



M.PHARM

[MASTER OF PHARMACY]

PHARMACY PRACTICE

Curriculum and Syllabus

**Effective from the Academic Year
2019-2020**

School of Pharmaceutical Sciences

SEMESTER I

17MPP101T

CLINICAL PHARMACY PRACTICE (Employability)

Course Objective: This course is designed to impart the basic knowledge and skills that are required to practice pharmacy including the provision of pharmaceutical care services to both healthcare professionals and patients in clinical settings.

UNIT I

12HRS

Introduction to Clinical Pharmacy: Definition, evolution and scope of clinical pharmacy, International and national scenario of clinical pharmacy practice, Pharmaceutical care

Clinical Pharmacy Services: Ward round participation, Drug therapy review (Drug therapy monitoring including medication order review, chart endorsement, clinical review and pharmacist interventions).

UNIT II

12HRS

Clinical Pharmacy Services: Patient medication history interview, Basic concept of medicine and poison information services, Basic concept of pharmacovigilance, Hemovigilance, Materiovigilance and AEFI, Patient medication counselling, Drug utilisation evaluation, Documentation of clinical pharmacy services, Quality assurance of clinical pharmacy services.

UNIT III

12HRS

Patient Data Analysis: Patient Data & Practice Skills: Patient's case history - its structure and significances in drug therapy management, Common medical abbreviations and terminologies used in clinical practice, Communication skills: verbal and non-verbal communications, its applications in patient care services.

Lab Data Interpretation: Hematological tests, Renal function tests, Liver function tests

UNIT IV

12HRS

Lab Data Interpretation: Tests associated with cardiac disorders, pulmonary function tests, Thyroid function tests, Fluid and electrolyte balance, Microbiological culture sensitivity tests.

UNIT V

12HRS

Medicines & Poison Information Services : Medicine Information Service: Definition and need for medicine information service, Medicine information resources, Systematic approach in answering medicine information queries, Preparation of verbal and written response, Establishing a drug information centre.

Poison Information Service: Definition, need, organization and functions of poison information Centre.

TOTAL: 60 HRS

COURSE OUTCOME

At the end of this course students will be able to,

- CO1 Explain the elements of pharmaceutical care and provide comprehensive patient care services
- CO2 Interpret the laboratory results to aid the clinical diagnosis of various disorders
- CO3 Produce integrated, critically analyzed medicine and poison information to enable healthcare professionals in the efficient patient management
- CO4 Prepare individualized therapeutic plans based on diagnosis
- CO5 Analyze the practice involved in Clinical Pharmacy Services including clinical discussion

REFERENCES:

1. A Textbook of Clinical Pharmacy Practice – Essential concepts and skills – Parthasarathi G, Karin Nyfort-Hansen and Milap Nahata
2. Practice Standards and Definitions - The Society of Hospital Pharmacists of Australia
3. Basic skills in interpreting laboratory data - Scott LT, American Society of Health System Pharmacists Inc
4. Relevant review articles from recent medical and pharmaceutical literature.

SEMESTER I
17MPP102T
PHARMACOTHERAPEUTICS I

(Employability)

Course Objective:

This course aims to enable the students to understand the different treatment approaches in managing various disease conditions. Also, it imparts knowledge and skills in optimizing drug therapy of a patient by individualizing the treatment plan through evidence-based medicines.

Etiopathogenesis and pharmacotherapy of diseases associated with following systems

UNIT I **12HRS**

Cardiovascular system: Hypertension, Congestive cardiac failure, Acute coronary syndrome, Arrhythmias, Hyperlipidemias.

UNIT II **12HRS**

Respiratory system: Asthma, Chronic obstructive airways disease, Drug induced pulmonary diseases
Endocrine system: Diabetes, Thyroid diseases

UNIT III **12HRS**

Gastrointestinal system: Peptic ulcer diseases, Reflux esophagitis, Inflammatory bowel diseases, Jaundice & hepatitis

UNIT IV **12HRS**

Gastrointestinal system: Cirrhosis, Diarrhea and Constipation, Drug-induced liver disease
Hematological diseases: Anemia, Deep vein thrombosis, Drug induced hematological disorders

UNIT V **12HRS**

Bone and joint disorders: Rheumatoid arthritis, Osteoarthritis, Gout, Osteoporosis
Dermatological Diseases: Psoriasis, Eczema and scabies, impetigo, drug induced skin disorders
Ophthalmology: Conjunctivitis, Glaucoma.

