frog 12.Computer based tutorials		
	Mode of examination	Theory		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
			30	70

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP201
2	Course Title	PATHOPHYSIOLOGY (THEORY)
3	Credits	-
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	Upon completion of the subject student shall be able to – a. Describe the etiology and pathogenesis of the selected disease states; b. Name the signs and symptoms of the diseases; and c. Mention the complications of the diseases.
6	Course Outcomes	**Upon completion of the course students will be able to:** CO1: Describe the process of cell injury by various etiological agents, the morphology of cell injury, cellular adaptations, and process of inflammation. CO2: Understand the pathophysiology of various diseases of the immune system. CO3: Apply the knowledge of immune tolerance and the Human Leucocytic antigen system in understanding the process of organ transplantation, autoimmunity, and hypersensitivity reactions. CO4: Appraise the principles of physical, chemical, and biological carcinogenesis and to evaluate the pathological changes observed in cancer tissue. CO5: Understand the pathophysiology of common and infectious diseases. CO6: Understand the mechanisms of shock, radiation on human health, and environmental and nutritional diseases.
7	Course Description	This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic Pathophysiological mechanisms. Hence it will not only help to study the syllabus of pathology but also to get baseline knowledge of its application in other subjects of pharmacy.
8	Outline syllabus	

	UNIT-1	**Basic principles of cell injury and Adaptation** a) Causes, Pathogenesis, and morphology of cell injury b) Abnormalities in lipoproteinaemia, glycogen infiltration and glycogen infiltration and glycogen infiltration and glycogen storage diseases **Inflammation** a) Pathogenesis of acute inflammation, Chemical mediators in inflammation, Types of chronic inflammation b) Repairs of wounds in the skin, factors influencing healing of wounds
	UNIT-2	**Diseases of Immunity** a) Introduction to T and B cells b) MHC proteins or transplantation antigens c) Immune tolerance - Hypersensitivity Hypersensitivity type I, II, III, IV, Biological significance, Allergy due to food, chemicals and drugs - Autoimmunity Criteria for autoimmunity, Classifications of autoimmune diseases in man, mechanism of autoimmunity, Transplantation and immunologic tolerance, allograft rejections, transplantation antigens, mechanism of rejection of allograft. - Acquired immune deficiency syndrome (AIDS) - Amylodosis
	UNIT-3	**Cancer:** differences between benign and malignant tumors, Histological diagnosis of malignancy, invasions and metastasis, patterns of spread, disturbances of growth of cells, classification of tumors, general biology of tumors, spread of malignant tumors, etiology and pathogenesis of cancer.
	UNIT-4	**Shock** Types of shock, mechanisms, stages, and management **Biological effects of radiation** **Environmental and nutritional diseases** i) Air pollution and smoking- SO2, NO, NO2, and CO ii) Protein calorie malnutrition, vitamins, obesity, pathogenesis of starvation.
	UNIT-5	**Pathophysiology of common diseases** a. Parkinsonism

		b. Schizophrenia c. Depression and mania d. Hypertension, e. Stroke (ischaemic and hemorrhage) f. Angina, CCF, Atherosclerosis, Myocardial infarction g. Diabetes Mellitus h. Peptic ulcer and inflammatory bowel diseases i. Cirrhosis and Alcoholic liver diseases j. Acute and chronic renal failure k. Asthma and chronic obstructive airway diseases **Infectious diseases:** Sexually transmitted diseases (HIV, Syphilis, Gonorrhea), Urinary tract infections, Pneumonia, Typhoid, Tuberculosis, Leprosy, Malaria, Dysentery (bacterial and amoebic), Hepatitis- infective hepatitis.		
	Mode of examination	Theory		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
			30	70
	Text books (Theory)	a. Pathologic basis of disease by- Cotran, Kumar, Robbins b. Text book of Pathology- Harsh Mohan c. Text book of Pathology- Y.M. Bhinde		
	Reference Books (Theory)	a. Clinical Pharmacy and Therapeutics; Second edition; Roger Walker; Churchill Livingstone publication.		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP202
2	Course Title	PHARMACEUTICAL MICROBIOLOGY (THEORY)
3	Credits	-
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	Upon completion of the subject student shall be able to – a. Know the anatomy, identification, growth factors and sterilization of microorganisms; b. Know the mode of transmission of disease causing microorganism, symptoms of disease, and treatment aspect; c. Do estimation of RNA and DNA and there by identifying the source; d. Do cultivation and identification of the microorganisms in the laboratory; e. Do identification of diseases by performing the diagnostic tests; and f. Appreciate the behavior of motility and behavioral characteristics of microorganisms.
6	Course Outcomes	**Students will be able to:** CO1: Describe the branches, scope of microbiology, morphology of microbes, and nutritional requirement and media for microbial cultures. CO2: Understand the methods of identification, cultivation, preservation of various microorganisms, and sterility testing of pharmaceutical products. CO3: Apply the principles of sterilization, evaluation of disinfectants, bactericidal, bacteriostatic, and virucidal activities. CO4: Analyze different types of immunological reactions, antigens, vaccines, and their role in immunity. O5: Evaluate microbiological standards of pharmaceuticals and the presence of pathogens. CO6: Describe various infectious diseases, microbiological assays for antibiotics, and interpretation of results of microbiological assays.
7	Course Description	Microbiology has always been an essential component of pharmacy curriculum. This is because of the relevance of microbiology to pharmaceutical sciences and more specifically to pharmaceutical industry. Pharmaceutical biotechnology is the logical extension of pharmaceutical microbiology, which is expected to change the complete drug product scenario in the future. This course deals with the various aspects of microorganisms, its

		classification, morphology, laboratory cultivation identification and maintenance. Its also discusses with sterilization of pharmaceutical products, equipment, media etc. The course further discusses the immunological preparations, diseases its transmission, diagnosis, control and immunological tests.
8	Outline syllabus	
	Unit-I	Introduction to the science of microbiology. Major divisions of microbial world and Relationship among them. Different methods of classification of microbes and study of Bacteria, Fungi, virus, Rickettsiae, Spirochetes. Nutritional requirements, growth and cultivation of bacteria and virus. Study of different important media required for the growth of aerobic and anaerobic bacteria & fungi. Differential media, enriched media and selective media, maintenance of lab cultures.
	Unit-II	Different methods used in isolation and identification of bacteria with emphasis to different staining techniques and biochemical reactions. Counting of bacteria -Total and Viable counting techniques. Detailed study of different methods of sterilization including their merits and demerits. Sterilization methods for all pharmaceutical products. Detailed study of sterility testing of different pharmaceutical preparations. Brief information on Validation.
	Unit-III	**Disinfectants:** Study of disinfectants, antiseptics, fungicidal and virucidal, agent's factors affecting their activation and mechanism of action. Evaluation of bactericidal, bacteriostatic, & virucidal activities and evaluation of preservatives in pharmaceutical preparations.
	Unit-IV	**Immunology:** Immunity, Definition, Classification, General principles of natural immunity, Phagocytosis, acquired immunity (active and passive). Antigens, chemical nature of antigens, structure and formation of Antibodies, Antigen-Antibody reactions. Bacterial exotoxins and endotoxins. Significance of toxoids in active immunity, Immunization programme and importance of booster dose.
	Unit-V	Diagnostic tests: Schick's Test, Elisa test, Western Blot test, Southern Blot PCR Widal, QBC, Mantaux Peripheral smear. Study of malarial parasite. Microbial culture sensitivity Testing: Interpretation of results Principles and methods of different microbiological assays. 1. Microbiological assay of Penicillin, Streptomycin, vitamin B_2 and B_{12}. Standardisation of vaccines and sera. 2. **Study of infectious diseases:** Typhoid, Tuberculosis, Malaria, Cholera, Hepatitis, Meningitis, Syphilis, Gonorrhea and HIV.
	Mode of examination	Theory

	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ETE
			30	70
	Text books (Theory	a. Vanitha Kale and Kishor Bhusari "Applied Microbiology" Himalaya Publishing house Mumbai. b. Mary Louis Turgeon "Immunology and Serology in Laboratory Medicines" 2nd edition, 1996 Mosby- Year book inc St. Louis Missouri 63146. c. Harsh Mohan, "Text book of Pathology" 3rd dition, 1998, B-3 Ansari road Darya ganj N. Delhi		
	Reference books (Theory)	a. Prescot L.M., Jarley G.P Klein D.A Microbiology‖ 2nd - edition Mc Graw Hill Company Inc b. Rawlins E.A. "Bentley's Text Book of Pharmaceutics" B ailliere Tindals 24-28 London 1988 c. Forbisher "Fundamentals of Microbiology" Philidelphia W.B. Saunders. d. Prescott L.M. Jarley G.P., Klein.D.A. "Microbiology." 2nd edition WMC Brown Publishers, Oxford. 1993 e. War Roitt, Jonathan Brostoff, David male, "Immunology" 3rd edition 1996, Mosby-year book Europe Ltd, London. f. Pharmacopoeia of India, Govt of India, 1996.		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP203
2	Course Title	PHARMACOGNOSY & PHYTOPHARMACEUTICALS (THEORY)
3	Credits	-
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	Upon completion of the course student shall be able to: a. Understand the basic principles of cultivation, collection and storage of crude drugs; b. Know the source, active constituents and uses of crude drugs; and c. Appreciate the applications of primary and secondary metabolites of the plant.
6	Course Outcomes	**Students will be able to:** CO1: Define and introduce the history, scope of pharmacognosy. and of crude drugs. CO2: Explain and relate the classification, cultivation, collection, processing, and storage of crude drugs. CO3: Apply the knowledge of microscopic and macroscopic techniques for characterization of crude drugs, and plant cell structure and cell constituents. CO4: Compare and classify the natural carbohydrates and lipids. CO5: Determine and evaluate the importance of proteins, and fibers along with their pharmacogenetic study. CO6: Estimate and predict the types of adulteration of crude drugs.
7	Course Description	This subject has been introduced for the pharmacy course in order to make the student aware of medicinal uses of various naturally occurring drugs its history, sources, distribution, method of cultivation, active constituents, medicinal uses, identification tests, preservation methods, substitutes and adulterants.
8	Outline syllabus	
	Unit-I	Introduction. Definition, history, and Scope of Pharmacognosy.
	Unit-II	Classification of crude drugs Cultivation, collection, processing, and storage of crude drugs. Detailed method of cultivation of crude drugs.
	Unit-III	Study of cell wall constituents and cell inclusions. Microscopical and powder Microscopical study of crude drugs. Study of natural pesticides. Detailed study of various cell constituents.

	Unit-IV	Carbohydrates and related products. Detailed study of carbohydrates containing drugs. (11 drugs) Definition sources, method extraction, chemistry, and method of analysis of lipids. Detailed study of oils.		
	Unit-V	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.		
	Mode of examination	Theory		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ETE
			30	70
	Text books	a. Pharmacognosy by G.E. Trease & W.C.Evans. b. Pharmacognosy by C.K.Kokate,Gokhale & A.C.Purohit.		
	Reference books	a. Pharmacognosy by Brady &Tyler.E. b. Pharmacognosy by T.E.Wallis. c. Pharmacognosy by C.S. Shah & Qadery. d. Pharmacognosy by M.A. Iyengar.		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP204
2	Course Title	PHARMACOLOGY – I (THEORY)
3	Credits	-
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	Upon completion of the subject student shall be able to (Know, do, appreciate) – a. Understand the pharmacological aspects of drugs falling under the above mentioned chapters; b. Handle and carry out the animal experiments; c. Appreciate the importance of pharmacology subject as a basis of therapeutics; and d. Correlate and apply the knowledge therapeutically.
6	Course Outcomes	Student will be able to: CO1: Describe the general concepts of pharmacology, pharmacokinetics and pharmacodynamics, routes of drug administration, drug interaction, pre-clinical evaluations, and drug toxicity. CO2: Understand the classification of the drugs acting on autonomic nervous system on the basis of their pharmacological action and therapeutic uses. CO3: Illustrate the pharmacology, associated side effects and toxicities of drugs acting on cardiovascular system and its interaction in between them. CO4: Analyze the mechanism of a drug's action, classification of the drugs acting on central nervous system on the basis of their pharmacological action and therapeutic uses. CO5: Evaluate the classification, mechanisms and action of the drugs acting on respiratory system on the basis of their pharmacological action and therapeutic uses. CO6: Evaluate the pharmacology of hormones and autacoids.
7	Course Description	This subject will provide an opportunity for the student to learn about the drug with regard to classification, pharmacodynamic and pharmacokinetic aspects, adverse effects, uses, dose, route of administration, precautions, contraindications and interaction with other drugs. In this subject, apart from general pharmacology, drugs acting on autonomic nervous system, cardiovascular system, central nervous system, blood and blood forming agents and renal system will be taught. In addition to theoretical knowledge, the basic practical knowledge relevant to therapeutics will be imparted.
8	Outline syllabus	

	UNIT-I	**General Pharmacology** a) Introduction, definitions and scope of pharmacology b) Routes of administration of drugs c) Pharmacokinetics (absorption, distribution, metabolism and excretion) d) Pharmacodynamics e) Factors modifying drug effects f) Drug toxicity - Acute, sub- acute and chronic toxicity. g) Pre-clinical evaluations h) Drug interactions Note: The term Pharmacology used here refers to the classification, mechanism of action, pharmacokinetics, pharmacodynamics, adverse effects, contraindications, Therapeutic uses, interactions and dose and route of administration.
	UNIT-II	**Pharmacology of drugs acting on ANS** a) Adrenergic and antiadrenergic drugs b) Cholinergic and anticholinergic drugs c) Neuromuscular blockers d) Mydriactics and miotics e) Drugs used in myasthenia gravis f) Drugs used in Parkinsonism
	UNIT-III	**Pharmacology of drugs acting on cardiovascular system** a) Antihypertensives b) Anti-anginal drugs c) Anti-arrhythmic drugs d) Drugs used for therapy of Congestive Heart Failure e) Drugs used for hyperlipidaemias
	UNIT-IV	**Pharmacology of drugs acting on Central Nervous System** a) General anesthetics b) Sedatives and hypnotics c) Anticonvulsants d) Analgesic and anti-inflammatory agents e) Psychotropic drugs f) Alcohol and methyl alcohol g) CNS stimulants and cognition enhancers h) Pharmacology of local anaesthetics
	UNIT-V	**Pharmacology of Drugs acting on Respiratory tract** a) Bronchodilators b) Mucolytics c) Expectorants d) Antitussives e) Nasal Decongestants **Pharmacology of Hormones and Hormone antagonists** a) Thyroid and Antithyroid drugs b) Insulin, Insulin analogues and oral hypoglycemic agents c) Sex hormones and oral contraceptives d) Oxytocin and other stimulants and relaxants **Pharmacology of autocoids and their antagonists** a) Histamines and Antihistaminics b) 5-Hydroxytryptamine and its antagonists c) Lipid derived autocoids and platelet activating factor

