Course Code	PRY401	Title of the Course	PHARMACOTHERAPEUTICS-III	SDG Goals	L	T	P	C
Year	P.B. I	Semester	ANNUAL		3	1	-	4

Course Objectives

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 individualized therapeutic plans based on diagnosis;
e. The 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. 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 individualized 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).

Course Outcomes	
CO1	Develop treatment strategies for peptic ulcer disease, GERD, and IBD using clinical guidelines and patient-specific factors.
CO2	Apply pharmacological principles to manage alcoholic liver disease, viral hepatitis, jaundice, and drug-induced liver disorders, ensuring drug safety.
CO3	Evaluate and manage anemia, venous thromboembolism, and drug-induced blood disorders, ensuring proper drug selection and monitoring.
CO4	Optimize drug therapy for epilepsy, Parkinson's disease, Alzheimer's disease, and stroke based on patient response and evidence-based guidelines.
CO5	Implement pharmacotherapeutic interventions for schizophrenia, affective disorders, anxiety, sleep disorders, and OCD, ensuring efficacy and safety.
CO6	Assess and improve pain management plans for neuropathic pain, headaches, and neuralgias, ensuring opioid safety. Evaluate pharmacotherapy using evidence-based medicine, clinical guidelines, and research for better treatment decisions.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO	SDG Targets
1.	**Gastrointestinal system**	Peptic ulcer disease, gastro esophageal reflux disease, inflammatory bowel disease,	12	1	-----
2.	**Liver disorders**	Alcoholic liver disease, viral hepatitis including jaundice, and drug induced liver disorders.	12	2	3.5
3.	**Haematological system**	Anaemias, venous thromboembolism, drug induced blood disorders.	12	3	-------
4.	**Nervous system**	Epilepsy, Parkinsonism, Alzheimer's disease, stroke.	12	4	------
5.	**Psychiatry disorders**	Schizophrenia, affective disorders, anxiety disorders, sleep disorders, obsessive compulsive disorders	12	5	------
6.	**Pain & Evidence Based Medicine**	Pain management including pain pathways, neuralgias, headaches and evidence based medicine.	12	6	-----

Reference Books:

1. Pharmacotherapy: A Pathophysiologic Approach by Joseph T. Dipiro. 11th Edition.
2. Clinical Pharmacy and Therapeutics by Roger Walker. 5th Edition.
3. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA
4. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication.
5. Pathologic basis of disease - Robins SL, W.B. Saunders Publication.
6. Pathology and therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice - Green and Harris, Chapman and Hall publication.

e-Learning Source:

https://www.google.co.in/books/edition/Pocket_Handbook_of_GI_Pharmacotherapeuti/x3SjDDjlW00C?hl=en&gbpv=1&dq=Pharmacotherapeutics-III&printsec=frontcover

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	1	1	2	2	1	1	1	2	3	1	3	-	-	-
CO2	3	3	3	1	1	2	2	1	1	1	2	3	1	3	-	-	-
CO3	3	3	3	1	1	2	2	1	1	1	2	3	1	3	-	-	-
CO4	3	3	3	1	1	2	2	1	1	1	2	3	1	3	-	-	-
CO5	3	3	3	1	1	2	2	1	1	1	2	3	1	3	-	-	-
CO6	3	3	3	1	1	2	2	1	1	1	2	3	1	3	-	-	-

1. Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HOD

Course Code	PRY402	Title of the Course	PHARMACOTHERAPEUTICS-III	L	T	P	C
Year	P.B. I	Semester	ANNUAL	-	-	3	1.5
Course Objectives	To describe the pathophysiology of selected disease states and explain the rationale for drug therapy; To summarize the therapeutic approach to management of these diseases including reference to the latest available evidence; To discuss the controversies in drug therapy; To discuss the preparation of individualised therapeutic plans based on diagnosis; and 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).						

Course Outcomes	
CO1	Students understand the pathophysiology & diagnosis of GIT & liver disorder and their management/controversies including 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).
CO2	Students have ability to explore the pathophysiology & diagnosis of hematological disorder and their management/controversies.
CO3	Students have ability to effectively communicate the pharmacotherapy of CNS disorder and their management/controversies.
CO4	Students analyzed the pathophysiology & diagnosis of Psychiatric disorder and their management/controversies including patient-specific parameters relevant in initiating drug therapy and monitoring therapy.
CO5	Students analyzed the pathophysiology & diagnosis of Schizophrenia, affective disorders, anxiety disorders, sleep disorders, obsessive compulsive disorders and their management/controversies including patient-specific parameters relevant in initiating drug therapy and monitoring therapy.
CO6	Students analyze the Pharmacotherapeutics of Pain management including pain pathways, neuralgias, headaches and evidence based medicine.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1.	Case study	Case study on Gastrointestinal & Liver disorders	12	1
2.	Case study	Case study on Haematological disorders	12	2
3.	Case study	Case study on Nervous system disorders	12	3
4.	Case study	Case study on Psychiatry disorders	12	4
5.	Case study	Case study on Pain and its managements	12	5
e-Learning Source:				
https://www.google.co.in/books/edition/Pharmacology_and_Pharmacotherapeutics/FR4OEAAAQBAJ?hl=en&gbpv=1&dq=PHARMACOTHERAPEUTICS&printsec=frontcover				

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)															
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	2	2	2	1	1	1	1	2	3	2	2	-	-	-
CO2	3	3	2	2	2	2	1	1	1	1	2	3	2	2	-	-	-
CO3	3	3	2	2	2	2	1	1	1	1	2	3	2	2	-	-	-
CO4	3	3	2	2	2	2	1	1	1	1	2	3	2	2	-	-	-
CO5	3	3	2	2	2	2	1	1	1	1	2	3	2	2	-	-	-
CO6	3	3	2	2	2	2	1	1	1	1	2	3	2	2	-	-	-

1. Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HOD

Course Code	PRY403	Title of the Course	BIOPHARMACEUTICS & PHARMACOKINETICS	SDG Goals	L	T	P	C
Year	P.B. I	Semester	ANNUAL		3	1	-	3
Course Objective	1. Upon completion of the course, the candidate shall have the ability to calculate 2. Pharmacokinetic parameters from the given data, apply principles of pharmacokinetics in the design of new formulations and conduct bioavailability and bioequivalence studies.							

Course Outcomes	
CO1	Know the process of absorption, distribution, excretion and biotransformation.
CO2	Explain basic concepts of biopharmaceutics and pharmacokinetics.
CO3	Calculate Pharmacokinetic parameters from the given data.
CO4	Apply principles of pharmacokinetics in the design of new formulations.
CO5	Conduct bioavailability and bioequivalence studies.
CO6	Applications of pharmacokinetics parameters in pharmacy practice.