TOTAL: 60 HRS

COURSE OUTCOME

At the end of this course students will be able to,

CO1 Describe and explain the rationale for drug therapy

CO2 Summarize the therapeutic approach for management of various disease conditions including reference to the latest available evidence

CO3 Discuss the clinical controversies in drug therapy and evidence based medicine

CO4 Prepare individualized therapeutic plans based on diagnosis

CO5 Identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy of Gastrointestinal system, Cardiovascular system, Respiratory system, Hematological diseases, Bone and joint disorders, Dermatological Diseases & Ophthalmology

REFERENCES

1. Roger and Walker. Clinical Pharmacy and Therapeutics - Churchill Livingstone publication
2. Joseph T. Dipiro et al. Pharmacotherapy: A Pathophysiologic Approach- Appleton & Lange
3. Robins SL. Pathologic basis of disease -W.B. Saunders publication
4. Eric T. Herfindal. Clinical Pharmacy and Therapeutics- Williams and Wilkins Publication
5. Lloyd Young and Koda-Kimble MA Applied Therapeutics: The clinical Use of Drugs- Lippincott Williams and Wilkins
6. Chisholm- Burns Wells Schwinghammer Malone and Joseph P Dipiro. Pharmacotherapy Principles and practice— McGraw Hill Publication
7. Carol Mattson Porth. Principles of Pathophysiology- Lippincott Williams and Wilkins
8. Harrison's. Principles of Internal Medicine - McGraw Hill
9. Relevant review articles from recent medical and pharmaceutical literature

SEMESTER I
17MPP103T
HOSPITAL & COMMUNITY PHARMACY
(Employability)

Course Objective:

This course is designed to impart basic knowledge and skills that are required to practice pharmacy in both hospital and community settings.

UNIT I **12HRS**

Introduction to Hospitals – Definition, classification, organizational structure
Hospital Pharmacy: Definition, Relationship of hospital pharmacy department with other departments, Organizational structure, legal requirements, work load statistics, Infrastructural requirements, Hospital Pharmacy Budget and Hospital Pharmacy management
Hospital Drug Policy: Pharmacy & Therapeutics Committee, Infection Control committee, Research & Ethics Committee, Management of Medicines as per NABH.

UNIT II **12HRS**

Hospital Formulary Guidelines and its development, Developing Therapeutic guidelines, Drug procurement process, and methods of Inventory control, Methods of Drug distribution, Intravenous admixtures, Hospital Waste Management

UNIT III **12HRS**

Education and training: Training of technical staff, training and continuing education for pharmacists, Pharmacy students, Medical staff and students, Nursing staff and students, Formal and informal meetings and lectures, Drug and therapeutics newsletter.
Community Pharmacy Practice: Definition, roles & responsibilities of community pharmacists, and their relationship with other health care providers.
Community Pharmacy management: Legal requirements to start community pharmacy, site selection, lay out & design, drug display, super drug store model, accounts and audits, Good dispensing practices, Different software's & databases used in community pharmacies. Entrepreneurship in community pharmacy.