	Mode of examination	Theory		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
			30	70
	Text books (Theory)	a. Tripathi, K. D. Essentials of medical pharmacology. 4th Ed, 1999. Publisher: Jaypee, Delhi. b. Satoskar, R.S. and Bhadarkar, S.D. Pharmacology and pharmacotherapeutics. 16th edition (single volume), 1999. Publisher: Popular, Dubai. c. Rang, H.P. & Dale, M.M. Pharmacology. 4th edition, 1999. Publisher: Churchill Living stone.		
	Reference books (Theory)	a. Goodman Gilman, A., Rall, T.W., Nies, A.I.S. and Taylor, P. Goodman and Gilman's The pharmacological Basis of therapeutics. 9th Ed, 1996. Publisher Mc Graw Hill, Pergamon press. b. Craig, C.R.&Stitzel, R.E. Modern Pharmacology. Latest edition. Publisher: Little Brown.Co c. Katzung, B.G. Basic and clinical pharmacology. Latest edition. Publisher: Prentice Hall, Int. d. Shargel and Leon. Applied Biopharmaceutics and pharmacokinetics. Latest edition. Publisher: Prentice Hall, London.		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP205
2	Course Title	COMMUNITY PHARMACY
3	Credits	-
4	Contact Hours (L-T-P)	2-1-0
	Course Type	Compulsory
5	Course Objective	Upon completion of the course, the student shall be able to – a. Know pharmaceutical care services; b. Know the business and professional practice management skills in community pharmacies; c. Do patient counselling & provide health screening services to public in community pharmacy; d. Respond to minor ailments and provide appropriate medication; e. Show empathy and sympathy to patients; and f. Appreciate the concept of Rational drug therapy.
6	Course Outcomes	Student will be able to: CO1: Describe professional practice management and pharmaceutical care services in community pharmacy. CO2: Understand patient counselling and practicing health screening services in community pharmacy. CO3: Apply practicing community services and responding to minor ailments proving appropriate medications with professional code of ethics. CO4: Analyze and support health education services to the community. CO5: Evaluate various skills such as dispensing of drugs, responding to minor ailments by providing suitable safe medication. CO6: Create code of ethics for community pharmacists, essential drugs concept and rational drug therapy for improved patient care in the community set up.
7	Course Description	In the changing scenario of pharmacy practice in India, Community Pharmacists are expected to offer various pharmaceutical care services. In order to meet this demand, students will be learning various skills such as dispensing of drugs, responding to minor ailments by providing suitable safe medication, patient counselling, health screening services for improved patient care in the community set up.
8	Outline syllabus	

	UNIT-I	**Definition,** scope, of community pharmacy Roles and responsibilities of Community pharmacist **Community Pharmacy Management** a) Selection of site, Space layout, and design b) Staff, Materials-coding, stocking c) Legal requirements d) Maintenance of various registers e) Use of Computers: Business and health care soft wares **Prescriptions** – parts of prescription, legality & identification of medication related problems like drug interactions **Inventory control in community pharmacy** Definition, various methods of Inventory Control **ABC, VED, EOQ, Lead time, safety stock**
	UNIT-II	**Pharmaceutical care** Definition and Principles of Pharmaceutical care. **Patient counselling** Definition, outcomes, various stages, barriers, Strategies to overcome barriers Patient information leaflets- content, design, & layouts, advisory labels **Patient medication adherence** Definition, Factors affecting medication adherence, role of pharmacist in improving the adherence.
	UNIT-III	**Health screening services** Definition, importance, methods for screening Blood pressure/ blood sugar/ lung function and Cholesterol testing. **OTC Medication-** Definition, OTC medication list & Counselling.
	UNIT-IV	**Health Education** WHO Definition of health, and health promotion, care for children, pregnant & breast-feeding women, and geriatric patients. Commonly occurring Communicable Diseases, causative agents, Clinical presentations and prevention of communicable diseases – Tuberculosis, Hepatitis, Typhoid, Amoebiasis, Malaria, Leprosy, Syphilis, Gonorrhea and AIDS Balance diet, and treatment & prevention of deficiency disorders Family planning – role of pharmacist
	UNIT-V	**Responding to symptoms of minor ailments** Relevant pathophysiology, common drug therapy to, Pain, GI disturbances (Nausea, Vomiting, Dyspepsia, diarrhea, constipation), Pyrexia, Opthalmic symptoms, worms infestations. **Essential Drugs concept and Rational Drug Therapy** **Role of community pharmacist 13 Code of ethics for community pharmacists**

	Mode of examination	Theory		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
			30	70
	Text books	a. Health Education and Community Pharmacy by N.S.Parmar. b. WHO consultative group report. c. Drug store & Business management by Mohammed Ali & Jyoti.		
	Reference books	a. Handbook of pharmacy – health care.Edt. Robin J Harman. The Pharmaceutical press. b. Comprehensive Pharmacy Review – Edt. Leon Shargel. Lippincott Williams & Wilkins.		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP206
2	Course Title	PHARMACOTHERAPEUTICS - I (THEORY)
3	Credits	-
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	At completion of this subject it is expected that students will be able to understand – a. The pathophysiology of selected disease states and the rationale for drug therapy; b. The therapeutic approach to management of these diseases; c. The controversies in drug therapy; d. The importance of preparation of individualised therapeutic plans based on diagnosis; e. 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); f. Describe the pathophysiology of selected disease states and explain the rationale for drug therapy; g. Summarise the therapeutic approach to management of these diseases including reference to the latest available evidence; h. Discuss the controversies in drug therapy; i. Discuss the preparation of individualised therapeutic plans based on diagnosis; and j. Identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects).
6	Course Outcomes	**Student will be able to:** CO1: Describe the pathophysiology of cardiovascular diseases, related case studies and progress of drug therapy. CO2: Understand diseases of Respiratory system, related case studies and progress of drug therapy. CO3: Apply and demonstrate different therapeutic approaches in management of selected disease conditions in Pediatric patients, Geriatric patients, and Pregnancy and breast feeding. CO4: Analyze individualized drug therapy based on diagnosis of selected disease conditions of Eye. CO5: Evaluate the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy. CO6: Understand diseases of Endocrine system, related case studies and progress of drug therapy.
7	Course Description	This course is designed to impart knowledge and skills necessary for contribution to quality use of medicines. Chapters dealt cover briefly pathophysiology and mostly therapeutics of various diseases. This will enable the student to understand the pathophysiology of common diseases and their management.

8	Outline syllabus			
	UNIT-I	**Cardiovascular system:** Hypertension, Congestive cardiac failure, Angina Pectoris, Myocardial infarction, Hyperlipidaemias, Electrophysiology of heart and Arrhythmias		
	UNIT-II	**Respiratory system**: Introduction to Pulmonary function test, Asthma, Chronic obstructive airways disease, Drug induced pulmonary diseases **Endocrine system:** Diabetes, Thyroid diseases, Oral contraceptives, Hormone replacement therapy, Osteoporosis		
	UNIT-III	**General prescribing guidelines for** a. Pediatric patients b. Geriatric patients c. Pregnancy and breast feeding.		
	UNIT-IV	**Ophthalmology**: Glaucoma, Conjunctivitis- viral & bacterial		
	UNIT-V	**Introduction to rational drug use** Definition, Role of pharmacist Essential drug concept Rational drug formulations		
	Mode of examination	Theory		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
			30	70
	Text books	a. Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone publication. b. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange.		
	Reference books	a. Pathologic basis of disease - Robins SL, W.B.Saunders publication. b. Pathology and therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice -Green and Harris, Chapman and Hall publication. c. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication. d. Applied Therapeutics:The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA e. Avery's Drug Treatment, 4th Edn, 1997, Adis International Limited. f. Relevant review articles from recent medical and pharmaceutical literature.		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP207
2	Course Title	PHARMACEUTICAL MICROBIOLOGY (PRACTICAL)
3	Credits	-
4	Contact Hours (L-T-P)	0-0-3
	Course Type	Compulsory
5	Course Objective	Upon completion of the subject student shall be able to – a. Know the anatomy, identification, growth factors and sterilization of microorganisms; b. Know the mode of transmission of disease causing microorganism, symptoms of disease, and treatment aspect; c. Do estimation of RNA and DNA and there by identifying the source; d. Do cultivation and identification of the microorganisms in the laboratory; e. Do identification of diseases by performing the diagnostic tests; and f. Appreciate the behavior of motility and behavioral characteristics of microorganisms.
6	Course Outcomes	Student will be able to: CO1: Describe different techniques of sterilization and equipment used in the microbiology laboratory. CO2: Understand the characteristics of microbes using staining techniques, isolation methods, and quantitative estimation. CO3: Construct standard graphs for estimating antibiotics and vitamins using microbes. CO4: Test for possible microbial contamination in a given sample. CO5: Estimate qualitatively and quantitatively the number of microbes in a sample. CO6: Choose the correct method for evaluating the microbes by serological and bacteriological methods.
7	Course Description	Microbiology has always been an essential component of pharmacy curriculum. This is because of the relevance of microbiology to pharmaceutical sciences and more specifically to pharmaceutical industry. Pharmaceutical biotechnology is the logical extension of pharmaceutical microbiology, which is expected to change the complete drug product scenario in the future. This course deals with the various aspects of microorganisms, its classification, morphology, laboratory cultivation identification and maintenance. Its also discusses with sterilization of pharmaceutical products, equipment, media etc. The course further discusses the immunological preparations, diseases its transmission, diagnosis, control and immunological tests.

8	Outline syllabus			
	Unit-1	a. Study of apparatus used in experimental microbiology* b. Sterilization of glass wares. Preparation of media and sterilization.*		
	Unit-2	a. Study of motility characters*. b. Enumeration of micro-organisms (Total and Viable) * c. Study of the methods of isolation of pure culture.*		
	Unit-3	a. Bio chemical testing for the identification of micro*- organisms b. Cultural sensitivity testing for some micro*-organisms.		
	Unit-4	a. Sterility testing for powders and liquids. * b. Determination of minimum inhibitory concentration.*		
	Unit-5	a. Microbiological assay of antibiotics by cup plate method. * b. Microbiological assay of vitamins by Turbidometric method** c. Determination of RWC. ** d. Diagnostic tests for some common diseases, Widal, and malarial parasites. ** * Indicate minor experiment & ** indicate major experiment		
	Mode of examination	Practical		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
			30	70
	Text books	a. Vanitha Kale and Kishor Bhusari "Applied Microbiology" Himalaya Publishing house Mumbai. b. Mary Louis Turgeon "Immunology and Serology in Laboratory Medicines" 2nd edition, 1996 Mosby- Year book inc St. Louis Missouri 63146. c. Harsh Mohan, "Text book of Pathology" 3rd edition, 1998, B-3 Ansari road Darya ganj N. Delhi.		
	Reference books	a. Prescot L.M., Jarley G.P Klein D.A "Microbiology" 2nd - edition Mc Graw Hill Company Inc. b. Rawlins E.A.‖Bentley's "Text Book of Pharmaceutics" B ailliere Tindals 24-28 London 1988. c. Forbisher "Fundamentals of Microbiology" Philidelphia W.B. Saunders. d. Prescott L.M. Jarley G.P., Klein.D.A. "Microbiology." 2nd edition WMC Brown Publishers, Oxford. 1993. e. War Roitt, Jonathan Brostoff, David male, "Immunology"3rd edition 1996, Mosby year book Europe Ltd, London. f. Pharmacopoeia of India, Govt of India, 1996.		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP208
2	Course Title	PHARMACOGNOSY & PHYTOPHARMACEUTICALS (PRACTICAL)
3	Credits	-
4	Contact Hours (L-T-P)	0-0-3
	Course Type	Compulsory
5	Course Objective	Upon completion of the course student shall be able to: a. Understand the basic principles of cultivation, collection and storage of crude drugs; b. Know the source, active constituents and uses of crude drugs; and c. Appreciate the applications of primary and secondary metabolites of the plant.
6	Course Outcomes	Students will be able to: CO1: Understand the collection and preparation of crude drugs and recall structure and components of plant cells. CO2: Understand macro and microscopic characters of Psychoactive Plants, Laxatives and Cathartics. CO3: Understand macro and microscopic characters of Spices and Flavoring plants. CO4: Understand macro and microscopic characters of crude drugs of Bitter Tonics, Bulk-Forming Laxatives, and Traditional Medicines. CO5: Identify crude drugs by chemical tests: Tragacanth, Acacia, Agar, Gelatin, Starch, Honey, and lipids. CO6: Estimate acid value, saponification value, ester value, iodine value and extractive values of crude drugs.
7	Course Description	This subject has been introduced for the pharmacy course in order to make the student aware of medicinal uses of various naturally occurring drugs its history, sources, distribution, method of cultivation, active constituents, medicinal uses, identification tests, preservation methods, substitutes and adulterants.
8	Outline syllabus	
	Unit-1	1. Introduction of Pharmacognosy laboratory and experiments. 2. Study of cell wall constituents and cell inclusions.
	Unit-2	1. Macro, powder and microscopic study of Datura. 2. Macro, powder and microscopic study of Ephedra.

		3. Macro, powder and microscopic study of Nux vomica. 4. Macro, powder and microscopic study of Rauwolfia. 5. Macro, powder and microscopic study of Senna.		
	Unit-3	1. Macro, powder and microscopic study of Cassia.cinnamon. 2. Macro, powder and microscopic study of Clove. 3. Macro, powder and microscopic study of Fennel. 4. Macro, powder and microscopic study of Coriander. 5. Macro, powder and microscopic study of Ginger.		
	Unit-4	1. Macro, powder and microscopic study of Cinchona. 2. Macro, powder and microscopic study of Quassia. 3. Macro, powder and microscopic study of Liquorice. 4. Macro, powder and microscopic study of Isapgol. 5. Macro, powder and microscopic study of Podophyllum.		
	Unit-5	1. Determination of Iodine value. 2. Determination of Saponification value and unsaponifiable matter. 3. Determination of ester value. 4. Determination of Acid value. 5. Chemical tests for Acacia. 6. Chemical tests for Tragacanth. 7. Chemical tests for Agar. 8. Chemical tests for Starch. 9. Chemical tests for Lipids. (castor oil, sesame oil, shark liver oil, bees wax) 10. Chemical tests for Gelatin.		
	Mode of examination	Practical		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ETE
			30	70
	Text books	a. Pharmacognosy by G.E. Trease & W.C.Evans. b. Pharmacognosy by C.K.Kokate,Gokhale & A.C.Purohit.		

	Referen ce books	a. Pharmacognosy by Brady &Tyler.E. b. Pharmacognosy by T.E.Wallis. c. Pharmacognosy by C.S. Shah & Qadery. d. Pharmacognosy by M.A. Iyengar.

School:	**SOP**

Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP209
2	Course Title	PHARMACOTHERAPEUTICS - I (PRACTICAL)
3	Credits	-
4	Contact Hours (L-T-P)	0-0-3
	Course Type	Compulsory
5	Course Objective	At completion of this subject it is expected that students will be able to understand – a. The pathophysiology of selected disease states and the rationale for drug therapy; b. The therapeutic approach to management of these diseases; c. The controversies in drug therapy; d. The importance of preparation of individualised therapeutic plans based on diagnosis; e. 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); f. Describe the pathophysiology of selected disease states and explain the rationale for drug therapy; g. Summarise the therapeutic approach to management of these diseases including reference to the latest available evidence; h. Discuss the controversies in drug therapy; i. Discuss the preparation of individualised therapeutic plans based on diagnosis; and j. Identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory).
6	Course Outcomes	**Student will be able to:** CO1: Describe the pathophysiology of cardiovascular diseases, related case studies and progress of drug therapy. CO2: Understand diseases of Respiratory system, related case studies and progress of drug therapy. CO3: Apply and demonstrate different therapeutic approaches in management of selected disease conditions in Pediatric patients, Geriatric patients, and Pregnancy and breast feeding. CO4: Analyze individualized drug therapy based on diagnosis of selected disease conditions. CO5: Evaluate the patient-specific parameters relevant in initiating drug therapy and monitoring therapy. CO6: Understand diseases of Endocrine system, related case studies and progress of drug therapy.
7	Course Description	This course is designed to impart knowledge and skills necessary for contribution to quality use of medicines. Chapters dealt cover briefly pathophysiology and mostly therapeutics of various diseases. This will enable the student to understand the pathophysiology of common diseases and their management.