UnitNo.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO	SDG Targets
1	**Introduction to Biopharmaceutics**	Introduction to Biopharmaceutics a. Absorption of drugs from gastrointestinal tract. b. Drug Distribution. c. Drug Elimination.	15	1	9.5
2	**Pharmacokinetics**	Introduction to Pharmacokinetics. a. Mathematical model b. Drug levels in blood. c. Pharmacokinetic model d. Compartment models e. Pharmacokinetic study.	12	2	9.5
3	**Compartment models**	A. One compartment open model. a. Intravenous Injection (Bolus) b. Intravenous infusion. B. Multicompartment models. a. Two compartment open model. b. IV bolus, IV infusion and oral administration	15	3	9.5
4	**Multiple Dosage Regimens.**	a. Repititive Intravenous injections – One Compartment Open Model b. Repititive Extravascular dosing – One Compartment Open model c. Multiple Dose Regimen – Two Compartment Open Model	12	4	9.5
5	**Nonlinear Pharmacokinetics.**	Introduction to Nonlinear pharmacokinetics a. Introduction b. Factors causing Non-linearity. c. Michaelis-menton method of estimating parameters. B. Noncompartmental Pharmacokinetics. a. Statistical Moment Theory. b. MRT for various compartment models. c. Physiological Pharmacokinetic model.	18	5	9.5
6	**Bioavailability and Bioequivalence**	Introduction to bioavailability. a. Bioavailability study protocol. b. Methods of Assessment of Bioavailability	15	1	9.5

Reference Books:

Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi.

Biopharmaceutics and Pharmacokinetics; By Robert F Notari

Applied biopharmaceutics and pharmacokinetics, Leon Shargel and Andrew B.C.YU 4th edition,Prentice-Hall Inernational edition.USA

Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B.Jaiswal,Vallabh Prakashan Pitampura, Delhi

Pharmacokinetics: By Milo Glbaldi Donald, R. Mercel Dekker Inc.

Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott.

e-Learning Source:

https://toaz.info/doc-view

Course Code	PRY404	Title of the Course	BIOPHARMACEUTICS & PHARMACOKINETICS	L	T	P	C
Year	IV	Semester	ANNUAL	-	-	3	-
Course Objectives	1. Upon completion of the course, the candidate shall have the ability to calculate Pharmacokinetic parameters from the given data, 2. Apply principles of pharmacokinetics in the design of new formulations and conduct bioavailability and Bioequivalence studies.						

Course Outcomes	
CO1	Explain basic concepts of bio pharmaceutics and pharmacokinetics
CO2	Calculate Pharmacokinetic parameters from the given data.
CO3	Apply principles of pharmacokinetics in the design of new formulations.
CO4	Conduct bioavailability and bioequivalence studies.
CO5	Applications of pharmacokinetics parameters in pharmacy practice.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1.	Introduction to dissolution apparatus	Improvement of dissolution characteristics of slightly soluble drugs by some methods.	3	1
2.	Introduction to buffers	Comparison of dissolution studies of two different marketed products of same Drug.	3	1
3.	Preparation of standard curve	Influence of polymorphism on solubility and dissolution.	3	5
4.	Drug release study	Protein binding studies of a highly protein bound drug and poorly protein bound Drug.	3	4
5.	Drug release study	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.	3	4
6.	Drug release study	Bioavailability studies of some commonly used drugs on animal/human model.	3	4
7.	Calculation of Pharmacokinetics Parameters.	Calculation of Ka, Ke, t1/2, Cmax, AUC, AUMC, MRT etc. from blood profile data.	3	2
8.	Calculation of Pharmacokinetics Parameters.	Calculation of bioavailability from urinary excretion data for two drugs.	3	2
9.	Calculation of Pharmacokinetics Parameters.	Calculation of AUC and bioequivalence from the given data for two drugs.	3	2
10.	Drug absorbtion study.	In vitro absorption studies.	3	4
11.	Bio equivalency study.	Bio equivalency studies on the different drugs marketed.(eg) Tetracycline, Sulphamethoxzole, Trimethoprim, Aspirin etc., on animals and human volunteers.	3	4
12.	Absorbtion study.	Absorption studies in animal inverted intestine using various drugs.	3	4
13.	Calculation of Pharmacokinetics Parameters.	Effect on contact time on the plasma protein binding of drugs.	3	4
14.	Calculation of Pharmacokinetics Parameters.	Studying metabolic pathways for different drugs based on elimination kinetics data.	3	2
15.	Calculation of Pharmacokinetics Parameters.	Calculation of elimination half-life for different drugs by using urinary elimination Data and blood level data.	3	2
16.	Calculation of Pharmacokinetics Parameters.	Determination of renal clearance.	3	2

e-Learning Source:

https://www.slideshare.net/grakbph040/biopharmaceutics-and-pharmacokinetics-practical-manual

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	2	2	3	2	1	2	3	3	3	3	2	-	-	-
CO2	3	3	2	2	2	3	2	1	2	3	3	3	3	2	-	-	-
CO3	3	3	2	2	2	3	2	1	2	3	3	3	3	2	-	-	-
CO4	3	3	2	2	2	3	2	1	2	3	3	3	3	2	-	-	-
CO5	3	3	2	2	2	3	2	1	2	3	3	3	3	2	-	-	-

1. Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HOD

Course Code	PRY405	Title of the Course	HOSPITAL PHARMACY	SDG Goals	L	T	P	C
Year	P.B. I	Semester	ANNUAL		3	1	4	4

Course Objectives

1. To prepare students as health care experts with emphasis on inter-professional healthcare team based patient care.
2. To develop the skills in monitoring of the National Health Programmes and schemes, oriented to provide preventive and promotive health care services to the community.
3. To impart applied knowledge related to clinical discussions, attending ward rounds, follow-up progress of patients, case presentation at discharge are imbibed through hospital postings.
4. To develop a trained clinical pharmacist who functions effectively as a member of a health care team organized to deliver the health and family welfare services in the existing socio-economic environment.
5. To promote health, wellness and disease prevention by developing the rational use of drugs.
6. To understand the clinical aspects of drug development, such as phases, ethical issues, and roles and responsibilities of clinical trial personnel, design of clinical study documents, data management and safety monitoring in clinical trials.

Course Outcomes	
CO1	Describe the organizational structure of hospital & hospital pharmacy
CO2	Understand budget and implementation of different drug policies & committees in the hospital
CO3	Appreciate various procedure for procuring and warehousing along with drug distribution methods and inventory management in the hospital pharmacy
CO4	Know the manufacturing practices of various formulations at hospital set-up
CO5	Develop and maintain the knowledge through continuing Professional development programs and ability in Handling and packaging of radiopharmaceuticals
CO6	Explain the professional relations and practices of hospital pharmacist

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO	SDG Target
1	**Hospital**	Its Organization and functions. Hospital pharmacy-Organization and management. Organizational structure-Staff, Infrastructure & workload statistics. Management of materials and finance, Roles & responsibilities of hospital pharmacist	2	1	3.8, 3.d
2	**The Budget**	Preparation and implementation Hospital drug policy Pharmacy and Therapeutic committee (PTC) b) Hospital formulary c) Hospital committees Infection committee Research and ethical committee d) Developing therapeutic guidelines e) Hospital pharmacy communication – Newsletter	2	2	3.7, 3.8, 3.c, 3.d
3	**Hospital pharmacy services**	a) Procurement & warehousing of drugs and Pharmaceuticals b) Inventory control Definition, various methods of Inventory Control ABC, VED, EOQ, Lead time, safety stock c) Drug distribution in the hospital i) Individual prescription method ii) Floor stock method iii) Unit dose drug distribution method d) Distribution of Narcotic and other controlled substances e) Central sterile supply services – Role of pharmacist	2	3	3.7, 3.8, 3.a, 3.c, 3.d
4	**Manufacture of Pharmaceutical preparations**	a) Sterile formulations – large and small volume parenterals b) Manufacture of Ointments, Liquids, and creams c) Manufacturing of Tablets, granules, capsules, and powders d) Total parenteral nutrition	2	4	-----
5	**Continuing professional development programs**	Education and training Radio Pharmaceuticals – Handling and packaging	2	5	3.8, 3.9
6	**Practice in Hospital**	Professional Relations and practices of hospital pharmacist.	2	6	3.4, 3.7

Reference Books:

WHO consultative group report.