UNIT IV **12HRS**

Prescription – Legal requirements & interpretation, prescription related problems
Responding to symptoms of minor ailments: Head ache, pyrexia, menstrual pains, food and drug allergy,

OTC medication: Rational use of over the counter medications Medication counseling and use of patient information leaflets Medication adherence – Definition, factors influencing adherence behavior, strategies to improve medication adherence

Patient referrals to the doctors

ADR monitoring in community pharmacies

UNIT V

12HRS

Health Promotion – Definition and health promotion activities, family planning, Health screening services, first aid, prevention of communicable and non-communicable diseases, smoking cessation, Child & mother care

National Health Programs- Role of Community Pharmacist in Malaria and TB control programs

Home Medicines review program – Definition, objectives, Guidelines, method and outcomes

Research in community pharmacy Practice

TOTAL: 60 HRS

COURSE OUTCOME

At the end of this course students will be able to,

- 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 Know about value added services in community pharmacies

REFERENCES:

1. Hospital Pharmacy - Hassan WE. Lea and Febiger publication.
2. Textbook of hospital pharmacy - Allwood MC and Blackwell.
3. Avery's Drug Treatment, Adis International Limited.
4. Community Pharmacy Practice – Ramesh Adepu, BSP Publishers, Hyderabad
5. Remington Pharmaceutical Sciences.
6. Relevant review articles from recent medical and pharmaceutical literature

SEMESTER I
17MPP104T
CLINICAL RESEARCH
(Employability)

Course Objective:

This course aims to provide the students an opportunity to learn drug development process especially the phases of clinical trials and also the ethical issues involved in the **conduct of clinical research**. Also, it aims to impart knowledge and develop skills on conceptualizing, designing, conducting and managing clinical trials.

UNIT I

12HRS

Drug development process: Introduction, various approaches to drug discovery, Investigational new drug application submission Ethics in Biomedical Research: Ethical Issues in Biomedical Research – Principles of ethics in biomedical research, Ethical committee [institutional review board] - its constitution and functions, Challenges in implementation of ethical guidelines, ICH GCP guidelines and ICMR guidelines in conduct of Clinical trials, **Drug Safety Reporting**.

UNIT II

12HRS

Types and Designs used in Clinical Research: Planning and execution of clinical trials, **Various Phases of clinical trials**, Bioavailability and Bioequivalence studies, Randomization techniques (Simple randomization, restricted randomization, blocking method and stratification), Types of research designs based on Controlling Method (Experimental, Quasi experimental, and Observational methods) Time Sequences (Prospective and Retrospective), Sampling methods (Cohort study, case Control study and cross sectional study), Health outcome measures (Clinical & Physiological, Humanistic and economic)

Clinical Trial Study team: Roles and responsibilities of: Investigator, Study Coordinator, Sponsor, Monitor, Contract Research Organization.

UNIT III

12HRS

Clinical trial Documents: Guidelines to the preparation of following documents: Protocols, Investigator's Brochure, Informed Consent Form, Case report forms, Contracts and agreements, Dairy Cards

Clinical Trial Start up activities: Site Feasibility Studies, Site/Investigator selection, Pre-study visit, Investigator meeting, Clinical trial agreement execution, Ethics committee document preparation and submission.

UNIT IV

12HRS

Investigational Product: Procurement and Storage of investigation product

Filing procedures: Essential documents for clinical trial, Trial Master File preparation and maintenance, Investigator Site File, Pharmacy File, Site initiation visit, Conduct, **Report and Follow up Clinical Trial Monitoring and Close out:**

Preparation and conduct of monitoring visit: Review of source documents, CRF, ICF, IP storage, accountability and reconciliation, Study Procedure, EC communications, Safety reporting, Monitoring visit reporting and follow-up

Close-Out visit: Study related documents collection, Archival requirement, **Investigational Product reconciliation and destruction**, Close-Out visit report.

UNIT V

12HRS

Quality Assurance and Quality Control in Clinical Trials: Types of audits, Audit criteria, Audit process, Responsibilities of stakeholders in audit process, Audit follow-up and documentation, **Audit resolution and Preparing for FDA inspections**, Fraud and misconduct management

Data Management

Infrastructure and System Requirement for Data Management: Electronic data capture systems, Selection and implementation of new systems, System validation and test procedures, Coding dictionaries, Data migration and archival

Clinical Trial Data Management: Standard Operating Procedures, Data management plan, CRF & Data base design considerations, Study set-up, Data entry, CRF tracking and corrections, Data cleaning, Managing laboratory and ADR data, Data transfer and database lock, **Quality Control and Quality Assurance in CDM**, Data mining and warehousing.