8	Outline syllabus	
	UNIT-I	**Cardiovascular system:** 1. To carry out case study in hospital and discuss clinically the etiology symptoms of Hypertension. 2. To follow up progress of medical cases of hypertension and study drug therapy. 3. To carry out case study in hospital and discuss clinically the etiology symptoms of Congestive cardiac failure. 4. To follow up progress of medical cases of Congestive cardiac failure and study drug therapy. 5. To carry out case study in hospital and discuss clinically the etiology symptoms of Hyperlipidemias. 6. To follow up progress of medical cases of Hyperlipidemias and study drug therapy.
	UNIT-II	**Respiratory system and Endocrine system**: 1. To carry out case study in hospital and discuss clinically the etiology symptoms of Asthma. 2. To follow up progress of medical cases of Asthma and study drug therapy. 3. To carry out case study in hospital and discuss clinically the etiology symptoms of Chronic obstructive airways disease. 4. To follow up progress of medical cases of Chronic obstructive airways disease and study drug therapy. 5. To carry out case study in hospital and discuss clinically the etiology symptoms of Diabetes. 6. To follow up progress of medical cases of Diabetes and study drug therapy. 7. To carry out case study in hospital and discuss clinically the etiology symptoms of Thyroid Disease. 8. To follow up progress of medical cases of Thyroid disease and study drug therapy.
	UNIT-III	1. To carry out case study in hospital and discuss General prescribing guidelines for Pediatric patients. 2. To carry out case study in hospital and discuss General prescribing guidelines for Geriatric patients. 3. To carry out case study in hospital and discuss General prescribing guidelines for pregnant and breast-feeding mothers.

	UNIT-IV	**Ophthalmology**: 1. To carry out case study in hospital and discuss clinically the etiology symptoms of Glaucoma. 2. To follow up progress of medical cases of Glaucoma and study drug therapy. 3. To carry out case study in hospital and discuss clinically the etiology symptoms of Conjunctivitis. 4. To follow up progress of medical cases of Conjunctivitis and study drug therapy.		
	UNIT-V	1. To study rational drug formula administered to hospital. 2. To study any ADR reported related to rational drug formula.		
	Mode of examination	Practical/Viva Voce		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
			30	70
	Text books	a. Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone publication. b. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange.		
	Reference books	a. Pathologic basis of disease - Robins SL, W.B.Saunders publication. b. Pathology and therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice -Green and Harris, Chapman and Hall publication. c. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication. d. Applied Therapeutics:The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA. e. Avery's Drug Treatment, 4th Edn, 1997, Adis International Limited. f. Relevant review articles from recent medical and pharmaceutical literature.		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	**PDP301**
2	Course Title	**PHARMACOLOGY- II (THEORY)**
3	Credits	-

4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	**Upon completion of this course, the student should be able to:** • learn about drug about classification. • Know the pharmacodynamic and pharmacokinetic aspects, adverse effects, uses, dose, route of administration, precautions, contraindications and interaction with other drugs. • Know the drugs acting as autacoids • Know the Drugs acting on the respiratory system, GIT, immune system and hormones, and the pharmacology of autacoids and hormones will be concentrated. • Know the pharmacology of chemotherapeutic agents, vitamins essential minerals and principles of toxicology are also taught. • Know the theoretical knowledge, and the basic practical knowledge relevant to therapeutics will be imparted.
6	Course Outcomes	**Upon completion of the course students will be able to:** **CO1**: Understand and the pharmacological aspects of drugs. **CO2**: carry out the animal experiments confidently. **CO3**: appreciate the importance of pharmacology subject as a basis of therapeutics. **CO4**: correlate and apply the knowledge therapeutically. **CO5**: evaluate the patient-specific parameters relevant in initiating drug therapy. **CO6:** understand the pathophysiology of common diseases and their management.
7	Course Description	This course deals with the drug with regard to classification, pharmacodynamic and pharmacokinetic aspects, adverse effects, uses, dose, route of administration, precautions, contraindications, and interaction with other drugs.
8	Outline syllabus	
	UNIT-I	**Pharmacology of Drugs acting on Blood and blood forming agents** • Anticoagulants • Thrombolytics and antiplatelet agent • Haemopoietic and plasma expanders.
	UNIT-II	**Pharmacology of drugs acting on Renal System** • Diuretics • Antidiuretics.
	UNIT-III	**Chemotherapy** • Introduction • Sulfonamides and co-trimoxazole • Penicillins and Cephalosporins • Tetracyclins and Chloramphenicol

		• Macrolides, Aminoglycosides • Polyene & Polypeptide antibiotics • Quinolines and Fluroquinolines • Antifungal antibiotics • Antiviral agents • Chemotherapy of tuberculosis and leprosy • Chemotherapy of Malaria • Chemotherapy of protozoal infections (amoebiasis, Giardiasis) • Pharmacology of Anthelmintic drugs Chemotherapy of cancer (Neoplasms)
	UNIT-IV	**Immunopharmacology** • Pharmacology of immunosuppressants and stimulants. **Principles Of Animal Toxicology** • Acute, Subacute and chronic toxicity.
	UNIT-V	The dynamic cell: The structures and functions of the components of the cell • Cell and macromolecules: Cellular classification, subcellular organelles, macromolecules, large macromolecular assemblies • Chromosome structure: Pro and eukaryotic chromosome structures, chromatin structure, genome complexity, the flow of genetic information. • DNA replication: General, bacterial and eukaryotic DNA replication. • The cell cycle: Restriction point, cell cycle regulators and modifiers. • Cell signaling: Communication between cells and their environment, ion-channels, signal transduction pathways (MAP kinase, P38 kinase, JNK, Ras and PI3-kinase pathways, biosensors. **The Gene: Genome structure and function:** • Gene structure: Organization and elucidation of genetic code. • Gene expression: Expression systems (pro and eukaryotic), genetic elements that control gene expression (nucleosomes, histones, acetylation, HDACS, DNA binding protein families. • Transcription and Transcription factors: Basic principles of transcription in pro and eukaryotes. Transcription factors that regulate transcription in pro and eukaryotes.

<table>
<tr><td></td><td></td><td colspan="3">• RNA processing: rRNA, tRNA and mRNA processing.
• Protein synthesis: Mechanisms of protein synthesis, initiation in eukaryotes, translation control and post-translation events
• Altered gene functions: Mutations, deletions, amplifications, LOH, translocations, trinucleotide repeats and other genetic abnormalities. Oncogenes and tumor suppressor genes.
• The gene sequencing, mapping and cloning of human disease genes.Introduction to gene therapy and targeting.
• Recombinant DNA technology: principles. Processes (gene transfertechnology) and applications.</td></tr>
<tr><td></td><td>Mode of examination</td><td colspan="3">Theory</td></tr>
<tr><td rowspan="2"></td><td rowspan="2">Weightage Distribution</td><td>Continuous Mode Assessment</td><td>Sessional Exam</td><td>ESE</td></tr>
<tr><td></td><td>30</td><td>70</td></tr>
<tr><td></td><td>Text books</td><td colspan="3">1. Tripathi, K. D. Essentials of medical pharmacology. 4t h edition, 1999. Publisher: Jaypee, Delhi.
2. Satoskar, R.S. and Bhadarkar, S.D. Pharmacology and pharmacotherapeutics. 16t h edition (single volume), 1999. Publisher: Popular, Dubai.
3. Rang, H.P. and Dale, M.M. Pharmacology. 4t h edition, 1999. Publisher: Churchill Living stone.</td></tr>
<tr><td></td><td>Reference Books</td><td colspan="3">1. Goodman Gilman, A., Rall, T.W., Nies, A.I.S. and Taylor,
P. Goodman and Gilman’s The pharmacological Basis of therapeutics. 9t h edition, 1996. Publisher: Mc Graw Hill, Pergamon press.
2.Craig, C.R. and Stitzel, R.E. Modern Pharmacology. Latest edition. Publisher: Little Brown and company.
3.Katzung, B.G. Basic and clinical pharmacology. Latest edition. Publisher: Prentice Hall, International.
Gupta, P.K. and Salunkhe, D.K. Modern Toxicology. Volume I, II and III. Latest edition. Publisher: B.V. Gupta, Metropolitan Book Co. (p) Ltd, New Delhi</td></tr>
</table>

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	**PDP302**
2	Course Title	**PHARMACEUTICAL ANALYSIS (THEORY)**
3	Credits	**-**
4	Contact Hours (L-T-P)	**3-1-0**
	Course Type	Compulsory
5	Course Objective	**Upon completion of the course student will be able to** • understand the concepts of QC/QA, GLP, ICH Guidelines and their importance in pharmaceutical industry. • develop the practical skills using instrumental techniques and gain knowledge on instrumental techniques for analysis of pharmaceuticals. • acquire knowledge on basic principles of electrochemical analytical techniques. • gain knowledge on the basic principles of spectroscopy, develop the practical skills using instrumental techniques, understand the knowledge about assay of pharmaceutical substances.
6	Course Outcomes	**Students will be able:** **CO1**: To understand the application of instrumental methods in qualitative and quantitative analysis of drugs. **CO2**: To illustrate fundamental knowledge on the principles and instrumentation of spectroscopic and chromatographic technique **CO3**: To understand the chromatographic separation and analysis of drugs. **CO4**: To understand the applications of analytical techniques. **CO5**: To analyse quantitative analysis of drugs using various analytical instruments. **CO6**: To analyse qualitative analysis of drugs using various analytical instruments
7	Course Description	This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. This subject is designed to impart fundamental knowledge on the principles and

		instrumentation of spectroscopic and chromatographic techniques.
8	Outline syllabus	
	Unit-I	**Quality Assurance:** • Introduction, sources of quality variation, control of quality variation. • Concept of statistical quality control. • Validation methods- quality of equipment, validation of equipment and validation of analytical instruments and calibration. • GLP, ISO 9000. • Total quality management, quality review and documentation. • ICH- international conference for harmonization-guidelines. • Regulatory control.
	Unit-II	**Chromatography:** Introduction, history, classification, separation techniques, choice of methods. The following techniques be discussed with relevant examples of pharmaceutical products involving principles and techniques of separation of drugs from excipients. • Column Chromatography: Adsorption column chromatography, Operational technique, frontal analysis and elution analysis. Factors affecting column efficiency, applications and partition chromatography. • TLC: Introduction, principle, techniques, R_f value and applications. • PC: Introduction, principle, types of paper chromatography, preparation techniques, development techniques, applications. • Ion-exchange chromatography: Introduction, principles, types of ion exchange synthetic resins, physical properties, factors affecting ion exchange, methodology and applications. • HPLC: Introduction, theory, instrumentation, and applications. • HPTLC: Introduction, theory, instrumentation, and applications. • Gas Chromatography: Introduction, theory, instrumentation-carrier gases, types of columns, stationary phases in GLC & GSC. Detectors- Flame ionization detectors, electron capture detector, thermal conductivity detector. Typical gas chromatogram, derivatisation techniques, programmed temperature gas chromatography, applications. • Electrophoresis: Principles of separation, equipment for paper and gel electrophoresis, and application.

		• Gel filtration and affinity chromatography: Introduction, technique, applications.
	Unit-III	• **Electrometric Methods:** Theoretical aspects, instrumentation, interpretation of data/spectra and analytical applications be discussed on the following topics. • Potentiometry: Electrical potential, electrochemical cell, reference electrodes, indicator electrodes, measurement of potential and pH, construction and working of electrodes, Potentiometric titrations, methods of detecting end point, Karl Fischer titration. • Conductometry: Introduction, conductivity cell, conductometric titrations and applications. • Polarography: Instrumentation, DME, residual current, diffusion current and limiting current, polarographic wave, Ilkovic's equation, Effect of oxygen on polarographic wave, Polarographic maxima and suppressors and applications. • Amperometric Titrations: Introduction, types of electrodes used, reference and indicator electrode, instrumentation, titration procedure, advantages and disadvantages of Amperometry over potentiometry. Pharma applications.
	Unit-IV	**Spectroscopy**: Theoretical aspects, instrumentation, elements of interpretation of data/spectra and application of analytical techniques be discussed on: • Absorption Spectroscopy: Theory of electronic, atomic and molecular spectra. Fundamental laws of photometry, Beer-Lambert's Law, application and its deviation, limitation of Beer law, application of the law to single and multiple component analysis, measurement of equilibrium constant and rate constant by spectroscopy. Spectra of isolated chromophores, auxochromes, batho-chromic shift, hypsochromic shift, hyperchromic and hypochromic effect, effect of solvent on absorption spectra, molecular structure and infrared spectra. Instrumentation – Photometer, U.V.-Visible spectrophotometer – sources of U.V.-Visible radiations, collimating systems, monochromators, samples cells and following detectors-Photocell, Barrier layer cell, Phototube, Diode array, applications of U.V.-Visible spectroscopy in pharmacy and spectrophotometric titrations. • Infrared Spectroscopy: Vibrational transitions, frequency – structure correlations, Infrared absorption bands, Instrumentation–IR spectro- meter – sources of IR, Collimating systems, monochromators, sample cells, sample

<table>
<tr><td></td><td></td><td colspan="3">handling in IR spectroscopy and detectors– Thermocouple, Golay Cells, Thermistor, Bolometer, Pyroelectric detector, Applications of IR in pharmacy.

• Fluorimetric Analysis: Theory, luminescence, factors affecting fluorescence, quenching. Instrumentation, Applications, fluorescent indicators, study of pharmaceutically important compounds estimated by fluorimetry.</td></tr>
<tr><td></td><td>Unit-V</td><td colspan="3">3. Flame Photometry: Theory, nebulisation, flame and flame temperature, interferences, flame spectrometric techniques and instrumentation and pharmaceutical applications.
4. Atomic Absorption Spectrometry: Introduction, Theory, types of electrodes, instrumentation and applications.
5. Atomic Emission Spectroscopy: Spectroscopic sources, atomic emission spectrometers, photographic and photoelectric detection.
6. NMR & ESR (introduction only): Introduction, theoretical aspects and applications.
7. Mass Spectroscopy: (Introduction only) – Fragmentation, types of ions produced mass spectrum and applications.
8. Polarimetry: (Introduction only) – Introduction to optical rotatory dispersion, circular dichroism, polarimeter.
9. X-RAY Diffraction: (Introduction only) – Theory, reciprocal lattice concept, diffraction patterns and applications.
10. Thermal Analysis: Introduction, instrumentation, applications, and DSC and DTA.</td></tr>
<tr><td></td><td>Mode of examination</td><td colspan="3">Theory</td></tr>
<tr><td rowspan="2"></td><td rowspan="2">Weightage Distribution</td><td>Continuous Mode Assessment</td><td>Sessional Exam</td><td>ESE</td></tr>
<tr><td></td><td>30</td><td>70</td></tr>
<tr><td></td><td>Reference books</td><td colspan="3">1.Text Book of Pharm. Analysis by Higuchi. T and Hasen. E. B., New York Inter Science Publishers.

2.Quantitative Pharma. Analysis by Jenkins, The Blakiston division, New York.

3.Quantitative Drug Analysis, by Garrot. D, Chapman & Hall Ltd., London.

4.Undergraduate Instrumental Analysis by James. E., CBS Publishers.

5.Instrumental Analysis by Willard and Merritt, EWP, East West</td></tr>
</table>

		Press Ltd., Delhi/Madras. 6.Pharm Analysis by Skoog and West, Sounders Manipal College Publishing. 7.Text Book of Chemical Analysis, by A.I.Vogel, ELBS with Macmillan press, Hampshire. 8.Textbook of Pharm. Analysis by K.A.Connors, John Wiley & Sons, New York, Brisbane, Singapore. 9.Textbook of Pharm. Analysis (Practical) by Beckett & Stenlake, CBS Publishers, Delhi. 10.Textbook of Drug Analysis by P.D. Sethi., CBS Publishers, Delhi. 11.Spectroscopy by Silverstein, John & Wiley & Sons. Inc., Canada & Singapore. 12.How to practise GMP-A Plan for total quality control by P.P. Sharma, Vandana Publications, Agra. 13.The Science & Practice of Pharmacy by Remington Vol-I & II, Mack Publishing Co. Pennsylvania. TLC by Stahl, Spring Verlay. 14.Text Book of Pharm. Chemistry by Chatten, CBS Publications. 15.Spectroscopy by William Kemp, ELBS with Macmillan Press, Hampshire. 16.I.P.-1996, The Controller of Publications, New Delhi. 17.BPC- Dept. of Health, U.K. for HMSO. 18.USP - Mack Publishing Co., Easton, PA. 19.The Extra Pharmacopoeia – The Pharm. Press, London.