R.P.S. Vol.2. Part –B; Pharmacy Practice section.

Handbook of pharmacy – Health care. Edt. Robin J Harman. The Pharmaceutical press.

e-Learning Source:

https://www.google.co.in/books/edition/Hospital_Pharmacy/kdAMf8f8RPwC?hl=en&gbpv=1&dq=hospital+pharmacy+pharm+d&printsec=frontcover

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																
PO-PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	3	3	2	2	2	2	1	1	1	1	2	1	3	3	-	-	-
CO2	3	3	2	2	2	2	1	1	1	1	2	2	3	3	-	-	-
CO3	3	3	2	2	2	2	1	1	1	1	2	3	3	2	-	-	-
CO4	3	3	2	2	2	2	1	1	1	1	2	2	3	2	-	-	-
CO5	3	3	2	2	2	2	1	1	1	1	2	1	3	2	-	-	-
CO6	3	3	2	2	2	2	1	1	1	1	2	2	1	1	-	-	-

1. Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HOD**

Course Code	PRY406	Title of the Course	HOSPITAL PHARMACY	L	T	P	C
Year	P.B. I	Semester	ANNUAL	-	-	3	-
Course Objectives	1. Assessment of drug interactions in given prescriptions. 2. Manufacture of parenteral formulations, powders. 3. Drug information queries and inventory control						

Course Outcomes	
CO1	Know various drug distribution methods.
CO2	Know the professional practice management skills in hospital pharmacies.
CO3	Provide unbiased drug information to the doctors.
CO4	Know the manufacturing practices of various formulations in hospital set up.
CO5	Appreciate the stores management and inventory control including practice based research methods.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO	SDG Target
1.	**Management**	Design and Management of Hospital pharmacy department for a 300 bedded hospital.	3	1	
2.	**P.T.C**	Pharmacy and Therapeutics committee-Organization, function and limitations.	3	2	
3.	**Hospital formulary**	Development of hospital formulary for 300 bedded teaching hospital.	3	4	
4.	**ABC analysis**	Preparation of ABC analysis of drugs sold in one month from the pharmacy.	3	5	
5.	**Evaluation of clinical trials**	Different phases of clinical trials with elements to be evaluated.	3	2	
6.	**Drug information**	Various sources of drug information and systemic approach to provide unbiased drug information.	3	3	
7.	**Drug interaction**	Evaluation of prescriptions generated in hospital for drug interaction and find out the suitable management.	3	2	
e-Learning Source:					
https://www.google.co.in/books/edition/Hospital_Pharmacy/kdAMf8f8RPwC?hl=en&gbpv=1&dq=hospital+pharmacy+pharm+d&printsec=frontcover					

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	1	2	2	1	1	1	-	-	1	3	3	-	-	-
CO2	3	3	2	1	2	2	1	1	1	-	-	2	3	3	-	-	-
CO3	3	3	2	1	2	2	1	1	1	-	-	3	3	2	-	-	-
CO4	3	3	2	1	2	2	1	1	1	-	-	2	3	2	-	-	-
CO5	3	3	2	1	2	2	1	1	1	-	-	1	3	2	-	-	-

1. Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HOD

Course Code	PRY407	Title of the Course	CLINICAL PHARMACY	SDG Goals	L	T	P	C
Year	P.B. I	Semester	ANNUAL		3	1	-	4
Course Objectives	1. Monitor drug therapy of patient through medication chart review and clinical review; 2. Obtain medication history interview and counsel the patients; 3. Identify and resolve drug related problems; 4. Detect, assess and monitor adverse drug reaction; 5. Interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states; and 6. Retrieve, analyze, interpret and formulate drug or medicine information.							

Course Outcomes	
CO1	Monitor drug therapy of patient through medication chart review and clinical review;
CO2	Obtain medication history interview and counsel the patients.
CO3	Identify and resolve drug related problems, Retrieve, analyze, interpret and formulate drug or medicine information
CO4	Detect, assess and monitor adverse drug reaction.
CO5	Interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states
CO6	Retrieve, analyze, interpret and formulate drug or medicine information.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO	SDG Target
1	**Definitions, development and scope of clinical pharmacy** **Introduction to daily activities of a clinical pharmacist**	a. Drug therapy monitoring: Medication chart review Clinical review Pharmacist interventions b. Ward round participation c. Adverse drug reaction management d. Drug information and poisons information	3	1	**3.7, 3.8**
2	**Introduction to daily activities of a clinical pharmacist-II** **Patient data analysis**	a. Medication history b. Patient counseling c. Drug utilisation evaluation (DUE) and review (DUR) d. Quality assurance of clinical pharmacy services. The patient's case history, its structure and use in evaluation of drug therapy & Understanding common medical abbreviations and terminologies used in clinical practices.	3	2	**3.3,, 3.7**
3	**Clinical laboratory tests used in the evaluation of disease states, and interpretation of test results:**	a. Haematological, 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	**3**	**5**	**3.7,3.8**
4	**Drug & Poison information**	a. Introduction to drug information resources available b. Systematic approach in answering DI queries c. Critical evaluation of drug information and literature d. Preparation of written and verbal reports e. Establishing a Drug Information Centre f. Poisons information- organization & information resources	3	3	**3.9, 3.b**
5	**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.	3	4	**3.7, 3.8**
6	**Communication skills, including patient counselling techniques, medication history interview, presentation of cases.** **Pharmaceutical care concepts**	a. Communication skills, including patient counselling techniques, medication history interview, presentation of cases. a. Pharmaceutical care concepts. b. Critical evaluation of biomedical literature. c. Medication errors.	3	5	**3.7, 3.3.8**

Reference Books:
Practice Standards and Definitions - The Society of Hospital Pharmacists of Australia.
Basic skills in interpreting laboratory data - Scott LT, American Society of Health System Pharmacists Inc.
Biopharmaceutics and Applied Pharmacokinetics - Leon Shargel, Prentice Hall publication.
A textbook of Clinical Pharmacy Practice; Essential concepts and skills, Dr.G.Parthasarathi, Karin Nyfort-Hansen and MilapNahata Orient Langman Pvt.Ltd. ISSBN8125026
Australian drug information -Procedure manual. The Society of Hospital Pharmacists of Australia.
Clinical Pharmacokinetics - Rowland and Tozer, Williams and Wilkins Publication.
Pharmaceutical Statistics. Practical and clinical applications. Sanford Bolton, Marcel Dekker, Inc.
e-Learning Source:
https://www.google.co.in/books/edition/Clinical_Pharmacy_Education_Practice_and/9Jp7DwAAQBAJ?hl=en&gbpv=1&dq=CLINICAL+pharmacy+pharm+d&printsec=frontcover