TOTAL: 60 HRS

COURSE OUTCOME

At the end of this course students will be able to,

- CO1 Explain the new drug development process.
- CO2 Describe the regulatory and ethical requirements.
- CO3 Judge and justify the clinical trials activities
- CO4 Illustrate the safety monitoring and reporting in clinical trials
- CO5 Elaborate the trial coordination process

REFERENCES

1. Principles and practice of pharmaceutical medicine, Second edition. Authors:Lionel. D. Edward, Aadrew.J.Flether Anthony W Fos , Peter D Sloaier Publisher:Wiley;
2. Handbook of clinical research. Julia Lloyd and Ann Raven Ed. Churchill Livingstone
3. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.
4. Central Drugs Standard Control Organization. Good Clinical Practices- Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health.
5. 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.
6. Ethical Guidelines for Biomedical Research on Human Subjects. Indian Council of Medical Research, New Delhi.
7. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, John Wiley and Sons.
8. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.
9. Goodman & Gilman: JG Hardman, LE Limbard, McGraw Hill Publications.
10. Relevant review articles from recent medical and pharmaceutical literature.

SEMESTER I

17MPP105 P

PHARMACY PRACTICE-I PRACTICAL (Skill Development)

Pharmacy Practice practical component includes experiments covering important topics of the courses Clinical Pharmacy Practice, Pharmacotherapeutics-I, Hospital & Community Pharmacy and Clinical Research.

List of Experiments (24)

1. Treatment Chart Review (one)
2. Medication History Interview (one)
3. Patient Medication Counseling (two)
4. Drug Information Query (two)
5. Poison Information Query (one)
6. Lab Data Interpretation (two)
7. Presentation of clinical cases of various disease conditions adopting Pharmaceutical Care Plan Model (eight)
8. ABC Analysis of a given list of medications (one)
9. Preparation of content of a medicine, with proper justification, for the inclusion in the hospital formulary (one)
10. Formulation and dispensing of a given IV admixtures (one)
11. Preparation of a patient information leaflet (two)
12. Preparation of Study Protocol (one)
13. Preparation of Informed Consent Form (one)

COURSE OUTCOME

At the end of this course students will be able to,

- CO1 Review the Treatment Chart Review.
- CO2 Analyze the Medication History Interview
- CO3 Understand the Patient Medication Counseling
- CO4 Analyze the Drug Information Query
- CO5 Able to perform ABC Analysis and formulate large volume parenteral.

SEMESTER I

17MPP201T

PRINCIPLES OF QUALITY USE OF MEDICINES (Employability)

Course Objective:

This course is designed to impart basic knowledge and skills that are required to practice quality use of medicines (QUM) in different healthcare settings and also to promote quality use of medicines, in clinical practice, through evidence-based medicine approach.

UNIT I

12HRS

Introduction to Quality use of medicines (QUM): Definition and Principles of QUM, Key partners and responsibilities of the partners, Building blocks in QMC, Evaluation process in QMC, Communication in QUM, **Cost effective prescribing**.

UNIT II

12HRS

Concepts in QUM

Evidence based medicine: Definition, concept of evidence based medicine, **Approach and practice of evidence based medicine in clinical settings**

Essential drugs: Definition, need, concept of essential drug, National essential drug policy and list

Rational drug use: Definition, concept and need for rational drug use, Rational drug prescribing,

Role of pharmacist in rational drug use.

UNIT III

12HRS

QUM in various settings: Hospital settings, Ambulatory care/Residential care, Role of health care professionals in promoting the QUM, Strategies to promote the QUM, **Impact of QUM on E-health**, integrative medicine and multidisciplinary care. QUM in special population: Pediatric prescribing, Geriatric prescribing, Prescribing in pregnancy and lactation, Prescribing in immune compromised and organ failure patients.

UNIT IV

12HRS

Regulatory aspects of QUM in India: Regulation including scheduling, Regulation of complementary medicines, Regulation of OTC medicines, Professional responsibility of pharmacist, **Role of industry in QUM in medicine development**.