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	**PDP303**
2	Course Title	**PHARMACOTHERAPEUTICS-II (THEORY)**
3	Credits	-
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	**Upon completion of this course the student should be able to** • designed to impart knowledge and skills necessary for contribution to quality use of medicines. • understand the brief pathophysiology and mostly therapeutics of various diseases. • student to understand the pathophysiology of common diseases and their management.

6	Course Outcomes	**Students will be able to** **CO1**: Understand the pathophysiology of selected disease states and the rationale for drug therapy. **CO2**: Understand the therapeutic approach for the management of these diseases. **CO3**: Analyse the controversies in drug therapy. **CO4**: Analyse the importance of preparation of individualized therapeutic plans based on diagnosis. **CO5**: Illustrate the needs to identify the patient specific parameters relevant to initiating drug therapy. **CO6**: Illustrate clinical and laboratory indices of therapeutic response and adverse effects.
7	Course Description	This course is designed to impart knowledge and skills necessary for contribution to quality use of medicines. Chapters dealt cover briefly pathophysiology and mostly therapeutics of various diseases. This will enable the student to understand the pathophysiology of common diseases and their management
8	Outline syllabus	
	Unit-I	Infectious disease: Guidelines for the rational use of antibiotics and surgical.Prophylaxis, Tuberculosis, Meningitis, Respiratory tract infections, Gastroenteritis, Endocarditis, Septicaemia, Urinary tract infections, Protozoal infection- Malaria, HIV & Opportunistic infections, Fungal infections, Viral infections, Gonorrhoea and Syphilis.
	Unit-II	Musculoskeletal disorders Rheumatoid arthritis, Osteoarthritis, Gout, Spondylitis, Systemic lupus erythematosus.
	Unit-III	• Renal system Acute Renal Failure, Chronic Renal Failure, Renal Dialysis, Drug-induced renal disorders
	Unit-IV	• Oncology: Basic principles of Cancer therapy, General introduction to cancer chemotherapeutic agents, Chemotherapy of breast cancer, leukemia. Management of chemotherapy nausea and emesis .
	Unit-V	• Dermatology: Psoriasis, Scabies, Eczema, Impetigo.
	Mode of Examination	Theory

	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
			30	70
	Text books	1.Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone publication		
	Reference books	1.Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange 2.Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication 3.Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA]		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	**PDP304**
2	Course Title	**PHARMACEUTICAL JURISPRUDENCE (THEORY)**
3	Credits	-
4	Contact Hours (L-T-P)	2-0-0
	Course Type	Compulsory
5	Course Objective	**Upon completion of the subject student shall be able to (Know, do, and appreciate)** – • Practice the Professional ethics. • Understand the various concepts of pharmaceutical legislation in India. • Know the various parameters in the Drug and Cosmetic Act and rules. • Know the Drug policy, DPCO, Patent and Design Act. • Understand the labelling requirements and packaging guidelines for drugs and cosmetics. • Understand the concepts of Dangerous Drugs Act, Pharmacy Act and Excise Duties Act. • Know other laws as prescribed by the Pharmacy Council of India from time to time including International Laws.
6	Course Outcomes	**Students will be able to:** **CO1**: Practice Professional ethics; understand the various concepts of the pharmaceutical legislation in India. **CO2**: Illustrate the various parameters in the Drug and Cosmetic Act and rules. **CO3**: Analyse the Drug Policy, DPCO, Patent and Design Act. **CO4**: Understand the labelling requirements and packaging guidelines for drugs and cosmetics. **CO5**: Understand the concepts of the Dangerous Drugs Act, Pharmacy Act and Excise Duties Act; and **CO6**: Understand the other laws as prescribed by the Pharmacy Council of India from time to time including International Laws.

7	Course Description	This course exposes the student to several important legislations related to the profession of pharmacy in India. The Drugs and Cosmetics Act, along with its amendments are the core of this course. Other acts, which are covered, include the Pharmacy Act, dangerous drugs, medicinal and toilet preparation Act etc. Besides this the new drug policy, professional ethics, DPCO, patent and design Act will be discussed.
8	Outline syllabus	
	Unit-I	• Pharmaceutical Legislations – A brief review.
		• Principle and Significance of professional ethics. Critical study of the code of pharmaceutical ethics drafted by PCI. • Drugs and Cosmetics Act, 1940,and its rules 1945.
	Unit-II	• Objectives, Legal definition, Study of Schedule's with reference to Schedule B, C&C1, D, E1, F&F1, F2, F3, FF, G, H, J, K, M, N, P, R, V, W, X, Y. Sales, Import, labeling and packaging of Drugs and Cosmetics Provisions Relating to Indigenous Systems. • Constitution and Functions of DTAB, DCC, CDL. Qualification and duties –Govt. analyst and Drugs Inspector.
	Unit-III	• Pharmacy Act –1948. Objectives Legal Definitions, General Study, Constitution and Functions of State & Central Council, Registration & Procedure, ER. • Medicinal and Toilet Preparation Act –1955. Objectives, Legal Definitions, Licensing, Bonded and Non Bonded Laboratory, Ware Housing, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietory Preparations. • Narcotic Drugs and Psychotropic substances Act-1985 and Rules. Objectives, Legal Definitions, General Study, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and regulations, Schedules to the Act.
	Unit-IV	• Study of Salient Features of Drugs and magic remedies Act and its rules. • Study of essential Commodities Act Relevant to drugs price control Order. • Drug Price control Order & National Drug Policy (Current). • Prevention Of Cruelty to animals Act-1960. • Patents & design Act-1970. • Brief study of prescription and Non-prescription Products.

<table>
<tr><td></td><td>Unit-V</td><td colspan="3">Assignments:

• Format of the assignment
• Minimum & Maximum number of pages
• It shall be a computer draft copy
• Reference(s) shall be included at the end.
• Name and signature of the student
• Assignment can be a combined presentation at the end of the academic year.
• Time allocated for presentation may be 8+2 Min

Case studies relating to

• Drugs and Cosmetics Act and rules along with its amendments, Dangerous Drugs Act, Medicinal and Toilet preparation Act, New Drug Policy, Professional Ethics, Drugs (Price control) Order, Patent and Design Act.
• Various prescription and non-prescription products.
• Medical and surgical accessories.
• Diagnostic aids and appliances available in the market.</td></tr>
<tr><td></td><td>Mode of examination</td><td colspan="3">Theory</td></tr>
<tr><td rowspan="2"></td><td rowspan="2">Weightage Distribution</td><td>Continuous Mode Assessment</td><td>Sessional Exam</td><td>ESE</td></tr>
<tr><td></td><td>30</td><td>70</td></tr>
<tr><td></td><td>Text books</td><td colspan="3">Mithal , B M. Textbook of Forensic Pharmacy. Calcutta :National; 1988.</td></tr>
<tr><td></td><td>Reference books</td><td colspan="3">1. Singh, KK, editor. Beotra’s the Laws of Drugs, Medicines & cosmetics. Allahabad: Law Book House; 1984.
2. Jain, NK. A Textbook of forensic pharmacy. Delhi: Vallabh prakashan ; 1995.
3. Reports of the Pharmaceutical enquiry Committee
4. I.D.M.A., Mumbai. DPCO 1995
5. Various reports of Amendments.
6. Deshapande, S.W. The drugs and magic remedies act 1954 and rules 1955. Mumbai: Susmit Publications; 1998.
7. Eastern Book Company .The narcotic and psychotropic substances act 1985, Lucknow: Eastern; 1987.</td></tr>
</table>

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	**PDP305**
2	Course Title	**MEDICINAL CHEMISTRY (THEORY)**
3	Credits	-
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	**Upon completion of the subject student shall be able to** – • impart fundamental knowledge on the structure, chemistry, and therapeutic value of drugs. • emphasises on modern techniques of rational drug design like quantitative structure-activity relationship (QSAR) • understand the prodrug concept, combinatorial chemistry, and Computer-aided drug design (CADD). • emphasizes on the chemistry, mechanism of action, metabolism, • know adverse effects, Structure-Activity Relationships (SAR) and therapeutic uses. • synthesize of important drugs.
6	Course Outcomes	**Student will be able to:** **CO1**: Illustrate the classification of drugs. **CO2**: Explain the mechanism of action of drugs. **CO3**: Understand the chemistry of drugs with respect to their biological activity. **CO4**: Illustrate the metabolism, adverse effects and therapeutic value of drugs. **CO5**: Analyse the importance of SAR of drugs. **CO6**: Understand the importance of drug design and different techniques of drug design.
7	Course Description	To gain the knowledge in the medicinal chemistry of various classes of drugs, structures, mechanism of actions, understand the SAR and perform drugs and intermediate synthesis and analysis.
8	Outline syllabus	

	Unit-I	• Modern concept of rational drug design: A brief introduction to Quantitative Structure Activity Relationship (QSAR), prodrug, combinatorial chemistry and computer aided drug design (CADD) and concept of antisense molecules. • A study of the development of the following classes of drugs including SAR, mechanism of action, synthesis of important compounds, chemical nomenclature, brand names of important marketed products and their side effects.		
	Unit-II	• Anti-infective agents • Local anti-infective agents b) • Preservatives • Antifungal agents • Urinary tract anti-infectives e) Antitubercular agents • Antiviral agents and Anti-AIDS agents • Antiprotozoal agents • Anthelmentics • Antiscabies and Antipedicular agents.		
	Unit-III	• Sulphonamides and sulphones • Antimalarials • Antibiotics • Antineoplastic agents		
	Unit-IV	• Cardiovascular agents • Antihypertensive agents • Antianginal agents and vasodilators • Antiarrhythmic agents • Antihyperlipidemic agents • Coagulants and Anticoagulants Endocrine.		
	Unit-V	11. Hypoglycemic agents 12. Thyroid and Antithyroid agents 13. Diuretics 14. Diagnostic agents 15. Steroidal Hormones and Adrenocorticoids.		
	Mode of examination	Theory		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
			30	70

	Text books	1. Wilson and Gisvold's Text book of Organic, Medicinal and Pharmaceutical Chemistry, Lippincott-Raven Publishers-New York, Philadelphia. 2. William.O.Foye, Principles of Medicinal Chemistry, B.I. Waverly Pvt. Ltd., New Delhi. 3. Burgers, Medicinal Chemistry, M.E.,Welly Med.Chemistry M.E. Walffed Johnwilley and Sons, Wiley-interscience Publication, New York, Toranto. 4. A Text Book of Medicinal Chemistry Vol. I and II by Surendra N. Pandeya, S.G. Publisher, 6, Dildayal Nagar, Varanasi -10. 5. Indian Pharmacopoeia 1985 and 1996. The Controller of Publications, Civil Lines, Delhi - 54. 6. Current Index of Medical Specialities (CIMS) and MIMS India, MIMS, A.E. Morgan Publications (I) Pvt. Ltd, New Delhi-19. 7. Organic Drug Synthesis-Ledniser Mitzsher Vol. I and II. 8. Pharmaceutical Chemistry drug Synthesis Vol. I and II by H. J. Roth and A.Kleemann. 9. The Science and Practice of Pharmacy Vol. 1 and 2, Remington, MACK Publishing Company, Easton, Pennsylvania.

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	**PDP306**
2	Course Title	**PHARMACEUTICAL FORMULATIONS (THEORY)**
3	Credits	**-**
4	Contact Hours (L-T-P)	**2-1-0**
	Course Type	Compulsory
5	Course Objective	**Upon completion of the subject student shall be able to:** • understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product. • discover various formulation considerations in the development of pharmaceutical dosage forms like tablets, capsules, etc. • Understand the quality control tests for the dosage forms. • know parenteral, stringent procedures in the preparation and its evaluation. • Understand clearly about packaging and cosmetic preparations. • Interpret the various pharmaceutical additives to be included in all dosage forms.
6	Course Outcomes	**Students shall be able to** **CO1**. Understand the principle involved in the formulation of various pharmaceutical dosage forms. **CO2**. Understand various pharmaceutical formulations. **CO3**. Evaluate pharmaceutical dosage forms. **CO4**. Understand and appreciate the concept of bioavailability. **CO5**. Understand and appreciate the concept of bioequivalence. **CO6.** Understand and appreciate the concept of Different clinical situations.
7	Course Description	Subject deals with the formulation and evaluation of various pharmaceutical dosage forms.
8	Outline syllabus	

	Unit-I	• Pharmaceutical dosage form- concept and classification • Tablets: Formulation of different types of tablets, tablet excipients, granulation techniques quality control and evaluation of tablets. Tablet coating, Type of coating, quality control tests for coated tablet. them.		
	Unit-II	• Capsules; Production and filling of hard gelatin capsules, Raw material for shell, finishing, quality control tests for capsules. Production and filling of soft gelatin capsules, quality control tests for soft gelatin capsules. • Liquid orals: Formulation and evaluation of suspensions, emulsions, and solutions. Stability of these preparations.		
	Unit-III	• Parenterals Introduction Containers used for Parenterals (including official tests) Formulation of large and small volume Parenterals Sterilization.		
	Unit-IV	• Ophthalmic preparations (Semi – Solids): Introduction and classification Factors affecting absorption and anatomy of skin Packaging storage and labeling, Ointments Types of Ointment Base Preparation of ointment, Jellies Types of jellies Formulation of jellies Suppositories, Method of preparation, Types Packaging.		
	Unit-V	• Definition and concept of Controlled and novel Drug delivery systems with available examples, viz. parenteral, trans dermal, buccal, rectal, nasal, implants, ocular.		
	Mode of examination	Theory		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
			30	70
	Text books	1. Pharmaceutical dosage forms, Vol, I,II and III by lachman 2. Rowlings Text book of Pharmaceutics 3. Tutorial Pharmacy – Cooper &Gun		
	Reference books	1.Remington's Pharmaceutical Sciences 2. USP/BP/IP.		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	**PDP307**
2	Course Title	**PHARMACOLOGY- II (PRACTICAL)**
3	Credits	-
4	Contact Hours (L-T-P)	0-0-3
	Course Type	Compulsory
5	Course Objective	**Upon completion of the subject student shall be able to:** • Calculate the dose in pharmacological experiments. • Perform various pharmacological screening studies. • Demonstrate the toxicity studies in animal models. • Know the student's t test, ANOVA, Chi square test, Wilcoxon Signed Rank test. • determine the pharmacokinetic parameters by using the data. • evaluate the acute skin irritation, acute eye irritation and corrosion of a test substance.
6	Course Outcomes	**Students will be able to:** **CO1**: Understand the dose in pharmacological experiments. **CO2**: Analyse various pharmacological screening studies. **CO3**: Demonstrate the toxicity studies in animal models. **CO4**: Describe the student's t-test, ANOVA, Chi-square test, and Wilcoxon Signed Rank test. **CO5**: Determine the pharmacokinetic parameters by using the data. **CO6**: Evaluate the acute skin irritation, acute eye irritation and corrosion of a test substance.
7	Course Description	This subject will provide an opportunity for the student to learn about the drug with regard to classification, pharmacodynamic and pharmacokinetic aspects, adverse effects, uses, dose, route of administration, precautions, contraindications and interaction with other drugs. In this subject, drugs acting on autacoids, respiratory system, GIT, immune system and hormones, and pharmacology of autocoids and hormones will be concentrated. In addition, pharmacology of chemotherapeutic agents, vitamins, essential minerals and principles of toxicology are also taught. In addition to theoretical knowledge, the basic practical knowledge relevant to therapeutics will be imparted.