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																
PO-PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	3	3	2	2	2	2	3	2	2	2	3	1	2	3	-	-	-
CO2	3	2	2	2	3	2	3	2	2	3	2	1	2	3	-	-	-
CO3	3	3	3	2	2	2	3	3	3	3	3	1	2	3	-	-	-
CO4	3	3	3	2	2	2	2	2	3	3	2	1	2	3	-	-	-
CO5	2	3	2	2	3	3	3	2	3	2	3	1	2	3	-	-	-
CO6	2	2	3	2	2	3	3	2		2	2	1	2	2	-	-	-

1. Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HOD**

Course Code	PRY408	Title of the Course	CLINICAL PHARMACY	L	T	P	C
Year	P.B. I	Semester	ANNUAL	-	-	3	-
Course Objectives	Upon completion of the subject student shall be able to (Know, do, appreciate) – 1. Monitor drug therapy of patient through medication chart review and clinical review; 2. Obtain medication history interview and counsel the patients; 3. Identify and resolve drug related problems; 4. Detect, assess and monitor adverse drug reaction; 5. Interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states; and 6. Retrieve, analyse, interpret and formulate drug or medicine information.						

Course Outcomes	
CO1	Monitor drug therapy of patient through medication chart review and clinical review;
CO2	Obtain medication history interview and counsel the patients.
CO3	Identify and resolve drug related problems, Retrieve, analyze, interpret and formulate drug or medicine information
CO4	Detect, assess and monitor adverse drug reaction.
CO5	Interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO	SDG Target
1.	**Answering drug information questions**	Case studies & Answering drug information questions (4 Nos)	10	3	
2.	**Patient medication counselling**	Case Studies & Patient medication counselling (4 Nos)	10	2	
3.	**Case studies related to laboratory investigations**	Case studies related to laboratory investigations (4 Nos)	10	5	
4.	**Patient medication history interview**	Patient medication history interview. (3 Nos)	7.5	2	
e-Learning Source:					
https://www.google.co.in/books/edition/A_Text_Book_of_Clinical_Pharmacy_Practic/FGDQZaqk9lYC?hl=en&gbpv=1&dq=CLINICAL+pharmacy+PRACTICAL+pharm+d&printsec=frontcover					

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	2	2	2	3	2	2	2	3	1	2	3	-	-	-
CO2	3	2	2	2	3	2	3	2	2	3	2	1	2	3	-	-	-
CO3	3	3	3	2	2	2	3	3	3	3	3	1	2	3	-	-	-
CO4	3	3	3	2	2	2	2	2	3	3	2	1	2	3	-	-	-
CO5	2	3	2	2	3	3	3	2	3	2	3	1	2	3	-	-	-
CO6	2	2	3	2	2	3	3	2		2	2	1	2	2	-	-	-

1. Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HOD

Course Code	PRY409	Title of the Course	BIOSTATISTICS & RESEARCH METHODOLOGY	SDG Goals	L	T	P	C
Year	P.B. I	Semester	ANNUAL		3	1	-	3

Course Objectives

1. To prepare students as health care expert with emphasis on inter-professional health care team based patient care.
2. To develop the skills in monitoring of the National Health Programmes and schemes, oriented to provide preventive and promotive health care services to the community.
3. To impart applied knowledge related to clinical discussions, attending ward rounds, follow-up progress of patients, case presentation at discharge are imbibed through hospital postings.
4. To develop a trained clinical pharmacist who functions effectively as a member of health care team organized to deliver the health and family welfare services in existing socio-economic environment.
5. To promote health, wellness and disease prevention by developing the rationale use of drugs.
6. To understand the clinical aspects of drug development, such as phases, ethical issues, and roles and responsibilities

Course Outcomes	
CO1	Learn the basic concept for research, designing of methodology and clinical study, determination of sample size and report writing.
CO2	Understand the basic concepts of biostatistics, measures of central tendency and spread and data graphics.
CO3	Explain the basics of hypothesis testing, different parametric and non-parametric tests and use of statistical software such as SPSS, Epi Info, and SAS
CO4	Discuss the statistical methods in epidemiology to solve different types of problems.
CO5	Appreciate the importance of Computer in hospital and Community Pharmacy.
CO6	Develop the ability and confidence in completing drug information and literature retrieval and evaluation tasks.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO	SDG Target
1.	**Research Methodology**	a) Types of clinical study designs: Case studies, observational studies, interventional studies, b) Designing the methodology c) 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 d) Report writing and presentation of data	2	1	
2.	**Research Methodology**	a) Types of clinical study designs: Case studies, observational studies, interventional studies, b) Designing the methodology c) 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 d) Report writing and presentation of data	2	2	
3.	**Basics of testing hypothesis**	Null hypothesis, level of significance, power of test, P value, statistical estimation of confidence intervals. 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-Wallis test (one way ANOVA) Linear regression and correlation- Introduction, Pearsonn's and Spearmann's correlation and correlation co-efficient. Introduction to statistical software: SPSS, Epi Info, SAS.	2	3	
4.	**Unit-IV**	Statistical methods in epidemiology Incidence and prevalence, relative risk, attributable risk	**2**	4	
5.	**Unit-V**	Patterns of Computer use in Hospital Pharmacy – Patient record database management, Medication order entry – Drug labels and list – Intravenous solution and admixture, patient medication profiles, Inventory control, Management report & Statistics. Computer in Community Pharmacy Computerizing the Prescription Dispensing process Use of Computers for Pharmaceutical Care in community pharmacy, Accounting and General ledger system			
6.	**Drug Information Retrieval & Storage**	Introduction – Advantages of Computerized Literature Retrieval Use of Computerized Retrieval	**2**	6	

Reference Books:

Pharmaceutical statistics- practical and clinical applications, Sanford Bolton 3rd edition, publisher Marcel Dekker Inc. NewYork.