UNIT V

12HRS

Medication errors: Definition, categorization and causes of medication errors, Detection and prevention of medication errors, **Role of pharmacist in monitoring and management of medication errors**

Pharmacovigilance: Definition, aims and need for pharmacovigilance, Types, predisposing factors and mechanism of adverse drug reactions (ADRs), Detection, reporting and monitoring of ADRs, Causality assessment of ADRs, Management of ADRs, **Role of pharmacist in pharmacovigilance.**

TOTAL: 60 HRS

COURSE OUTCOME

At the end of this course students will be able to,

- CO1 Understand the principles of quality use of medicines
- CO2 Know the benefits and risks associated with use of medicines
- CO3 Understand regulatory aspects of quality use of medicines
- CO4 Identify and resolve medication related problems
- CO5 Practice evidence-based medicines

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REFERENCES:

1. A Textbook of Clinical Pharmacy Practice – Essential concepts and skills – Parthasarathi G, Karin Nyfort-Hansen and Milap Nahata
2. Andrews EB, Moore N. Mann's Pharmacovigilance
3. Dipiro JT, Talbert RL, Yee GC. Pharmacotherapy: A Pathophysiologic Approach
4. Straus SE, Richardson WS, Glasziou P, Haynes RB. Evidence-Based Medicine: How to practice and teach it
5. Cohen MR. Medication Errors
6. Online:
 - http://medicinesaustralia.com.au/files/2012/05/MA_QUM_External_Reduced.pdf
 - <http://curriculum.racgp.org.au/statements/quality-use-of-medicines/>
 - http://www.rug.nl/research/portal/files/14051541/Chapter_2.pdf
7. Relevant review articles from recent medical and pharmaceutical literature.

SEMESTER II
17MPP202T
PHARMACOTHERAPEUTICS II (Employability)

Course Objective:

This course aims to enable the students to understand the different treatment approaches in managing various disease conditions. Also, it imparts knowledge and skills in optimizing drug therapy of a patient by individualizing the treatment plan through evidence-based medicines.

UNIT I

12HRS

Nervous system: Epilepsy, Parkinson's disease, Stroke, Headache, Alzheimer's disease, Neuralgias and Pain pathways and Pain management.

UNIT II

12HRS

Psychiatric disorders: Schizophrenia, Depression, Anxiety disorders, Sleep disorders, Drug induced psychiatric disorders
Renal system: Acute renal failure, Chronic renal failure, Renal dialysis, Drug induced renal disease

UNIT III

12HRS

Infectious diseases: General guidelines for the rational use of antibiotics and surgical prophylaxis, Urinary tract infections, Respiratory tract infections, Gastroenteritis, Tuberculosis, Malaria, Bacterial endocarditis, Septicemia.

UNIT IV

12HRS

Infectious diseases: Meningitis, HIV and opportunistic infections, Rheumatic fever, Dengue fever, H1N1, Helmenthiasis, Fungal infections
Gynecological disorders: Dysmenorrhea, Hormone replacement therapy.

UNIT V

12HRS :

General principles of **cancer chemotherapy**, pharmacotherapy of breast cancer, lung cancer, head & neck cancer, hematological malignancies, Management of nausea and vomiting, Palliative care

TOTAL: 60 HRS

COURSE OUTCOME

At the end of this course students will be able to,

- CO1 Describe and explain the rationale for drug therapy
- CO2 Summarize the therapeutic approach for management of various disease conditions including reference to the latest available evidence
- CO3 Discuss the clinical controversies in drug therapy and evidence based medicine
- CO4 Prepare individualized therapeutic plans based on diagnosis
- CO5 Identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy of Nervous system, Psychiatric disorders, Infectious diseases & Oncology