8	Outline syllabus			
	Unit-I	c. Study of laboratory animals and their handling (a. Frogs, b. Mice, c. Rats, d. Guinea pigs, e. Rabbits). d. Study of physiological salt solutions used in experimental pharmacology. e. Study of laboratory appliances used in experimental pharmacology.		
	Unit-II	• Study of use of anaesthetics in laboratory animals. • To record the dose response curve of Ach using isolated ileum/rectus abdominis muscle preparation. • To carry out bioassay of Ach using isolated ileum/rectus abdominis muscle preparation by interpolation method.		
	Unit-III	• To carry out bioassay of Ach using isolated ileum/rectus abdominis muscle preparation by three point method. • To record the dose response curve of Histamine using isolated guinea-pig ileum preparation. • Study of agonistic and antagonistic effects of drugs using isolated guinea-pig ileum preparation.		
	Unit-IV	c. To carry out bioassay of Histamine using isolated guinea-pig ileum preparation by interpolation method. d. To carry out bioassay of Histamine using guinea-pig ileum preparation by three point method. e. To study the routes of administration of drugs in animals (Rats, Mice, Rabbits).		
	Unit-V	Study of theory, principle, procedure involved and interpretation of given results for the following experiments: • Analgesic property of drug using analgesiometer. • Antiinflammatory effect of drugs using rat-paw edema method. • Anticonvulsant activity of drugs using maximal electroshock and pentylene tetrazole methods. • Antidepressant activity of drugs using pole climbing apparatus and pentobarbitone induced sleeping time methods. • Locomotor activity evaluation of drugs using actophotometer and rotorod. • Cardiotonic activity of drugs using isolated frog heart and mammalian heart preparations.		
	Mode of examination	Practical		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE

			30	70
	Text Books	Kulkarni, S. K. and Dandia, P. C. Hand book of experimental pharmacology. Latest edition, Publisher: Vallab, Delhi.		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	**PDP308**
2	Course Title	**PHARMACEUTICAL ANALYSIS (PRACTICAL)**
3	Credits	-
4	Contact Hours (L-T-P)	0-0-3
	Course Type	Compulsory
5	Course Objective	**Upon completion of the subject student shall be able to:** • Estimate the samples using analytical instruments. • Perform an assay of drug samples using analytical instruments • determine the effect of solvents on absorption maxima. • separate the mixtures of samples using chromatographic techniques. • demonstrate HPLC. • demonstrate gas chromatography.
6	Course Outcomes	**Students will be able to:** **CO1**: Understand the application of instrumental methods in qualitative and quantitative analysis of drugs. **CO2:** Analyse fundamental knowledge on the principles and instrumentation of spectroscopic and chromatographic techniques. **CO3:** Apply theoretical and practical knowledge of modern analytical instruments that are used for drug testing. **CO4**: Illustrate the applications of analytical techniques. **CO5**: Illustrate quantitative analysis of drugs using various analytical instruments. **CO6**: Illustrate qualitative analysis of drugs using various analytical instruments.
7	Course Description	This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. This subject is designed to impart fundamental knowledge on the principles and instrumentation of spectroscopic and chromatographic techniques.
8	Outline syllabus	
	Unit-I	• Separation and identification of Amino Acids by Paper

<table>
<tr><td></td><td></td><td colspan="3">Chromatography.
• Separation and identification of Sulpha drugs by TLC technique.
• Effect of pH and solvent on the UV spectrum of given compound.
• Comparison of the UV spectrum of a compound with that of its derivatives.
• Determination of dissociation constant of indicators using UV-Visible spectroscopy.</td></tr>
<tr><td></td><td>Unit-II</td><td colspan="3">• Conductometric titration of mixture of acids with a strong base.
• Potentiometric titration of a acid with a strong base.
• Estimation of drugs by Fluorimetric technique.
• Study of quenching effect in fluorimetry.
• Colourimetric estimation of Supha drugs using BMR reagent.</td></tr>
<tr><td></td><td>Unit-III</td><td colspan="3">• Simultaneous estimation of two drugs present in given formulation.
• Assay of Salicylic Acid by colourimetry.
• Determination of Chlorides and Sulphates in Calcium gluconate by Nepheloturbidimetric Method.
• Determination of Na/K by Flame Photometry.
• Determination of pKa using pH meter.</td></tr>
<tr><td></td><td>Unit-IV</td><td colspan="3">• Determination of specific rotation.
• Comparison of the IR spectrum of a compound with that of its derivatives.
• Demonstration of HPLC.</td></tr>
<tr><td></td><td>Unit-V</td><td colspan="3">• Demonstration of HPTLC.
• Demonstration of GC-MS.
• Demonstration of DSC.
• Interpretation of NMR spectra of any one compound.</td></tr>
<tr><td></td><td>Mode of Examination</td><td colspan="3">Practical</td></tr>
<tr><td rowspan="2"></td><td rowspan="2">Weightage Distribution</td><td>Continuous Mode Assessment</td><td>Sessional Exam</td><td>ESE</td></tr>
<tr><td></td><td>30</td><td>70</td></tr>
</table>

	Reference Books	1. Text Book of Pharm. Analysis by Higuchi. T and Hasen. E. B., New York Inter Science Publishers. 2. Quantitative Pharma. Analysis by Jenkins, The Blakiston division, New York. 3. Quantitative Drug Analysis, by Garrot. D, Chapman & Hall Ltd., London. 4. Undergraduate Instrumental Analysis by James. E., CBS Publishers. 5. Instrumental Analysis by Willard and Merritt, EWP, East West Press Ltd., Delhi/Madras. 6. Pharm Analysis by Skoog and West, Sounders Manipal College Publishing. 7. Text Book of Chemical Analysis, by A.I.Vogel, ELBS with Macmillan press, Hampshire. 8. Textbook of Pharm. Analysis by K.A.Connors, John Wiley & Sons, New York, Brisbane, Singapore. 9. Textbook of Pharm. Analysis (Practical) by Beckett & Stenlake, CBS Publishers, Delhi. 10. Textbook of Drug Analysis by P.D. Sethi., CBS Publishers, Delhi. 11. Spectroscopy by Silverstein, John & Wiley & Sons. Inc., Canada & Singapore. 12. How to practise GMP-A Plan for total quality control by P.P. Sharma, Vandana Publications, Agra. 13. The Science & Practice of Pharmacy by Remington Vol-I & II, Mack Publishing Co. Pennsylvania.TLC by Stahl, Spring Verlay. 14. Text Book of Pharm. Chemistry by Chatten, CBS Publications. 15. Spectroscopy by William Kemp, ELBS with Macmillan Press, Hampshire. 16. I.P.-1996, The Controller of Publications, New Delhi. 17. BPC- Dept. of Health, U.K. for HMSO. 18. USP - Mack Publishing Co., Easton, PA. 19. The Extra Pharmacopoeia – The Pharm. Press, London.

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	**PDP309**
2	Course Title	**PHARMACOTHERAPEUTICS – II (PRACTICAL)**
3	Credits	-
4	Contact Hours (L-T-P)	0-0-3
	Course Type	Compulsory
5	Course Objective	**Upon completion of this course the student should be able to** • impart knowledge and skills necessary for contribution to quality use of medicines. • know the pathophysiology and mostly therapeutics of various diseases. • understand the pathophysiology of common diseases and their management.
6	Course Outcomes	**Students will be able to** **CO1**: Understand the pathophysiology of selected disease states and the rationale for drug therapy. **CO2**: Understand the therapeutic approach to the management of these diseases. **CO3**: Analyse the controversies in drug therapy. **CO4**: Illustrate the importance of preparation individualized therapeutic plans based on diagnosis. **CO5**: Apply the need to identify the patient-specific parameters relevant in initiating drug therapy. **CO6:** Apply clinical and laboratory indices of therapeutic response and adverse effects.
7	Course Description	This course deals with impart knowledge and skills necessary for contribution to quality use of medicines.
8	Outline syllabus	
	Unit-I	Hospital postings in various departments designed to complement the lectures by providing practical clinical discussion; attending ward rounds; follow up the progress and changes made in drug therapy in allotted patients; case presentation upon discharge.
	Unit-II	Students are required to maintain a record of cases presented and the same should be submitted at the end of the course for evaluation.

	Unit-III	A minimum of 20 cases should be presented and recorded covering most common diseases.		
	Unit-IV	Assignments: Students are required to submit written assignments on the topics given to them. Topics allotted should cover recent developments in drug therapy of various diseases. A minimum of THREE assignments [1500 – 2000 words] should be submitted for evaluation.		
	Unit-V	Format of the assignment: 1.Minimum & Maximum number of pages. 2.Reference(s) shall be included at the end. 3.Assignment can be a combined presentation at the end of the academic year. 4.It shall be computer draft copy. 5.Name and signature of the student. 6.Time allocated for presentation may be 8+2 Min.		
	Mode of Examination	Practical		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
			30	70
	Text Books	Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone publication		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	**PDP310**
2	Course Title	**MEDICINAL CHEMISTRY (PRACTICAL)**
3	Credits	-
4	Contact Hours (L-T-P)	0-0-3
	Course Type	Compulsory
5	Course Objective	**Upon completion of the course, the student shall be able to** • 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.
6	**Course Outcomes**	**Students will be able to:** **CO1**: Understand the structure, chemistry and its correlation with the therapeutic value of drugs. **CO2:** Analyse drugs and preparation of drugs. **CO3**: Apply Monograph analysis of important drugs **CO4**: Plan the preparation of medicinally important compounds **CO5**: Plan the Assays of important drugs. **CO6:** Analyse about the drug characteristics.
7	Course Description	This course deals with impart knowledge and skills necessary for contribution to quality use of medicines.
8	Outline syllabus	
	Unit-I	Assays of important drugs from the course content.
	Unit-II	Preparation of medicinally important compounds or intermediates required for synthesis of drugs.
	Unit-III	Monograph analysis of important drugs
	Unit-IV	Determination of partition coefficients, dissociation constants.

	UNIT-V	Determination of molar refractivity of compounds for QSAR analysis.		
	Mode of Examination	Practical		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
			30	70
	Reference Books:	1. Wilson and Gisvold's Text book of Organic, Medicinal and Pharmaceutical Chemistry, Lippincott-Raven Publishers-New York, Philadelphia. 2. William.O.Foye, Principles of Medicinal Chemistry, B.I. Waverly Pvt. Ltd., New Delhi. 3. Burgers, Medicinal Chemistry, M.E.,Welly Med.Chemistry M.E. Walffed Johnwilley and Sons, Wiley-interscience Publication, New York, Toranto. 4. A Text Book of Medicinal Chemistry Vol. I and II by Surendra N. Pandeya, S.G. Publisher, 6, Dildayal Nagar, Varanasi -10. 5. Indian Pharmacopoeia 1985 and 1996. The Controller of Publications, Civil Lines, Delhi - 54. 6. Current Index of Medical Specialities (CIMS) and MIMS India, MIMS, A.E. Morgan Publications (I) Pvt. Ltd, New Delhi-19. 7. Organic Drug Synthesis-Ledniser Mitzsher Vol. I and II. 8. Pharmaceutical Chemistry drug Synthesis Vol. I and II by H. J. Roth and A. Kleemann. 9. The Science and Practice of Pharmacy Vol. 1 and 2, Remington, MACK Publishing Company, Easton, Pennsylvania.		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	**PDP311**
2	Course Title	**PHARMACEUTICAL FORMULATIONS (PRACTICAL)**
3	Credits	-
4	Contact Hours (L-T-P)	0-0-3
	Course Type	Compulsory
5	Course Objective	**Upon completion of the course, the student shall be able to** • understand the strict formulation considerations in parenteral and ophthalmic manufacturing. • demonstrate the evaluations of different packaging materials in the pharmaceutical industry. • achieve skills in making a pharmaceutical product. • demonstrate the manufacturing of capsules. • exploit the formulation of various cosmetics.
6	Course Outcomes	**Students will be able to** **CO1**: Understand the strict formulation considerations in parenteral and ophthalmic manufacturing. **CO2**:Demonstrate the evaluations of different packaging materials in pharmaceutical industry. **CO3**: Illustrate skills in making a pharmaceutical product. **CO4**: Demonstrate the manufacturing of capsules. **CO5**: Explain the formulation of various cosmetics.
7	Course Description	Subject deals with the formulation and evaluation of various pharmaceutical dosage forms.
8	Outline syllabus	
	Unit-I	Manufacture of Tablets • Ordinary compressed tablet-wet granulation • Tablets prepared by direct compression. • Soluble tablet. • Chewable tablet.

	Unit-II	• Formulation and filling of hard gelatin capsules • Manufacture of parenterals • Ascorbic acid injection • Calcium gluconate injection • Sodium chloride infusion. • Dextrose and Sodium chloride injection/ infusion.		
	Unit-III	Evaluation of Pharmaceutical Formulations (QC tests) • Tablets • Capsules • Injections		
	Unit-IV	Formulation of two liquid oral preparations and evaluation by assay • Solution: Paracetamol Syrup • Antacid suspensions- Aluminium hydroxide gel		
	UNIT -V	Formulation of semisolids and evaluation by assay • Salicylic acid and benzoic acid ointment • Gel formulation Diclofenac gel Cosmetic preparations • Lipsticks • Cold cream and vanishing cream • Clear liquid shampoo • Tooth paste and tooth powders. Tablet coating (demonstration)		
	Mode of Examination	Practical		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
			30	70
	Text Books **Reference Books**	1. Pharmaceutical dosage forms, Vol, I,II and III by Lachman 2. Rowlings Textbook of Pharmaceutics 3. Tutorial Pharmacy – Cooper & Gun 1. Remington's Pharmaceutical Sciences 2. USP/BP/IP		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP401
2	Course Title	**Pharmacotherapeutics-III (Theory)**
3	Credits	-
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	At completion of this subject it is expected that students will be able to understand- a. the pathophysiology of selected disease states and the rationale for drug therapy; b. The therapeutic approach to management of these diseases; c. The controversies in drug therapy; d. the importance of preparation of individualised therapeutic plans based on diagnosis; e. 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); f. Describe the pathophysiology of selected disease states and explain the rationale for drug therapy; g. To summarize the therapeutic approach to management of these diseases including reference to the latest available evidence; h. To discuss the controversies in drug therapy; i. To discuss the preparation of individualised therapeutic plans based on diagnosis; and j.Identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects).
6	Course Outcomes	Students will be able to: CO1: Describe the pathophysiology of selected disease states and the rational drug therapy on Gastrointestinal system. CO2: Understand the different therapeutic approaches in management of selected disease conditions on Haematological system. CO3: Apply the individualized therapeutic plans based on diagnosis on Nervous system. CO4: Analyze therapeutic drug monitoring for selected disease conditions on Psychiatry disorders. CO5: Evaluate the pharmacological concepts in raising the therapeutic quality. CO6: Create the drug regimen applied in the treatment of various diseases with systemic approaches.
7	Course Description	This course is designed to impart knowledge and skills necessary for contribution to quality use of medicines. Chapters dealt cover briefly pathophysiology and mostly therapeutics of various diseases. This will enable the student to understand the pathophysiology of common diseases and their management.