Drug Information- A Guide for Pharmacists, Patrick M Malone, Karen L Kier, John E Stanovich , 3rd edition, McGraw Hill Publications 2006.

e-Learning Source:

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																
PO-PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	3	3	2	2	2	2	1	1	1	1	2	3	3	3	-	-	-
CO2	3	3	2	2	2	2	1	1	1	1	2	3	3	3	-	-	-
CO3	3	3	2	2	2	2	1	1	1	1	2	3	2	2	-	-	-
CO4	3	3	2	2	2	2	1	1	1	1	2	3	2	2	-	-	-
CO5	3	3	2	2	2	2	1	1	1	1	2	3	2	2	-	-	-
CO6	3	3	2	2	2	2	1	1	1	1	2	1	1	1	-	-	-

1. Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HOD**

Course Code	PRY410	Title of the Course	CLINICAL TOXICOLOGY	SDG Goals	L	T	P	C
Year	P.B. I	Semester	ANNUAL		3	1	0	4
Course Objectives	Developing general working knowledge of the principles and practice of clinical toxicology							

Course Outcomes	
CO1	Differentiate the clinical signs and symptoms of various acute poisonings.
CO2	Manage the clinical signs and symptoms of different chronic poisonings.
CO3	Distinguish the clinical symptoms of chronic poisoning by heavy metals.
CO4	Plan public health care professionals in the management of emergency cases.
CO5	Evaluate, minimize and prevent the substance abuse cases in local population.
CO6	Knowledge about different antidotes for the management of clinical toxicology.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO	SDG Target
1.	General principles involved in the management of poisoning	General principles involved in the management of poisoning Antidotes and the clinical applications. Supportive care in clinical Toxicology	20	1,2	-------
2.	General principles involved in the management of poisoning	Gut Decontamination. Elimination Enhancement. Toxicokinetics.	23	2,3	-----
3.	Clinical symptoms and management of acute poisoning	Pesticide poisoning: organophosphorous compounds, carbamates, organochlorines, pyrethroids. Opiates overdose. Antidepressants Barbiturates and benzodiazepines. Alcohol: ethanol, methanol. Paracetamol and salicylates Non-steroidal anti-inflammatory drugs. Hydrocarbons: Petroleum products and PEG. Caustics: inorganic acids and alkali. Radiation poisoning	28	2,3	3.9, 3.a
4.	Clinical symptoms and management of chronic poisoning	Clinical symptoms and management of chronic poisoning with the following agents - Heavy metals: Arsenic, lead, mercury, iron, copper Venomous snake bites: Families of venomous snakes, clinical effects of venoms, general management as first aid, early manifestations, complications and snake bite injuries.	26	3,4	3.9, 3.a
5.	Plants poisoning	Plants poisoning. Mushrooms, Mycotoxins. Food poisonings Envenomations – Arthropod bites and stings.	27	2,3	3.9
6.	Substance abuse	Signs and symptoms of substance abuse and treatment of dependence CNS stimulants :amphetamine Opioids CNS depressants Hallucinogens: LSD Cannabis group Tobacco	20	2,5	3.a

Reference Books:

Matthew J Ellenhorn. ELLENHORNS MEDICAL TOXICOLOGY – DIAGNOSIS AND TREATMENT OF POISONING. Second edition. Williams and Willkins publication, London

V VPillay. HANDBOOK OF FORENSIC MEDICINE AND TOXICOLOGY. Thirteenth edition 2003 Paras Publication, Hyderabad

e-Learning Source:

http://www.prip.edu.in/img/ebooks/VV-Pillay-Modern-Medical-Toxicology-4th-Edition.pdf

http://pustaka.unp.ac.id/file/abstrak_kki/EBOOKS/A%20textbook%20of%20Modern%20Toxicology.pdf

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	3	2	3	2	2	3	2	2	3	2	-	-	-
CO2	3	2	3	2	2	3	2	2	2	2	3	3	2	2	-	-	-
CO3	3	2	2	3	2	3	2	3	3	3	3	3	2	3	-	-	-
CO4	3	2	3	2	2	3	2	2	3	3	3	3	2	2	-	-	-
CO5	3	2	3	3	3	2	2	3	3	2	2	2	2	3	-	-	-
CO6	2	3	1	1	2	3	2	2	2	3	1	2	3	1	-	-	-

1. Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HOD

Course Code	PRY411	Title of the Course	PHARMACOTHERAPEUTICS-I & II	SDG Goals	L	T	P	C
Year	P.B. I	Semester	ANNUAL		3	1	-	4

Course Objectives

At completion of this subject it is expected that students will be able to understand:
To describe the pathophysiology of selected disease states and explain the rationale for drug therapy;
To summarize the therapeutic approach to management of these diseases including reference to the latest available evidence
To discuss the controversies in drug therapy;
To discuss the preparation of individualised therapeutic plans based on diagnosis; and
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).

Course Outcomes	
CO1	Students understand the pathophysiology & diagnosis of CVS & Respiratory system and endocrine system and their management/controversies including 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).
CO2	Students have ability to explore the general guidelines for the management/controversies in case of children, old age patients and in PregnancyandbreastfeedingGlaucoma,Conjunctivitis-viral&bacterial
CO3	Students have ability to understand the rationale of essential drugs.
CO4	Students analyzed the pathophysiology & diagnosis of infectious disease and their management.
CO5	Students analyze the Pharmacotherapeutics of muscular pain management and renal disorders and also able to elucidate the Evidence Based Medicine.
CO6	Students analyzed the pathophysiology & diagnosis of cancer and some skin diseases.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO	SDG Targets
1.	Cardiovascular system	Hypertension, congestive cardiac failure, angina pectoris, myocardial infarction, hyperlipidaemias, electrophysiology of heart and arrhythmias.	13	1	-----
2.	Respiratory system Endocrine system	Introduction to pulmonary function test, asthma, chronic obstructive airways disease, drug induced pulmonary diseases; Diabetes, thyroid diseases, oral contraceptives, hormone replacement therapy, osteoporosis.	14	2	3.5
3.	General prescribing guidelines, Ophthalmology, Introduction to rational drug use, Infectious diseases	General prescribing guidelines for paediatric patients, geriatric patients, pregnancy and breast-feeding cases; Glaucoma, conjunctivitis- viral & bacterial; Definition, role of pharmacist essential drug concept rational drug formulations; Guidelines for the rational use of antibiotics and surgical prophylaxis, tuberculosis, meningitis.	13	2	-------
4.	Infectious diseases	Respiratory tract infections, gastroenteritis, endocarditis, septicemia, urinary tract infections, protozoal infection-malaria, HIV & opportunistic infections, fungal infections, viral infections, gonarrhoea and syphillis.	14	4	------
5.	Musculoskeletal disorders, Renal system	Rheumatoid arthritis, osteoarthritis, gout, spondylitis, systemic lupus erythematosus; Acute renal failure, chronic renal failure, renal dialysis, drug induced renal disorders	11	5	------
6.	Oncology, Dermatology	Basic principles of cancer therapy, general introduction to cancer chemotherapeutic agents, chemotherapy of breast cancer, leukemia. management of chemotherapy nausea and emesis; Psoriasis, scabies, eczema, impetigo.	10	6	-- -- -

Reference Books:

thology and therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice - Green and Harris, Chapman and Hall publication
d. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA
Avery's Drug Treatment, 4th Edn, 1997, Adis International Limited.
Relevant review articles from recent medical and pharmaceutical literature.
thologic basis of disease - Robins SL, W.B.Saunders publication
inical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication

e-Learning Source:

https://www.google.co.in/books/edition/Pocket_Handbook_of_GI_Pharmacotherapeuti/x3SjDDjlW00C?hl=en&gbpv=1&dq=Pharmacotherapeutics-III&printsec=frontcover