REFERENCES

1. Roger and Walker. Clinical Pharmacy and Therapeutics - Churchill Livingstone publication.
2. Joseph T. Dipiro et al. Pharmacotherapy: A Pathophysiologic Approach- Appleton & Lange
3. Robins SL. Pathologic basis of disease -W.B. Saunders publication
4. Eric T. Herfindal. Clinical Pharmacy and Therapeutics- Williams and Wilkins Publication
5. Lloyd Young and Koda-Kimble MA Applied Therapeutics: The clinical Use of Drugs- Lippincott Williams and Wilkins
6. Chisholm- Burns Wells Schwinghammer Malone and Joseph P Dipiro. Pharmacotherapy Principles and practice— McGraw Hill Publication
7. Carol Mattson Porth. Principles of Pathophysiology- Lippincott Williams and Wilkins
8. Harrison's. Principles of Internal Medicine - McGraw Hill
9. Relevant review articles from recent medical and pharmaceutical literature

SEMESTER II

17MPP203T

CLINICAL PHARMACOKINETICS AND THERAPEUTIC DRUG MONITORING (Employability)

Course Objective:

This course is designed to enable students to understand the basic principles and applications of pharmacokinetics in designing the individualized dosage regimen, to interpret the plasma drug concentration profile in altered pharmacokinetics, drug interactions and in therapeutic drug monitoring processes to optimize the drug dosage regimen. Also, it enables students to understand the basic concepts of pharmacogenetics, pharmacometrics for modeling and simulation of pharmacokinetic data.

UNIT I

12HRS

Introduction to Clinical pharmacokinetics: Compartmental and Non compartmental models, Renal and non-renal clearance, Organ extraction and models of hepatic clearance, Estimation and determinants of bioavailability, Multiple dosing, Calculation of loading and maintenance doses
Designing of dosage regimens: Determination of dose and dosing intervals, Conversion from intravenous to oral dosing, Nomograms and Tabulations in designing dosage regimen.

UNIT II

12HRS

Pharmacokinetics of Drug Interaction: Pharmacokinetic drug interactions, Inhibition and Induction of Drug metabolism, Inhibition of Biliary Excretion
Pharmacogenetics: Genetic polymorphism in Drug metabolism: Cytochrome P-450 Isoenzymes, Genetic Polymorphism in Drug Transport and Drug Targets, Pharmacogenetics and Pharmacokinetic / Pharmacodynamic considerations
Introduction to Pharmacometrics: Introduction to Bayesian Theory, Adaptive method or Dosing with feedback, Analysis of Population pharmacokinetic Data.

UNIT III

12HRS

Non Linier Mixed Effects Modelling: The Structural or Base Model, Modeling Random Effects, Modeling Covariate Relationships, Mixture Model, Estimation Methods, Model Building Techniques, Covariate Screening Methods, Testing the model assumptions, Precision of the parameter estimates and confidence intervals, Model misspecification and violation of the model assumptions, Model Validation, Simulation of dosing regimens and dosing recommendations, Pharmacometrics software.

UNIT IV

12HRS

Altered Pharmacokinetics: Drug dosing in the elderly, Drug dosing in the paediatrics, Drug dosing in the obese patients, Drug dosing in the pregnancy and lactation, Drug dosing in the renal failure and extracorporeal removal of drugs, Drug dosing in the hepatic failure.

UNIT V

12HRS :

Therapeutic Drug monitoring: Introduction, Individualization of drug dosage regimen (Variability – Genetic, age, weight, disease and Interacting drugs), Indications for TDM, Protocol for TDM, Pharmacokinetic/Pharmacodynamic Correlation in drug therapy, TDM of drugs used in the following conditions: Cardiovascular disease: Digoxin, Lidocaine, Amiodarone; Seizure disorders: Phenytoin, Carbamazepine, Sodium Valproate; Psychiatric conditions: Lithium, Fluoxetine, Amitriptyline; Organ transplantations: Cyclosporine; Cytotoxic Agents: Methotrexate, 5-FU, Cisplatin; Antibiotics: Vancomycin, Gentamicin, Meropenem.