8	Outline syllabus			
	UNIT-I	Gastrointestinal system: Peptic ulcer disease, Gastro Esophageal Reflux Disease, Inflammatory bowel disease, Liver disorders - Alcoholic liver disease, Viral hepatitis including jaundice, and Drug induced liver disorders.		
	UNIT-II	Haematological system: Anaemias, Venous thromboembolism, Drug induced blood disorders.		
	UNIT-III	Nervous system: Epilepsy, Parkinsonism, Stroke, Alzheimer's disease		
	UNIT-IV	Psychiatry disorders: Schizophrenia, Affective disorders, Anxiety disorders, Sleep disorders, Obsessive Compulsive disorders		
	UNIT-V	Pain management including Pain pathways, neuralgias, headaches. Evidence based medicines		
	Mode of examination	Theory/Jury/Practical/Viva		
	Weightage Distribution	**Continuous Mode Assessment**	Sessional Exam	ESE
			30	70
	Text book/s*	1. *1.Roger and Walker, Clinical Pharmacy and Therapeutics, Churchill Livingstone Publication* and Suspensions, Marcel Dekker, INC, New York.		
	Other References	1. *Robins SL, Pathologic basis of disease, W.B.Saunders Publication* 2. *Green and Harris, Pathology and therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice - Chapman and Hall Publication* 3. *Joseph T. Dipiro et al., Pharmacotherapy: A Pathophysiologic approach - Appleton & Lange* 4. *Eric T. Herfindal, Clinical Pharmacy and Therapeutics, Williams and WilkinsPublication* 5. *Lloyd Young and Koda, Applied Therapeutics: The clinical Use of Drugs, KimbleMA* *Avery's Drug Treatment, 4th Edn, 1997, AdisInternationalLimited.*		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP407
2	Course Title	**Pharmacotherapeutics-III (Practical)**
3	Credits	-
4	Contact Hours (L-T-P)	0-0-3
	Course Type	Compulsory
5	Course Objective	At completion of this subject it is expected that students will be able to understand- a. the pathophysiology of selected disease states and the rationale for drug therapy; j. the therapeutic approach to management of these diseases; k. the controversies in drug therapy; l. the importance of preparation of individualised therapeutic plans based on diagnosis; m. 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); n. describe the pathophysiology of selected disease states and explain the rationale for drug therapy; o. to summarize the therapeutic approach to management of these diseases including reference to the latest available evidence; p. to discuss the controversies in drug therapy; q. to discuss the preparation of individualised therapeutic plans based on diagnosis; and identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects).
6	Course Outcomes	At completion of this subject it is expected that students will be able to CO1: Describe the pathophysiology of selected disease states and the rational drug therapy. CO2: Understand the different therapeutic approaches in management of selected disease conditions. CO3: Apply the individualized therapeutic plans based on diagnosis. CO4: Analyze therapeutic drug monitoring for selected disease conditions. CO5: Evaluate the pharmacological concepts in raising the therapeutic quality. CO6: Create the drug regimen applied in the treatment of various diseases with systemic approaches.
7	Course Description	This course is designed to impart knowledge and skills necessary for contribution to quality use of medicines. Chapters dealt cover briefly pathophysiology and mostly therapeutics of various diseases. This will enable the student to understand the pathophysiology of common diseases and their management.
8	Outline syllabus	

	UNIT-I	Hospital postings in various departments designed to complement the lectures by providing practical clinical discussion; attending ward rounds; follow up the progress and changes made in drug therapy in allotted patients; case presentation upon discharge. Students are required to maintain a record of cases presented and the same should be submitted at the end of the course for evaluation.		
	UNIT-II	The student shall be trained to understand the principle and practice involved in selection of drug therapy including clinical discussion.		
	UNIT-III	A minimum of 20 cases should be presented and recorded covering most common diseases.		
	UNIT-IV	Assignments: Students are required to submit written assignments on the topics given to them. Topics allotted should cover recent developments in drug therapy of various diseases. A minimum of THREE assignments [1500 – 2000 words] should be submitted for evaluation.		
	UNIT-V	Students are required to presentation any two cases written assignments on the topics given to them. Topics allotted should cover recent developments in drug therapy of various diseases. Students should cover recent developments in drug therapy of various diseases case presentation.		
	Mode of examination	Practical/Viva		
	Weightage Distribution	**Continuous Mode Assessment**	Sessional Exam	ESE
			30	70
	Text book/s*	1. *Roger and Walker, Clinical Pharmacy and Therapeutics, Churchill Livingstone Publication* and Suspensions, Marcel Dekker, INC, New York.		
	Other References	2. *Robins SL, Pathologic basis of disease, W.B.Saunders Publication* 3. *Green and Harris, Pathology and therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice - Chapman and Hall Publication* 4. *Joseph T. Dipiro et al., Pharmacotherapy: A Pathophysiologic approach - Appleton & Lange* 5. *Eric T. Herfindal, Clinical Pharmacy and Therapeutics, Williams and WilkinsPublication* 6. *Lloyd Young and Koda, Applied Therapeutics: The clinical Use of Drugs, KimbleMA* *Avery's Drug Treatment, 4th Edn, 1997, AdisInternationalLimited.*		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP402
2	Course Title	**Hospital Pharmacy (Theory)**
3	Credits	-
4	Contact Hours (L-T-P)	2-1-0
	Course Type	Compulsory
5	Course Objective	Upon completion of the course, the student shall be able to – a. know various drug distribution methods; b. know the professional practice management skills in hospital pharmacies; c. provide unbiased drug information to the doctors; d. know the manufacturing practices of various formulations in hospital set up; appreciate the practice based research methods; and f. appreciate the stores management and inventory control.
6	Course Outcomes	Students will be able to CO1: Understand drug distribution and professional practice management skills in hospital pharmacies. CO2: Demonstrate unbiased drug information to the patients and physicians. CO3: Formulate extemporaneous drug preparations in the hospital pharmacies. CO4: Practice drug dispensing, store management and inventory control in hospitals. CO5: Develop practice-based research methods. CO6: Maintain purchase ordering and consumption of drugs in various departments.
7	Course Description	In the changing scenario of pharmacy practice in India, for successful practice of Hospital Pharmacy, the students are required to learn various skills like drug distribution, drug dispensing, manufacturing of parenteral preparations, drug information, patient counselling, and therapeutic drug monitoring for improved patient care.
8	Outline syllabus	
	UNIT-I	**1.** Hospital - its organization and functions **2.** Hospitalpharmacy-Organization and management: Organizational Structure-Staff, Infrastructure & work load statistics, Management of materials and finance, Roles & responsibilities of hospital pharmacist The Budget - Preparation and implementation Hospital drug policy: i. Pharmacy and Therapeutic committee (PTC) ii. Hospital formulary Hospital committees: Infection control,

	UNIT-II	i. Research and ethical committee ii. Developing therapeutic guidelines iii. Hospital pharmacy communication –Newsletters Hospital pharmacy services **1.** Procurement & warehousing of drugs and Pharmaceuticals **2.** Inventory control: Definition, Importance, various methods of Inventory Control ABC, VED, EOQ, Lead time, safety stock		
	UNIT-III	Drug distribution in the hospital Individual prescription method, Floor stock method and Unit dose drug distribution methods. **1.** Distribution of Narcotic and other controlled substances. **2.** Central sterile supply services-Role of pharmacist		
	UNIT-IV	Manufacture of Pharmaceutical preparations 1. Sterile formulations – large and small volume parenteral 2. Manufacture of Ointments, Liquids, and creams 3. Manufacturing of Tablets, granules, capsules, and powders Total parenteral nutrition		
	UNIT-V	1. Continuing professional development programs: Education and training. 2. Radio Pharmaceuticals – Handling and packaging Professional Relations and practices of hospital pharmacist		
	Mode of examination	Theory/Jury/Practical/Viva		
	Weightage Distribution	**Continuous Mode Assessment**	Sessional Exam	ESE
			30	70
	Text book/s*	*1. A text book of Hospital Pharmacy by S.H.Merchant&Dr. J.S. Qadry. Revised by R.K.Goyal& R.K. Parikh* and Suspensions, Marcel Dekker, INC, New York.		
	Other References	*1. WHO consultative group report.* *2. R.P.S. Vol.2. Part –B; Pharmacy Practicesection.* *Handbook of pharmacy – health care. Edt. Robin J Harman. The Pharmaceuticalpress.* *4. Hospital pharmacy by William .E.Hassan, Lea &Febiger,Philadelphia.*		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP408
2	Course Title	**Hospital Pharmacy (Practical)**
3	Credits	-
4	Contact Hours (L-T-P)	0-0-3
	Course Type	Compulsory
5	Course Objective	Upon completion of the course, the student shall be able to – a.know various drug distribution methods; b.know the professional practice management skills in hospital pharmacies; c.provide unbiased drug information to the doctors; d.know the manufacturing practices of various formulations in hospital set up; e.appreciate the practice based research methods; and f. appreciate the stores management and inventory control.
6	Course Outcomes	Students will be able to: CO1: Understand drug-drug interaction and professional practice management skills in drug interaction. CO2: Understand and perform Manufacture of parenteral formulations and powders. CO3: Understand the Drug information queries. CO4: Understand Practice ABC analysis of drugs sold in one month from the pharmacy. CO5: Understand and development of a hospital formulary. CO6: Understand various sources of drug information and systematic approach to provide unbiased drug information.
7	Course Description	In the changing scenario of pharmacy practice in India, for successful practice of Hospital Pharmacy, the students are required to learn various skills like drug distribution, drug dispensing, manufacturing of parenteral preparations, drug information, patient counselling, and therapeutic drug monitoring for improved patient care.
8	Outline syllabus	
	UNIT-I	Assessment of drug interactions in the given prescriptions: 1.Evaluation of prescriptions generated in hospital for drug interactions and find out the suitable management.
	UNIT-II	Manufacture of parenteral formulations, powders: 1.Sterile formulations – large and small volume parenteral 2.Manufacture of Ointments, Liquids, and creams 3.Manufacturng of Tablets, granules, capsules, and powders
	UNIT-III	Drug information queries. 1.To write and perform. Any 5 (five) drugs drug information queries.
	UNIT-IV	Inventory control. 1.Preparation of ABC analysis of drugs sold in one month from the pharmacy.

	UNIT-V	1.Development of a hospital formulary for 300 bedded teaching hospital 2.Various sources of drug information and systematic approach to provide unbiased drug information		
	Mode of examination	Practical/Viva		
	Weightage Distribution	**Continuous Mode Assessment**	Sessional Exam	ESE
			30	70
	Text book/s*	*1. A text book of Hospital Pharmacy by S.H.Merchant&Dr. J.S. Qadry. Revised by R.K.Goyal& R.K. Parikh* and Suspensions, Marcel Dekker, INC, New York.		
	Other References	3. *WHO consultative group report.* 4. *R.P.S. Vol.2. Part –B; Pharmacy Practicesection.* *Handbook of pharmacy – health care. Edt. Robin J Harman. The Pharmaceuticalpress.* 5. *Hospital pharmacy by William .E.Hassan, Lea &Febiger,Philadelphia.*		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP403
2	Course Title	**Clinical Pharmacy (Theory)**
3	Credits	-
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	Upon completion of the subject student shall be able to (Know, do, appreciate) – a. monitor drug therapy of patient through medication chart review and clinical review; b. obtain medication history interview and counsel the patients; c. identify and resolve drug related problems; d. detect, assess and monitor adverse drug reaction; e. interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states; and f. retrieve, analyses, interpret and formulate drug or medicine information
6	Course Outcomes	Students will be able to: CO1: Identifying and resolving drug related problems. CO2: Assessing adverse drug reactions. CO3: Interpreting selected laboratory results (as monitoring parameters in therapeutics) for specific diseased conditions and providing medicine information. CO4: Practicing medication history interviews and patients counseling. CO5: Practicing medication history interviews and patients counseling. CO6: Assisting the physicians in making the drug regimen and maximize patient counseling.
7	Course Description	Clinical pharmacology is the scientific discipline that involves all aspects of the relationship between drugs and humans. Clinical pharmacologists participate in and guide the process of new drug development, undertake pharmacovigilance, pharmacoepidemiology and pharmacoeconomic activities.
8	Outline syllabus	
	UNIT-I	Definitions, Development and scope of clinical pharmacy Introduction to daily activities of a clinical pharmacist: Drug therapy monitoring (medication chart review, clinical review, pharmacist interventions), Ward round participation, Adverse drug reaction management, Drug and poisons information, Medication history, Patient counseling, Drug utilization evaluation (DUE) and review (DUR), Quality assurance of clinical pharmacy services. **Patient data analysis:** Patient's case history, its structure and use in evaluation of drug therapy & Understanding common medical abbreviations and terminologies used in clinical practices.

	UNIT-II	**Clinical laboratory tests used in the evaluation of diseased states and interpretation of test results:** a. Hematological, Liver function, Renal function, thyroid function tests b. Tests associated with cardiac disorders c. Fluid and electrolyte balance d. Microbiological culture sensitivity tests e. Pulmonary Function Tests .		
	UNIT-III	**Drug & Poison information:** Introduction to drug information resources, Systematic approach in answering Drug Information queries, Critical evaluation of drug information and literature, Preparation of written and verbal reports, Poisons information- organization & information resources.		
	UNIT-IV	**Pharmacovigilance** a. Scope, definition and aims of pharmacovigilance b. Adverse drug reactions - Classification, mechanism, predisposing factors, causality assessment [different scales used] c. Reporting, evaluation, monitoring, preventing & management of ADRs d. Role of pharmacist in management of ADR.		
	UNIT-V	Communication skills, including patient counselling techniques, medication history interview, presentation of cases. 1. Pharmaceutical care concepts 2. Critical evaluation of biomedical literature Medication errors		
	Mode of examination	Theory/Jury/Practical/Viva		
	Weightage Distribution	**Continuous Mode Assessment**	Sessional Exam	ESE
			30	70
	Text book/s*	*1. A text book of Clinical Pharmacy Practice; Essential concepts and skills, Dr. G. Parthasarathietal, Orient OrientLangramPvt.Ltd.ISSBN8125026*		
	Other References	*1. Australian drug information -Procedure manual. The Society of Hospital Pharmacists ofAustralia.* *2. Rowland and Tozer, Clinical Pharmacokinetics - Williams and WilkinsPublication.* *3. Practical and clinical applications. Pharmaceutical statistics. Sanford Bolton, Marcel Dekker,Inc.* *4. Practice Standards and Definitions - The Society of Hospital Pharmacists ofAustralia.* *5. Basic skills in interpreting laboratory data - Scott LT, American Society of Health System Pharmacists Inc.* *Biopharmaceutics and Applied Pharmacokinetics - Leon Shargel, Prentice Hall publication.*		

School:		**SOP**		
Program:		**Pharm.D.**		
Branch:		**Pharmacy**		
1	Course Code	PDP409		
2	Course Title	**Clinical Pharmacy (Practical)**		
3	Credits	-		
4	Contact Hours (L-T-P)	0-0-3		
	Course Type	Compulsory		
5	Course Objective	Upon completion of the subject student shall be able to (Know, do, appreciate) – a. monitor drug therapy of patient through medication chart review and clinical review; b. obtain medication history interview and counsel the patients; c. identify and resolve drug related problems; d. detect, assess and monitor adverse drug reaction; e. interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states; and f . retrieve, analyses, interpret and formulate drug or medicine information		
6	Course Outcomes	Students will be able to: CO1: TO answering drug information question and resolving drug related problems. CO2: To perform the patient medication counselling. CO3: Practicing medication history interviews and patients counselling. CO4: Interpreting selected laboratory results (as monitoring parameters in therapeutics) for specific diseased conditions and providing medicine information. CO5: Practicing medication history interviews and patients counseling. CO6: Assisting the physicians in making the drug regimen and maximize patient counseling.		
7	Course Description	Clinical pharmacology is the scientific discipline that involves all aspects of the relationship between drugs and humans. Clinical pharmacologists participate in and guide the process of new drug development, undertake pharmacovigilance, pharmacoepidemiology and pharmacoeconomic activities.		
8	Outline syllabus			
	UNIT-I	Answering drug information questions (4 Nos)		
	UNIT-II	Patient medication counselling (4 Nos)		
	UNIT-III	Studies related to laboratory investigations (2Nos)		
	UNIT-IV	Case studies related to laboratory investigations (2 Nos)		
	UNIT-V	Patient medication history interview (3 Nos)		
	Mode of examination	Practical/Viva		
	Weightage Distribution	**Continuous Mode Assessment**	Sessional Exam	ESE