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	2	2	2	1	1	1	1	2	3	2	2	-	-	-
CO2	3	3	2	2	2	2	1	1	1	1	2	3	2	2	-	-	-
CO3	3	3	2	2	2	2	1	1	1	1	2	3	2	2	-	-	-
CO4	3	3	2	2	2	2	1	1	1	1	2	3	2	2	-	-	-
CO5	3	3	2	2	2	2	1	1	1	1	2	3	2	2	-	-	-
CO6	3	3	2	2	2	2	1	1	1	1	2	3	2	2	-	-	-

1. Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HOD

Course Code	PRY412	Title of the Course	PHARMACOTHERAPEUTICS I & II	L	T	P	C
Year	P.B. I	Semester	ANNUAL	-	-	3	-
Course Objectives	At completion of this subject, it is expected that students will be able to understand the principle and practice involved in selection of drug therapy including clinical discussion and also 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. the 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. 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);						

Course Outcomes	
CO1	The therapeutic approaches to the management of cardiovascular disorders, respiratory disorders, endocrine disorders, ophthalmological disorders, infectious diseases, musculoskeletal disorders, renal disorders, oncology, dermatological disorders; General prescribing guidelines for paediatric patients, geriatric patients, pregnancy and breast feeding cases, the introduction to rational drug use.
CO2	The treatment objectives for the individual patients and the diseases.
CO3	The importance of developing individualized therapeutic plans.
CO4	Prescribing guidelines for the special populations.
CO5	Patient-specific parameters for selection, initiation and monitoring of drug therapies.
CO6	Most recent updates in relevant treatment guidelines.

Exp .No.	Title of Expermnt	Content of Unit	Contact Hrs.	Mapped CO
1	Case study	Case study of Hypertension	3	1
2	Case study	Case study of Angina Pectoris/ Myocardial infarction.	3	1
3	Case study	Case study of Hyperlipidaemias	3	1
4	Case study	Case study of Asthma	3	2
5	Case study	Case study on COPD	3	2
6	Case study	Case study on Diabetes	3	2
7	Case study	Case study on Thyroid diseases	3	2
8	Case study	Case study of Osteoporosis.	3	3
9	Case study	Case study on special population (Paediatrics, Geriatrics, Pregnancy or breast feeding)	3	3
10	Case study	Case study of Tuberculosis	3	3
11	Case study	Case study of Meningitis	3	3
12	Case study	Case study of Respiratory tract infections	3	4
13	Case study	Case study of Gastroenteritis	3	4
14	Case study	Case study on Malaria	3	4
15	Case study	Case study on HIV	3	4
16	Case study	Case study on Fungal infections	3	4
17	Case study	Case study on Rheumatoid arthritis	3	5
18	Case study	Case study on renal failure	3	5
19	Case study	Case study on Cancer	3	6
20	Case study	Case study on Psoriasis	3	6

e-Learning Source:

https://accesspharmacy.mhmedical.com/book.aspx?bookID=2577

https://books.google.co.in/books?id=CcDRAQAAQBAJ&printsec=copyright&redir_esc=y#v=onepage&q&f=false

https://books.google.co.in/books/about/Pharmacotherapy_A_Pathophysiologic_Appro.html?id=jJWwDwAAQBAJ&redir_esc=y

https://books.google.co.in/books/about/Clinical_Pharmacy_and_Therapeutics_E_Boo.html?id=CcDRAQAAQBAJ&redir_esc=y

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	3	1	2	1	2	1	1	1	2	3	1	3
CO2	3	2	2	1	2	1	2	1	1	1	2	3	1	3
CO3	3	3	3	1	2	1	2	1	1	1	2	3	1	3
CO4	3	3	3	1	2	1	2	1	1	1	2	3	1	3
CO5	3	3	2	1	2	1	2	1	1	1	2	3	1	3
CO6	3	3	3	2	2	1	2	1	1	1	2	3	1	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Course Code	PRY501	Title of the Course	CLINICAL RESEARCH	SDG Goals	L	T	P	C
Year	P.B. II	Semester	ANNUAL		3	1	0	4
Course Objectives	1. This course is designed to impart knowledge and skills necessary for contribution to Clinical research in new drug development. 2. Chapters deal to cover briefly knowledge of Clinical trial and its documentation of new drug development 3. This will enable the student to understand the pathway of drug in clinical trial.							

Course Outcomes	
CO1	Understand the fundamental ideas behind the drug development process, including what it is, how it varies from standard care, and why it is carried out.
CO2	To establish that clinical research designs and the regulatory approval process are effective.
CO3	Become familiar with the numerous regulatory documents and guidelines, and assess the most significant domestic, international, and health care regulatory, and product development, consequences.
CO4	Effectively manage and access the ethical aspects of clinical trial activity.
CO5	To ensure that high-quality research is conducted, become familiar with the roles and duties of the professionals involved in conducting clinical research.
CO6	Acknowledge the clinical trial safety monitoring and reporting processes, and regulate the trial Co-ordination process.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO	SDG Target
1.	**Drug development process**	Introduction, Various Approaches to drug discovery, Pharmacological, Toxicological, IND Application, Drug characterization, Dosage form	3	1	------
2.	**Clinical development of drug**	Introduction to Clinical trials, Various phases of clinical trial, Methods of post marketing surveillance, Abbreviated New Drug Application submission.	3	2	3.9, 3.b
3.	**Good Clinical Practice**	ICH, GCP, Central drug standard control organization (CDSCO) guidelines, Challenges in the implementation of guidelines, Ethical guidelines in Clinical Research, Composition, responsibilities, procedures of IRB / IEC, Overview of regulatory environment in USA, Europe and India.	3	3	3.b
4.	**Role and responsibilities of clinical trial personnel as per ICH GCP**	Sponsor, Investigators, Clinical research associate, Auditors, Contract research coordinators, Regulatory authority	3	4	3.b, 3.c
5.	**Designing of clinical study documents (protocol, CRF, ICF, PIC with assignment)**	Informed consent Process, Data management and its components, Safety monitoring in clinical trials.	3	5	------

Reference Books:

Central Drugs Standard Control Organization. Good Clinical Practices-Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health; 2001.

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.

Ethical Guidelines for Biomedical Research on Human Subjects 2000. Indian Council of Medical Research, New Delhi.

Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March 2005, John Wiley and Sons.

Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.

Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.

Goodman & Gilman: JG Hardman, LE Limbard, 10th Edn. McGraw Hill Publications, 2001.

e-Learning Source:

https://www.google.co.in/books/edition/Principles_and_Practice_of_Clinical_Rese/o6-F8I4LJLgC?hl=en&gbpv=1&dq=CLINICAL+RESEARCH&printsec=frontcover

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	2	2	1	2	2	1	1	2	2	2	2	-	-	-
CO2	3	2	2	2	2	1	2	2	1	2	2	2	2	2	-	-	-
CO3	3	2	2	2	2	1	2	2	1	2	2	2	2	2	-	-	-
CO4	3	2	2	2	2	1	2	2	1	2	2	2	2	2	-	-	-
CO5	3	2	2	2	2	1	2	2	1	2	2	2	2	2	-	-	-
CO6	3	2	2	2	2	1	2	2	1	2	2	2	2	2	-	-	-

1. Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HOD

Course Code	PRY502	Title of the Course	PHARMACOEPIDEMIOLOGY & PHARMACOECONOMICS	SDG Goals	L	T	P	C
Year	P.B. II	Semester	ANNUAL		3	1	-	4
Course Objectives	1. Pharmacoepidemiology can help assess patterns and appropriateness of drug utilization, 2. Provide explanations for poor compliance, quantify the frequency and severity of side effects, and aid in the design and evaluation of interventions to improve drug use and outcomes.							