TOTAL: 60 HRS

COURSE OUTCOME

At the end of this course students will be able to,

- CO1 Design the drug dosage regimen for individual patients
- CO2 Interpret and correlate the plasma drug concentrations with patients' therapeutic outcomes
- CO3 Recommend dosage adjustment for patients with renal/ hepatic impairment
- CO4 Manage pharmacokinetic drug interaction
- CO5 Do pharmacokinetic modeling for the given data using the principles of pharmacometrics

REFERENCES

1. Leon Shargel, Susanna Wu-Pong, Andrew Yu. Applied Biopharmaceutics & Pharmacokinetics. New York: Mc Graw Hill.
2. Peter L. Bonate. Pharmacokinetic - Pharmacodynamic Modeling and Simulation. Springer Publications.
3. Michael E. Burton, Leslie M. Shaw, Jerome J. Schentag, William E. Evans. Applied Pharmacokinetics & Pharmacodynamics: Principles of Therapeutic Drug Monitoring. Ippincott Williams & Wilkins.
4. Steven How-Yan Wong, Irving Sunshine. Handbook of Analytical Therapeutic Drug Monitoring and Toxicology. CRC Press, USA.

- 5 Soraya Dhillon, Andrzej Kostrzewski. Clinical pharmacokinetics. 1st edition. London: Pharmaceutical Press.
- 6 Joseph T.Dipiro, William J.Spruill, William E.Wade, Robert A.Blouin and Jane M.Pruemer .Concepts in Clinical Pharmacokinetics. American Society of Health-System Pharmacists, USA.
- 7 Malcolm Rowland, Thomas N. Tozer .Clinical Pharmacokinetics and pharmacodynamics: concepts and applications. Ippincott Williams & Wilkins, USA.
- 8 Evans, Schentag, Jusko. Applied pharmacokinetics. American Society of Health system Pharmacists, USA.
- 9 Michael E. Winter. Basic Clinical Pharmacokinetics. Iippincott Williams & Wilkins, USA.
- 10 Milo Gibaldi. Biopharmaceutics and Clinical Pharmacokinetics. Pharma Book Syndicate, USA.
- 11 Dhillon and Kostrzewski. Clinical pharmacokinetics. Pharmaceutical Press, London.
- 12 John E .Murphy. Clinical Pharmacokinetics. 5th edition. US: American Society of Health-System Pharmacist, USA.
- 13 Relevant review articles from recent medical and pharmaceutical literature.

SEMESTER II

17MPP204

PHARMACOEPIDEMIOLOGY & PHARMACOECONOMICS (Employability)

Course Objective:

This course enables students to understand various pharmacoepidemiological methods and their clinical applications. Also, it aims to impart knowledge on basic concepts, assumptions, terminology, and methods associated with Pharmacoeconomics and health related outcomes, and when should be appropriate Pharmacoeconomics model should be applied for a health care regimen.

UNIT I

12HRS

Introduction to Pharmacoepidemiology: Definition, Scope, Need, Aims & Applications; Outcome measurement: Outcome measures, Drug use measures: Monetary units, Number of prescriptions, units of drug dispensed, defined daily doses, prescribed daily doses, Diagnosis and Therapy surveys, Prevalence, Incidence rate, Monetary units, number of prescriptions, unit of drugs dispensed, defined daily doses and prescribed daily doses, **medications adherence measurements**. Concept of risk: Measurement of risk, Attributable risk and relative risk, Time- risk relationship and odds ratio

UNIT II

12HRS

Pharmacoepidemiological Methods: Qualitative models: Drug Utilization Review; **Quantitative models**: case reports, case series, Cross sectional studies, Cohort and case control studies, Calculation of Odds' ratio, Meta-analysis models, Drug effects study in populations: Spontaneous reporting, Prescription event monitoring, Post marketing surveillance, Record linkage systems, Applications of Pharmacoepidemiology

UNIT III

12HRS

Introduction to Pharmacoeconomics: Definition, history of Pharmacoeconomics, Need of Pharmacoeconomics studies in Indian healthcare system.

Cost categorization and resources for cost estimation: Direct costs. Indirect costs. Intangible costs.