			30	70
	Text book/s*	*1. A text book of Clinical Pharmacy Practice; Essential concepts and skills, Dr. G. Parthasarathietal, Orient OrientLangramPvt.Ltd.ISSBN8125026*		
	Other References	*3. Australian drug information -Procedure manual. The Society of Hospital Pharmacists ofAustralia.* *4. Rowland and Tozer, Clinical Pharmacokinetics - Williams and WilkinsPublication.* *6. Practical and clinical applications. Pharmaceutical statistics. Sanford Bolton, Marcel Dekker,Inc.* *7. Practice Standards and Definitions - The Society of Hospital Pharmacists ofAustralia.* *8. Basic skills in interpreting laboratory data - Scott LT, American Society of Health System Pharmacists Inc.* *Biopharmaceutics and Applied Pharmacokinetics - Leon Shargel, Prentice Hall publication.*		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	**PDP404**
2	Course Title	**Biostatistics and Research Methodology (Theory)**
3	Credits	-
4	Contact Hours (L-T-P)	2-1-0
	Course Type	Compulsory
5	Course Objective	This is an introductory course in statistics, research methodology and Computer application in hospital and community Pharmacy. This subject deals with Research methodology, Biostatics, epidemiology and Computer application and clinical studies. Research methodology deal about types of clinical study, designing, sample size determination and power of study Statistics deals about frequency distribution, graphics, averages, measures of dispersion, Correlation, regression, Parametric and non-parametric tests. Incidence and prevalence, relative risk, attributable risk Computer Application deals with application of Computer Systemin Hospital Pharmacy and Community Pharmacy
6	Course Outcomes	Student shall be able to: CO1: Know the various statistical methods to solve different types of problems CO2: Operate various statistical software packages. CO3: Understanding Graphical data representation and various applied hypothesis testing. CO4: Understanding the Statistical methods in epidemiology, incidence and prevalence. CO5: Appreciate the importance of Computer in hospital and Community Pharmacy. CO6: Appreciate the statistical technique in solving the pharmaceutical problems.
7	Course Description	It covers topics related to frequency distributions, measures of central tendency, mean, weighted mean, geometric mean, harmonic mean, median, mode, measures of dispersion, range, standard deviation, correlation analysis, Karl Pearson's correlation coefficient, regression analysis, multiple regression analysis.
8	Outline syllabus	
	UNIT-I	**Research Methodology** Types of clinical study designs: Case studies, observational studies, interventional studies, Designing the methodology Sample size determination and Power of a study, Determination of sample size for simple comparative experiments, determination of sample size to obtain a confidence interval of specified width, power of a study Report writing and presentation of data

	UNIT-II	**Biostatistics** a)Introduction b)Types of data distribution Measures describing the central tendency distributions- average, median, mode Measurement of the spread of data-range, mean deviation, standard deviation, variance, coefficient of variation, standard error of mean.		
	UNIT-III	3.1 **Data graphics** Construction and labelling of graphs, histogram, Pie charts, scatter plots, semi-logarithmic plots 3.2**Basics of testing hypothesis** a) Null hypothesis, level of significance, power of test, P value, statistical estimation of confidence intervals. b) Level of significance (Parametric data)- students t test (paired and unpaired), chi Square test, Analysis of Variance (one-way and two way) Level of significance (Non-parametric data)-Sign test, Wilcoxan's signed rank test, Wilcoxan rank sum test, Mann Whitney U test, Kruskal-Wall's test (one way ANOVA) Linear regression and correlation-Introduction, Pearson's and Spearman's correlation and correlation co-efficient. Introduction to statistical software: SPSS, Epi Info, SAS.		
	UNIT-IV	**Statistical methods in epidemiology** Incidence and prevalence, relative risk, attributable risk		
	UNIT-V	**Computer applications in pharmacy <u>Computer System in Hospital Pharmacy</u>**: Patterns of Computer use in Hospital Pharmacy– Patient record data base management, Medication order entry – Drug labels and list – Intravenous solution and admixture, patient medication profiles, Inventory control, Management report & Statistics. **<u>Computer In Community Pharmacy</u>** Computerizing the Prescription Dispensing process Use of Computers for Pharmaceutical Care in community pharmacy Accounting and General ledger system **<u>Drug Information Retrieval & Storage</u>:** Introduction–Advantages of Computerized Literature Retrieval, Use of Computerized Retrieval		
	Mode of examination	Theory/Jury/Practical/Viva		
	Weightage Distribution	**Continuous Mode Assessment**	Sessional Exam	ESE
			30	70
	Text book/s*	Pharmaceuticalstatistics.Practicalandclinicalapplications.4th ed. 2003, Sanford Bolton, Marcel Dekker, Inc. and Suspensions, Marcel Dekker, INC, New York.		

	Other References	Pharmaceutical statistics. Practical and clinical Drug Information- A Guide for Pharmacists, Patrick M Malone, Karen L Kier, John E Stanovich, 5rdedition, Mc Graw Hill Publications 2014 Computer Application in Pharmacy–William E. Fassett, publisher– Lea & Febiger. Philadelphia.

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP405
2	Course Title	**Biopharmaceutics and Pharmacokinetics (Theory)**
3	Credits	-
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	Upon completion of the course, the students will be able ● Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance. ● Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination. ● To understand the concepts of bioavailability and bioequivalence of drug products and their significance. ● Understand various pharmacokinetic parameters, their significance & applications.
6	Course Outcomes	Students will be able: CO1: To describe the basic concepts of Biopharmaceutics and Pharmacokinetics. CO2: To understand *in-vitro* dissolution studies and in-vivo bioavailability studies CO3: To apply *in-vitro* dissolution studies and *in-vivo* bioavailability studies for various drugs and their formulations. CO4: To analyze plasma drug concentration profiles and prediction of pk parameters. CO5: To evaluate the pharmacokinetic parameters of a drug to fix the dosage regimen for the formulation. CO6: To create and conduct bioavailability and bio-equivalence studies for new drug formulations.
7	Course Description	The course aims to impart knowledge and skills of Biopharmaceutics and pharmacokinetics and their applications in pharmaceutical development, design of dose and dosage regimens, and in solving the associated problems.
8	Outline syllabus	
	UNIT I	**Biopharmaceutics** Introduction to Biopharmaceutics a. Absorption of drugs from gastrointestinal tract. b. Drug Distribution. Drug Elimination.

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP405
2	Course Title	**Biopharmaceutics and Pharmacokinetics (Theory)**
3	Credits	-
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	Upon completion of the course, the students will be able ● Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance. ● Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination. ● To understand the concepts of bioavailability and bioequivalence of drug products and their significance. ● Understand various pharmacokinetic parameters, their significance & applications.
6	Course Outcomes	Students will be able: CO1: To describe the basic concepts of Biopharmaceutics and Pharmacokinetics. CO2: To understand *in-vitro* dissolution studies and in-vivo bioavailability studies CO3: To apply *in-vitro* dissolution studies and *in-vivo* bioavailability studies for various drugs and their formulations. CO4: To analyze plasma drug concentration profiles and prediction of pk parameters. CO5: To evaluate the pharmacokinetic parameters of a drug to fix the dosage regimen for the formulation. CO6: To create and conduct bioavailability and bio-equivalence studies for new drug formulations.
7	Course Description	The course aims to impart knowledge and skills of Biopharmaceutics and pharmacokinetics and their applications in pharmaceutical development, design of dose and dosage regimens, and in solving the associated problems.
	UNIT II	**Pharmacokinetics** Introduction to Pharmacokinetics a. Mathematical models b. Drug levels in blood c. Pharmacokinetic Models Compartment models Pharmacokinetic study.
	Unit-III	**One Compartment Open model:** a. Intravenous injection (bolus) Intravenous injection **Multiple Compartment models** a. Two-compartment open model IV bolus, IV infusion, and oral administration

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP405
2	Course Title	**Biopharmaceutics and Pharmacokinetics (Theory)**
3	Credits	-
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	Upon completion of the course, the students will be able ● Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance. ● Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination. ● To understand the concepts of bioavailability and bioequivalence of drug products and their significance. ● Understand various pharmacokinetic parameters, their significance & applications.
6	Course Outcomes	Students will be able: CO1: To describe the basic concepts of Biopharmaceutics and Pharmacokinetics. CO2: To understand *in-vitro* dissolution studies and in-vivo bioavailability studies CO3: To apply *in-vitro* dissolution studies and *in-vivo* bioavailability studies for various drugs and their formulations. CO4: To analyze plasma drug concentration profiles and prediction of pk parameters. CO5: To evaluate the pharmacokinetic parameters of a drug to fix the dosage regimen for the formulation. CO6: To create and conduct bioavailability and bio-equivalence studies for new drug formulations.
7	Course Description	The course aims to impart knowledge and skills of Biopharmaceutics and pharmacokinetics and their applications in pharmaceutical development, design of dose and dosage regimens, and in solving the associated problems.
	UNIT-IV	**Multiple -Dosage regimens:** a. Repetitive Intravenous injections – One Compartment Open Model b. Repetitive Extravascular dosing – One Compartment Open model c. Multiple Dose Regimen – Two Compartment Open Model **Non-Linear Pharmacokinetics** a. Introduction b. Factors causing non-linearity Michaelis menton method of estimating various parameters

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP405
2	Course Title	**Biopharmaceutics and Pharmacokinetics (Theory)**
3	Credits	-
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	Upon completion of the course, the students will be able ● Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance. ● Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination. ● To understand the concepts of bioavailability and bioequivalence of drug products and their significance. ● Understand various pharmacokinetic parameters, their significance & applications.
6	Course Outcomes	Students will be able: CO1: To describe the basic concepts of Biopharmaceutics and Pharmacokinetics. CO2: To understand *in-vitro* dissolution studies and in-vivo bioavailability studies CO3: To apply *in-vitro* dissolution studies and *in-vivo* bioavailability studies for various drugs and their formulations. CO4: To analyze plasma drug concentration profiles and prediction of pk parameters. CO5: To evaluate the pharmacokinetic parameters of a drug to fix the dosage regimen for the formulation. CO6: To create and conduct bioavailability and bio-equivalence studies for new drug formulations.
7	Course Description	The course aims to impart knowledge and skills of Biopharmaceutics and pharmacokinetics and their applications in pharmaceutical development, design of dose and dosage regimens, and in solving the associated problems.
	UNIT-V	**Non-Compartmental Pharmacokinetics** a. Statistical moment theory. b. MRT for various compartment models. c. Physiological pharmacokinetic model. **Bioavailability and Bioequivalence** a. Introduction. b. Bioavailability study protocol. Methods of Assessment of Bioavailability
	Mode of examination	Theory/Jury/Practical/Viva

School:		**SOP**		
Program:		**Pharm.D.**		
Branch:		**Pharmacy**		
1	Course Code	PDP405		
2	Course Title	**Biopharmaceutics and Pharmacokinetics (Theory)**		
3	Credits	-		
4	Contact Hours (L-T-P)	3-1-0		
	Course Type	Compulsory		
5	Course Objective	Upon completion of the course, the students will be able ● Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance. ● Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination. ● To understand the concepts of bioavailability and bioequivalence of drug products and their significance. ● Understand various pharmacokinetic parameters, their significance & applications.		
6	Course Outcomes	Students will be able: CO1: To describe the basic concepts of Biopharmaceutics and Pharmacokinetics. CO2: To understand *in-vitro* dissolution studies and in-vivo bioavailability studies CO3: To apply *in-vitro* dissolution studies and *in-vivo* bioavailability studies for various drugs and their formulations. CO4: To analyze plasma drug concentration profiles and prediction of pk parameters. CO5: To evaluate the pharmacokinetic parameters of a drug to fix the dosage regimen for the formulation. CO6: To create and conduct bioavailability and bio-equivalence studies for new drug formulations.		
7	Course Description	The course aims to impart knowledge and skills of Biopharmaceutics and pharmacokinetics and their applications in pharmaceutical development, design of dose and dosage regimens, and in solving the associated problems.		
	Weightage Distribution	**Continuous Mode Assessment**	Sessional Exam	ESE
			30	70
	Text book/s*	*1. Brahmankar DM, Sunil BJ. Bio pharmaceutics and Pharmacokinetics-A Treatise, Vallabh PrakashanPitampura,Delhi.* *2. Shargel L, Pong WU. Applied Biophrmaceutics& Pharmacokinetics, Mc Graw Hill.*		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP405
2	Course Title	**Biopharmaceutics and Pharmacokinetics (Theory)**
3	Credits	-
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	Upon completion of the course, the students will be able ● Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance. ● Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination. ● To understand the concepts of bioavailability and bioequivalence of drug products and their significance. ● Understand various pharmacokinetic parameters, their significance & applications.
6	Course Outcomes	Students will be able: CO1: To describe the basic concepts of Biopharmaceutics and Pharmacokinetics. CO2: To understand *in-vitro* dissolution studies and in-vivo bioavailability studies CO3: To apply *in-vitro* dissolution studies and *in-vivo* bioavailability studies for various drugs and their formulations. CO4: To analyze plasma drug concentration profiles and prediction of pk parameters. CO5: To evaluate the pharmacokinetic parameters of a drug to fix the dosage regimen for the formulation. CO6: To create and conduct bioavailability and bio-equivalence studies for new drug formulations.
7	Course Description	The course aims to impart knowledge and skills of Biopharmaceutics and pharmacokinetics and their applications in pharmaceutical development, design of dose and dosage regimens, and in solving the associated problems.
	Other References	*1. Milo GD. Pharmacokinetics: R. MercelDekkerInc.* *2. Milo G, Laurie P. Hand Book of Clinical Pharmacokinetics, by ADIS Health SciencePress.* *3. Abdou HM, Mack, Dissolution, Bioavailability and Bioequivalence, Publishing Company, Pennsylvania, 1989.* *4. James S, James, Roylan C, Encyclopedia of Pharmaceutical Technology, Vol 13, Marcel Dekker Inc, New York1996.*

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP410
2	Course Title	**Biopharmaceutics and Pharmacokinetics (Practical)**
3	Credits	-
4	Contact Hours (L-T-P)	0-0-3
	Course Type	Compulsory
5	Course Objective	Upon completion of the course, the students will be able ● Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance. ● Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination. ● To understand the concepts of bioavailability and bioequivalence of drug products and their significance. ● Understand various pharmacokinetic parameters, their significance & applications.
6	Course Outcomes	Students will be able to: CO1: Describe the basic concepts of dissolution and protein binding. CO2: Understand *in-vitro* dissolution studies and in-vivo bioavailability studies CO3: Understand and apply *urination excretion* studies and Calculation of AUC. CO4: Understand Bioequivalency studies on the different drugs marketed. CO5: Understand metabolic pathways for different drugs based on elimination kinetics data. CO6: To apply and Calculation of elimination half-life for different drugs by using urinary elimination data, blood level data and Determination of renal clearance.
7	Course Description	The course aims to impart knowledge and skills of Biopharmaceutics and pharmacokinetics and their applications in pharmaceutical development, design of dose and dosage regimens, and in solving the associated problems.
8	Outline syllabus	
	UNIT I	1.Improvement of dissolution characteristics of slightly soluble drugs by some methods. 2.Comparison of dissolution studies of two different marketed products of same drug. 3.Influence of polymorphism on solubility and dissolution. 4.Protein binding studies of a highly protein bound drug and poorly protein bound drug.