Course Outcomes	
CO1	Differentiate the various methods used in Pharmacoepidemiology.
CO2	Evaluate and identify the various risks in Epidemiological studies.
CO3	Assessment of data used in Pharmacoepidemiology and Pharmacoeconomic.
CO4	Demonstrate ability in the design, conduct and evaluation of Pharmacoeconomic studies.
CO5	Applications of Pharmacoepidemiology and Pharmacoeconomics in clinical settings.
CO6	Interpretation the result in Pharmacoepidemiology and Pharmacoeconomic.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO	SDG Target
1.	**Definition and scope**	Origin and evaluation of Pharmacoepidemiology need for Pharmacoepidemiology, aims and applications. 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.	28	1,2	3.3, 3.4
2.	**Concept of risk in pharmacoepidemiology**	Measurement of risk, attributable risk and relative risk, time-risk relationship and odds ratio.	15	2,3	3.8, 3.c, 3.d
3.	**Pharmacoepidemiological methods**	Includes theoretical aspects of various methods and practical study of various methods with the help of case studies for individual methods. Drug utilization review, case reports, case series, surveys of drug use, cross – sectional studies, cohort studies, case control studies, case –cohort studies, meta-analysis studies, spontaneous reporting, prescription event monitoring and record linkage system.	28	2,3	3.8, 3.c, 3.d
4.	**Sources of data for pharmacoepidemiological studies**	Ad Hoc data sources and automated data systems. Selected special applications of pharmacoepidemiology: Studies of vaccine safety, hospital pharmacoepidemiology, pharmacoepidemiology and risk management, and drug induced birth defects	27	3,4	3.1, 3.2, 3.4, 3.8, 3.b
5.	**Definition, history, needs of pharmacoeconomic evaluations**	Role in formulary management decisions Pharmacoeconomic evaluation: Outcome assessment and types of evaluation Includes theoretical aspects of various methods and practical study of various methods with the help of case studies for individual methods: Cost – minimization, cost- benefit, and cost – effectiveness, cost utility.	27	2,3	3.8, 3.c, 3.d
6.	**Applications of Pharmacoeconomics**	Applications of Pharmacoeconomics: Software and case studies.	20	2,5	3.8, 3.c, 3.d

Reference Books:

K.Park , Park's textbook of preventive and social medicine(21st edition), M/s BanarsidasBhanot Publishers,Jabalpur,2011.

Brian L Strom and Stephen E Kimmel, Textbook of pharmacoepidemiology by Brian L Strom and Stephen E Kimmel(4th edition),John wiley& Sons Ltd, England, 2005.

Stephen P Glasser,Essentials of clinical research(1st edition),Springer-Verlag, New York, 2008.

e-Learning Source:

https://pharmareview.files.wordpress.com/2011/10/pharmacoepidemiology.pdf

https://pharmacystblog.files.wordpress.com/2019/05/textbook-of-pharmacoepidemiology.pdf

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	3	2	3	2	2	3	2	2	3	3	-	-	-
CO2	3	2	3	2	2	3	2	2	2	2	3	3	2	2	-	-	-
CO3	3	2	2	3	2	3	2	3	3	3	2	2	3	2	-	-	-
CO4	3	2	3	2	2	3	2	2	3	3	3	3	2	2	-	-	-
CO5	3	2	3	3	3	2	2	3	3	2	3	3	3	3	-	-	-
CO6	2	2	2	2	1	1	1	1	2	2	1	2	3	2	-	-	-

1. Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HOD

Course Code	PRY503	Title of the Course	CLINICAL PHARMACOKINETICS & THERAPEUTIC DRUG MONITORING	SDG Goals	L	T	P	C
Year	P.B. II	Semester	ANNUAL		2	1	-	3
Course Objectives	1. Know the basics of pharmacokinetic parameters and their application. 2. Understand concept of nomograms for elderly and pediatric patients for effective therapy. 3. Know the advantages of individualization of dosage regimen and therapeutic drug monitoring. 4. Understand the concept of population pharmacokinetics and pharmacogenomics.							

Course Outcomes	
CO1	Students can understand the basic principles of clinical pharmacokinetics
CO2	Students shall able to design dosage regimen for individual patients
CO3	Students shall able to analyze and resolve pharmacokinetics drug interactions
CO4	Students shall able to adjust the dose in different disease conditions
CO5	Students can understand therapeutic drug monitoring forsafe and effective therapy
CO6	Understand the concept of population pharmacokinetics and Pharmacogenetics

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO	SDG Target
1.	**Clinical Pharmacokinetics-Introduction**	a. Introduction to Clinical pharmacokinetics. b. 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.	12	1,& 2	-------
2.	**Pharmacokinetics of Drug Interaction**	a. Pharmacokinetic drug interactions b. Inhibition and Induction of Drug metabolism c. Inhibition of Biliary Excretion.	2	4	------
3.	**Therapeutic Drug monitoring**	a. Introduction b. Individualization of drug dosage regimen (Variability – Genetic, Age and Weight , disease, Interacting drugs). c. Indications for TDM. Protocol for TDM. d. Pharmacokinetic/Pharmacodynamic Correlation in drug therapy. e. TDM of drugs used in the following disease conditions: cardiovascular disease, Seizure disorders, Psychiatric conditions, and Organ transplantations.	18	1, 3& 4	------
4.	**Dosage adjustment in Renal and hepatic Disease**	a. Renal impairment b. Pharmacokinetic considerations c. General approach for dosage adjustment in Renal disease. d. Measurement of Glomerular Filtration rate and creatinine clearance. e. Dosage adjustment for uremic patients. f. Extracorporeal removal of drugs. g. Effect of Hepatic disease on pharmacokinetics.	10	1,3& 4	------
5.	**Population Pharmacokinetics**	a. Introduction to Bayesian Theory. b. Adaptive method or Dosing with feed back. c. Analysis of Population pharmacokinetic Data.	12	1,3& 5	3.8, 3.c, 3.d
6.	**Pharmacogenetics**	a. Genetic polymorphism in Drug metabolism: Cytochrome P-450 Isoenzymes. b. Genetic Polymorphism in Drug Transport and Drug Targets. c. Pharmacogenetics and Pharmacokinetics/Pharmacodynamic considerations	8	1,3& 5	------

Reference Books:

Clinical Pharmacokinetics 6th Edition. John E. Murphy

Concepts in Clinical Pharmacokinetics 4th Edition. Joseph T. DiPiro

Applied Clinical Pharmacokinetics. 2nd Edition. Larry A. Bauer

e-Learning Source:

Access Pharmacy:https://accesspharmacy.mhmedical.com/content.aspx?sectionid=41488039&bookid=513

Future Learn:https://www.futurelearn.com/courses/pharmacokinetics-and-dosing-regimen-in-renal-disease

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1	-	-	1	-	-	2	1	1	1	1	1	3	-	-	-
CO2	2	1	1	2	2	-	1	2	1	1	2	1	1	3	-	-	-
CO3	2	-	-	3	2	-	2	2	2	1	2	2	1	3	-	-	-
CO4	3	3	-	2	2	-	2	2	3	1	3	3	1	3	-	-	-
CO5	2	2	-	2	2		3	2	3	1	2	1	1	3	-	-	-
CO6															-		

1. Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HOD

Course Code	PRY504	Title of the Course	PHARMACOTHERAPEUTICS-III	SDG Goals	L	T	P	C
Year	P.B. II	Semester	ANNUAL		3	1	-	4

Course Objectives

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 individualized therapeutic plans based on diagnosis;
e. The 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. 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 individualized 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).

Course Outcomes	
CO1	Formulate and implement evidence-based, patient-specific treatment plans for gastrointestinal disorders by developing and justifying comprehensive treatment plans, achieving maximum accuracy based on detailed patient histories, diagnostic results, and current clinical guidelines.
CO2	Develop and apply evidence-based drug therapy for liver disorders by analyzing detailed patient histories and diagnostic results, ensuring adherence to current clinical guidelines with a minimum correctness.
CO3	Design individualized therapeutic plans for patients with hematological disorders by integrating recent advances in hematology research and clinical practice, ensuring maximum adherence to current evidence-based guidelines.
CO4	Investigate clinical case studies of neurological diseases to determine appropriate pharmacological and non-pharmacological interventions, achieving high accuracy based on detailed patient histories, diagnostic results, and current clinical guidelines.
CO5	Develop evidence-based pharmacotherapy plans for psychiatric disorders, integrating medication, psychotherapy modalities, and patient-specific considerations to achieve highest adherence to current clinical guidelines and evidence-based practices.
CO6	Design and implement evidence-based pharmacotherapy plans for pain disorders, ensuring individualized treatment approaches integrating medication, non-pharmacological therapies, corroborating current clinical guidelines and evidence-based practices. Evaluate the importance of evidence-based medicine in pharmacotherapy, demonstrating proficiency in applying current clinical guidelines and research findings to achieve maximum accuracy in therapeutic decision-making and patient care.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO	SDG Targets
1.	**Gastrointestinal system**	Peptic ulcer disease, gastro esophageal reflux disease, inflammatory bowel disease,	12	1	-----
2.	**Liver disorders**	Alcoholic liver disease, viral hepatitis including jaundice, and drug induced liver disorders.	12	2	3.5
3.	**Haematological system**	Anaemias, venous thromboembolism, drug induced blood disorders.	12	3	-------
4.	**Nervous system**	Epilepsy, Parkinsonism, Alzheimer's disease, stroke.	12	4	------
5.	**Psychiatry disorders**	Schizophrenia, affective disorders, anxiety disorders, sleep disorders, obsessive compulsive disorders	12	5	------
6.	**Pain & Evidence Based Medicine**	Pain management including pain pathways, neuralgias, headaches and evidence based medicine.	12	6	-----

Reference Books:

1. Pharmacotherapy: A Pathophysiologic Approach by Joseph T. Dipiro. 11th Edition.
2. Clinical Pharmacy and Therapeutics by Roger Walker. 5th Edition.
3. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA
4. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication.
5. Pathologic basis of disease - Robins SL, W.B. Saunders Publication.
6. Pathology and therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice - Green and Harris, Chapman and Hall publication.

e-Learning Source:

https://www.google.co.in/books/edition/Pocket_Handbook_of_GI_Pharmacotherapeuti/x3SjDDjlW00C?hl=en&gbpv=1&dq=Pharmacotherapeutics-III&printsec=frontcover

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	1	2	1	2	1	1	1	2	3	1	3	-	-	-
CO2	3	3	3	1	2	1	2	1	1	1	2	3	1	3	-	-	-
CO3	3	3	3	1	2	1	2	1	1	1	2	3	1	3	-	-	-
CO4	3	3	3	1	2	1	2	1	1	1	2	3	1	3	-	-	-
CO5	3	3	3	1	2	1	2	1	1	1	2	3	1	3	-	-	-
CO6	3	3	3	2	2	1	2	1	1	1	2	3	1	3	-	-	-

1. Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HOD

Course Code	PRY505	Title of the Course	PHARMACOTHERAPEUTICS-III	L	T	P	C
Year	P.B. II	Semester	ANNUAL	-	-	3	1.5
Course Objectives	To describe the pathophysiology of selected disease states and explain the rationale for drug therapy; To summarize the therapeutic approach to management of these diseases including reference to the latest available evidence; To discuss the controversies in drug therapy; To discuss the preparation of individualised therapeutic plans based on diagnosis; and 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).						

Course Outcomes	
CO1	Students understand the pathophysiology & diagnosis of GIT & liver disorder and their management/controversies including 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).
CO2	Students have ability to explore the pathophysiology & diagnosis of hematological disorder and their management/controversies.
CO3	Students have ability to effectively communicate the pharmacotherapy of CNS disorder and their management/controversies.
CO4	Students analyzed the pathophysiology & diagnosis of Psychiatric disorder and their management/controversies including patient-specific parameters relevant in initiating drug therapy and monitoring therapy.
CO5	Students analyzed the pathophysiology & diagnosis of Schizophrenia, affective disorders, anxiety disorders, sleep disorders, obsessive compulsive disorders and their management/controversies including patient-specific parameters relevant in initiating drug therapy and monitoring therapy.
CO6	Students analyze the Pharmacotherapeutics of Pain management including pain pathways, neuralgias, headaches and evidence based medicine.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Case study	Case study on Gastrointestinal & Liver disorders	12	1
2	Case study	Case study on Haematological disorders	12	2
3	Case study	Case study on Nervous system disorders	12	3
4	Case study	Case study on Psychiatry disorders	12	4
5	Case study	Case study on Pain and its managements	12	5
e-Learning Source:				
https://www.google.co.in/books/edition/Pharmacology_and_Pharmacotherapeutics/FR4OEAAAQBAJ?hl=en&gbpv=1&dq=PHARMACOTHERAPEUTICS&printsec=frontcover				

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)															
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CO1	3	3	2	2	2	2	1	1	1	1	2	3	2	2	-	-	-
CO2	3	3	2	2	2	2	1	1	1	1	2	3	2	2	-	-	-
CO3	3	3	2	2	2	2	1	1	1	1	2	3	2	2	-	-	-
CO4	3	3	2	2	2	2	1	1	1	1	2	3	2	2	-	-	-
CO5	3	3	2	2	2	2	1	1	1	1	2	3	2	2	-	-	-
CO6	3	3	2	2	2	2	1	1	1	1	2	3	2	2	-	-	-

1. Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HOD