Outcomes and Measurements of Pharmacoeconomics: Types of outcomes: Clinical outcome, Economic outcomes, Humanistic outcomes; Quality Adjusted Life Years, Disability Adjusted Life Years Incremental Cost Effective Ratio, Average Cost Effective Ratio. Person Time, Willingness To Pay, Time Trade Off and Discounting.

UNIT IV

12HRS

Pharmacoeconomic evaluations: Definition, Steps involved, Applications, Advantages and disadvantages of the following **Pharmacoeconomic models**: Cost Minimization Analysis (CMA), Cost Benefit Analysis (CBA), Cost Effective Analysis (CEA), Cost Utility Analysis (CUA), Cost of Illness (COI), Cost Consequences Analysis (COA)..

UNIT V

12HRS :

Definition, Steps involved, Applications, Advantages and disadvantages of the following:

Health related quality of life (HRQOL): Definition, Need for measurement of HRQOL, Common HRQOL measures.

Definition, Steps involved, Applications of the following: Decision Analysis and Decision tree, Sensitivity analysis, Markov Modeling, Software used in Pharmacoeconomic analysis, **Applications of Pharmacoeconomics.**

TOTAL: 60 HRS

COURSE OUTCOME

At the end of this course students will be able to,

- CO1 Explain the various epidemiological methods and their applications
- CO2 Explain the fundamental principles of Pharmacoeconomics
- CO3 Identify and determine relevant cost and consequences associated with pharmacy products and services.
- CO4 Perform the key Pharmacoeconomics analysis methods
- CO5 Analyze the Pharmacoeconomic decision analysis methods and its applications.

REFERENCES

1. Rascati K L. Essentials of Pharmacoeconomics, Woulters Kluwer Lippincott Williams & Wilkins, Philadelphia.
2. Thomas E Getzen. Health economics. Fundamentals and Flow of Funds. John Wiley & Sons, USA.
3. Andrew Briggs, Karl Claxton, Mark Sculpher. Decision Modelling for Health Economic Evaluation, Oxford University Press, London.
4. Michael Drummond, Mark Sculpher, George Torrence, Bernie O'Brien and Greg Stoddart. Methods for the Economic Evaluation of Health Care Programmes Oxford University Press, London.
5. GeorgeE Mackinnon III. Understanding health outcomes and Pharmacoeconomics.

6. Graker, Dennis. Pharmacoeconomics and outcomes.
7. Walley, Pharmacoeconomics.
8. Pharmacoeconomic – ed. by Nowakowska – University of Medical Sciences, Poznan.
9. Relevant review articles from recent medical and pharmaceutical literature

SEMESTER II

17MPP205T

PHARMACY PRACTICE II – PRACTICAL (Skill Development)

Pharmacy Practice practical component includes **experiments** covering important topics of the courses Principles of Quality Use of Medicines, Pharmacotherapeutics-II, Clinical Pharmacokinetics & Therapeutic Drug Monitoring and Pharmacoepidemiology and Pharmacoeconomics.

List of Experiments (24)

1. Causality assessment of adverse drug reactions (three)
2. Detection and management of medication errors (three)
3. Rational use of medicines in special population (three)
4. Presentation of clinical cases of various disease conditions adopting Pharmaceutical Care Plan Model (eight)
5. Calculation of Bioavailability and Bioequivalence from the given data (two)
6. Interpretation of Therapeutic Drug Monitoring reports of a given patient (three)
7. Calculation of various Pharmacoeconomic outcome analysis for the given data (two)

COURSE OUTCOME

At the end of this course students will be able to,

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|-----|--|
| CO1 | Assess of adverse drug reactions |
| CO2 | Detect and manage the medication errors |
| CO3 | Understand the rational use of medicines in special population |
| CO4 | Present the clinical cases of various disease conditions adopting Pharmaceutical Care Plan Model |
| CO5 | Able to perform calculation for dose adjustment in special population |

17SMPP11
SEMINAR
Employability

Present the Pharmacy practice topics and clinical cases of various disease conditions adopting
Pharmaceutical Care Plan Model