	UNIT II	5.Extent of plasma-protein binding studies on the same drug (i.e. highly and poorly protein bound drug) at different concentrations in respect of constant time. 6.Bioavailability studies of some commonly used drugs on animal/human model. 7.Calculation of Ka, Ke, $t_1/2$, Cmax, AUC, AUMC, MRT etc. from blood profile data.		
	UNIT-III	8.Calculation of bioavailability from urinary excretion data for two drugs. 9.Calculation of AUC and bioequivalence from the given data for two drugs. 10.In vitro absorption studies.		
	UNIT-IV	11.Bioequivalency studies on the different drugs marketed. (eg) Tetracycline, Sulphamethoxzole, Trimethoprim, Aspirin etc., on animals and human volunteers. 12.Absorption studies in animal inverted intestine using various drugs. 13.Effect on contact time on the plasma protein binding of drugs.		
	UNIT-V	14**.** Studying metabolic pathways for different drugs based on elimination kinetics data. 15.Calculation of elimination half-life for different drugs by using urinary elimination data and blood level data. 16.Determination of renal clearance.		
	Mode of examination	Practical/Viva		
	Weightage Distribution	**Continuous Mode Assessment**	Sessional Exam	ESE
			30	70
	Text book/s*	1.Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi 2.Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.		
	Other References	*1. Milo GD. Pharmacokinetics: R. MercelDekkerInc.* *2. Milo G, Laurie P. Hand Book of Clinical Pharmacokinetics, by ADIS Health SciencePress.* *3. Abdou HM, Mack, Dissolution, Bioavailability and Bioequivalence, Publishing Company, Pennsylvania, 1989.* *4. James S, James, Roylan C, Encyclopedia of Pharmaceutical Technology, Vol 13, Marcel Dekker Inc, New York1996.*		

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP406
2	Course Title	**Clinical Toxicology (Theory)**
3	Credits	-
4	Contact Hours (L-T-P)	2-1-0
	Course Type	Compulsory
5	Course Objective	Upon completion of the course, the students will be able to Involves the research, prevention and treatment of diseases caused by chemicals, drugs and toxins. Special attention is paid to levels of chemical exposure and to the effects that exposure can have on people and the environment.
6	Course Outcomes	Students will be able to: CO1: Describe general principles involved in the management of poisoning. CO2: Differentiate the clinical symptoms of various acute poisonings. CO3: Manage the clinical symptoms of different chronic poisonings and distinguish the clinical symptoms of chronic poisoning by heavy metals. CO4: Manage the various clinical symptoms of different chronic poisoning by Venomous snake bites. CO5: Recognize the clinical symptoms and management of food poisoning and poisoning by various plants. CO6: Recognize the clinical symptoms and management of envenomation.
7	Course Description	Clinical toxicology is concerned with the risk assessment and management of drugs, chemicals and venoms in humans.
8	Outline syllabus	
	UNIT I	a.General principles involved in the management of poisoning b.Antidotes and the clinical applications. c.Supportive care in clinical Toxicology. d.Gut Decontamination. Elimination Enhancement. e.Toxicokinetics

	UNIT II	Clinical symptoms and management of acute poisoning with the following agents – a) Pesticide poisoning: organophosphorous compounds, carbamates, organochlorines, pyrethroids. b) Opiates overdose. c) Antidepressants d) Barbiturates and benzodiazepines. e) Alcohol: ethanol, methanol. f) Paracetamol and salicylates. g) Non-steroidal anti-inflammatory drugs. h) Hydrocarbons: Petroleum products and PEG. i) Caustics: inorganic acids and alkali. j) Radiation poisoning		
	Unit-III	Clinical symptoms and management of chronic poisoning with the following agents – Heavy metals: Arsenic, lead, mercury, iron, copper		
	UNIT-IV	Venomous snake bites: Families of venomous snakes, clinical effects of venoms, general management as first aid, early manifestations, complications and snake bite injuries.		
	UNIT-V	Plants poisoning. Mushrooms, Mycotoxins. Food poisonings Envenomations – Arthropod bites and stings. Substance abuse: Signs and symptoms of substance abuse and treatment of dependence a) CNS stimulants: amphetamine b) Opioids c) CNS depressants d) Hallucinogens: LSD e) Cannabis group f) Tobacco		
	Mode of examination	Theory /Viva		
	Weightage Distribution	**Continuous Mode Assessment**	Sessional Exam	ESE
			30	70
	Text book/s*	1 .Matthew J Ellenhorn. ELLENHORNS MEDICAL TOXICOLOGY – DIAGNOSIS AND TREATMENT OF POISONING. Second edition. Williams and Willkins publication, London		

	Other References	V V Pillay. HANDBOOK OF FORENSIC MEDICINE AND TOXICOLOGY. Thirteenth edition 2003 Paras Publication, Hyderabad

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP501
2	Course Title	Clinical Research (Theory)
3	Credits	-
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	The primary objectives of this course is to 1. Know the concept of new drug development process. 2. Understand the regulatory and ethical requirements. 3. Conduct the clinical trials in accordance with regulatory and ethical requirements. 4. Coordinate the clinical trials and promote quality drug trial research.
6	Course Outcomes	Students will be able: CO1: To describe the various approaches to drug discovery, developments an requirements of drug regulatory bodies at national and international level CO2: To understand the various phases of clinical trials and various methods of post marketing surveillance. CO3: To Apply good clinical practice as per ICH guidelines. CO4 :To Organize the roles and responsibilities of the personnel involved in conduct of clinical research to ensure the quality research is undertaken CO5: To appraise the clinical study documents and safety monitoring in clinical trials. CO6: To assess and manage ethical aspects of conduct of clinical trial.
7	Course Description	This course is designed to make the students to understand the principles and gain adequate knowledge regarding the various approaches to drug discovery including clinical phase of development. Also enables the students to understand and implement all regulatory and ethical requirements that are required during the process of drug development.
8	Outline syllabus	
	UNIT-I	**Drug development process:** Introduction, Various Approaches to drug discovery Pharmacological & Toxicological aspects IND Application, Drug characterization and Dosage forms.
	UNIT-II	**Clinical development of drug: Introduction to Clinical trials.** **Various phases of clinical trial** Methods of Post Marketing Surveillance Abbreviated New Drug Application submission

	UNIT-III	**Good Clinical Practice:** ICH, GCP, Central drug standard control organisation (CDSCO) guidelines Challenges in the implementation of guidelines**,** Ethical guidelines in clinical research.		
	UNIT-IV	Composition, responsibilities, procedures of IRB / IEC Overview of regulatory environment in USA, Europe and India. **Role and responsibilities of clinical trial personnel as per ICH GCP** a. Sponsor b. Investigators c. Clinical research associate d. Auditors e. Contract research coordinators f. Regulatory authority		
	UNIT-V	Designing of clinical study documents (protocol, CRF, ICF, PIC with assignment) Informed consent process, Data management and its components Safety monitoring in clinical trials Data management and its components Safety monitoring in clinical trials		
	Mode of examination	Theory/Jury/Practical/Viva		
	Weightage Distribution	**Continuous Mode Assessment**	Sessional Exam	ESE
			30	70
	Text book/s*	1.David Machin, Textbook of Clinical Trials edited, Simon Day and Sylvan Green, March 2005, John Wiley and Sons.		

	Other References	1. *Central Drugs Standard Control Organization. Good Clinical Practices-Guidelines forClinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health;2001.* 2. *International Conference on Harmonisation of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonised Tripartite Guideline. Guideline for Good Clinical Practice.E6; May 1996.* 3. *Ethical Guidelines for Biomedical Research on Human Subjects 2000. Indian Council of Medical Research, New Delhi.* 4. *Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green,March 2005, John Wiley and Sons.* 5. *Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.* 6. *Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.* 7. *Goodman & Gilman: JG Hardman, LE Limbard, 10th Edn. McGraw Hill Publications, 2001.* *Latest editions of a of all the suggested books are recommended.*

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP502
2	Course Title	**Pharmacoepidemiology and Pharmacoeconomics (Theory)**
3	Credits	-
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	The primary objectives of this course are to 1.Understand the scope and applications of pharmacoepidemiology and pharmacoeconomics. 2.Understand pharmacoepidemiological outcome measures 3.Adopt the tools effectively in evaluating risk and benefit of therapy 4. Conduct pharmacoepidemiology studies and evaluate the outcomes of measures 5.Understand the pharmacoepidemiological databases 6. Understand pharmacoeconomic outcome measures 7. Conduct pharmacoeconomic studies and evaluate the outcomes of treatment 8. Understand the applications of softwares in Pharmacoepidemiology and Pharmacoeconomic analysis.
6	Course Outcomes	Student would be able: CO1: To describe the concept of pharmacoepidemiology and pharmacoeconomics. CO2: To Identify the risk factors related to the occurrence of disease. CO3: To demonstrate the various Pharmacoepidemiological methods with the help of case studies. CO4: To analyze the outcomes based case study reports to minimize cost of drug therapy. CO5: T appraise the current pharmacoeconomic evaluation methods CO6.To develop the Softwares used in Pharmacoepidemiology and Pharmacoeconomics Analysis
7	Course Description	This course is designed to to impart knowledge regarding various methods and applications of pharmacoepidemiology and pharmacoeconomics in drug safety monitoring, drug approval & regulations, examine the costs of different therapeutic interventions and therapeutic outcomes.
8	Outline syllabus	
	UNIT-I	**Pharmacoepidemiology:** **Definition and scope:** Origin and evaluation of pharmacoepidemiology Need for pharmacoepidemiology Aims and applications.

	UNIT-II	**Measurement of outcomes in pharmacoepidemiology** Outcome measure and drug use measures Prevalence, incidence and incidence rate. Monetary units, number of prescriptions, units of drugs dispensed, defined daily doses and prescribed daily doses, medication adherence measurement **Concept of risk in pharmacoepidemiology** Measurement of risk, attributable and relative risk, time-risk relationship and odds ratio.		
	UNIT-III	**Pharmacoepidemiological methods** Including theoretical aspects and practical studies of various methods with the help of case studies. Drug utilization review, case reports, case series, surveys of drug use, cross–sectional studies, cohort studies, case control studies, case –cohort studies Meta– analysis, spontaneous reporting, prescription event monitoring and record linkage system.		
	UNIT-IV	**Sources of data for pharmacoepidemiological studies:** Adhoc data sources and Automated data systems. **Selected special applications of Pharmacoepidemiology:** Studies of vaccine safety, Hospital pharmacoepidemiology, Pharmacoepidemiology and risk management, Drug induced birth defects.		
	UNIT-V	**Pharmacoeconomics** **1. Definition, history, needs of pharmacoeconomic evaluations** Role in formulary management decision and **Pharmacoeconomic evaluation:** Outcome assessment and types of evaluation Includes theoretical aspects of various methods Practical study of various methods with the help of case studies for individual methods: Cost – minimization, cost- benefit, cost – effectiveness, cost utility **Applications of Pharmacoeconomic** Software and case studies		
	Mode of examination	Theory/July		
	Weightage Distribution	**Continuous Mode Assessment**	Sessional Exam	ESE
			30	70
	Text book/s*	1. *Parthasarathi, G., 2004. COUNTRY PROFILE: INDIA. A Text Book of Clinical Pharmacy Practice: Essential Concepts and Skills, p.458.* *Remington, J.P., 2006. Remington: the science and practice of pharmacy (Vol. 1). Lippincott Williams & Wilkins.*		

	Other References	1. *Joseph T Dipiro, Pharmacotherapy – A Pathophysiologic Approach, 5th Edn. Published by McGraw – Hill medical publication,2002.* 2. *Leon Shargel, Comprehensive Pharmacy Review: 5th Edn. Published by Lippincot Williams & Wilkins2004.* 3. *Scott L Traub, Basic skills in interpreting lab data: 2nd Edn. Published by American Society of Health System Pharmacist1996.* 4. *Avery's Drug Treatment, 4th Edn, 1997, AdisInternationalLimited.* **Latest editions of all the suggested books arerecommended.*

School:		**SOP**
Program:		**Pharm.D.**
Branch:		**Pharmacy**
1	Course Code	PDP503
2	Course Title	**Clinical Pharmacokinetics and Pharmacotherapeutic Drug Monitoring (Theory)**
3	Credits	-
4	Contact Hours (L-T-P)	2-1-0
	Course Type	Compulsory
5	Course Objective	On completion of the course, the student shall be able to 1. Design the drug therapy regimen for individual patient 2. Interpret and correlate the plasma drug concentration with patient's therapeutic outcome. 3. Recommend dosage adjustment for patients with renal/ hepatic impairment Detect and manage drug-drug interactions
6	Course Outcomes	Students will be able: CO1 :To Describe the dosage regimen for the given drug based on the pharmacokinetic principles and route of administration CO2 : To understand the potential drug-drug interactions in a given case with appropriate recommendations for dosage adjustments CO3 : To interpret the results of therapeutic drug monitoring services of various drugs and give required recommendations for the dosage adjustment of those drugs, if required towards optimizing the treatment outcome CO4: To analyze the Individualize dosage regimen for the patients with altered pharmacokinetics viz. renal / hepatic impairment, pediatrics, geriatrics, etc. CO5 : To appraise the genetic polymorphisms of the patients, if any with the clinical outcomes of the patients CO6 : To design the protocol(s) for the therapeutic drug monitoring of drug(s) and initiate the service in collaboration with other healthcare team members
7	Course Description	This course is designed to make the students to understand and apply pharmacokinetic principles in designing / individualizing dosage regimen. Also, enable the students to interpret the plasma drug range, and hepatic / renal function in optimizing the drug therapy.
8	Outline syllabus	

	UNIT-I	**Introduction to Clinical Pharmacokinetics,** **Design of Dosage Regimens** Nomograms and Tabulations in designing dosage regimen, Conversion from intravenous to oral dosing, Determination of dose and dosing intervals, Drug dosing in the elderly and pediatrics and obese patients.		
	UNIT-II	**Pharmacokinetics of Drug Interactions**: Pharmacokinetic drug interactions Inhibition and Induction of Drug metabolism Inhibition of Biliary Excretion.		
	UNIT-III	**Therapeutic Drug monitoring:**Introduction, Individualization of drug dosage regimen (Variability – Genetic, Age and Weight, disease, Interacting drugsIndications for TDM.Protocol for TDM.Pharmacokinetic/Pharmacodynamic correlation in drug therapy. TDM of drugs used in the following disease conditions: cardiovascular disease, Seizure disorders, Psychiatric conditions, and Organ transplantations.		
	UNIT-IV	**Dosage adjustment in Renal and hepatic Disease.** Renal impairment, Pharmacokinetic considerations General approach for dosage adjustment in Renal disease ,Measurement of Glomerular Filtration rate and creatinine clearance. Dosage adjustment for uremic patients.,Extracorporeal removal of drugs.,Effect of Hepatic disease on pharmacokinetics.		
	UNIT-V	**Population Pharmacokinetics.** Introduction to Bayesian Theory.,Adaptive method or Dosing with feedback.,Analysis of Population pharmacokinetic Data.		
		Pharmacogenetics Genetic polymorphism in Drug metabolism: Cytochrome P-450 Isoenzymes, Genetic Polymorphism in Drug Transport and Drug Targets. Pharmacogenetics and Pharmacokinetics/Pharmacodynamic considerations		
	Mode of examination	Theory		
	Weightage Distribution	**Continuous Mode Assessment**	Sessional Exam	ESE
			30	70

	Text book/s*	1. *Shargel, L., Andrew, B.C. and Wu-Pong, S., 1999. Applied biopharmaceutics & pharmacokinetics (Vol. 264). Stamford: Appleton & Lange.* *Malcom Rowland & Thomas Tozer. 1995.Clinical Pharmacokinetics – Concepts and Applications. 3rd Edn.*
	Other References	1. *Joseph T Dipiro, Pharmacotherapy,2002. A Pathophysiologic Approach, 5th Edn. Appleton & Lange* 2. *Bertram G Katzung, 2004.Basic and Clinical Pharmacology. 9th Edn. Lange Publications,* 3. *Eric T Herfindal,2000 Textbook of therapeutics, drug and disease management:7th Edn. Williams & Wilkins Publications,* 4. *Wolfgang A. Ritschel, Gregory L. Kearns. Hand Book ofBasic Pharmacokinetics. 5th Edn.* 5. *Trevor M Speight, Nicholas HG et al,1997. Avery's Drug Treatment:4th Edn. Adis International Ltd.* *Latest editions of all the suggested books are recommended.*