



GLA
UNIVERSITY
MATHURA
Established vide U.P. Act 21 of 2010.

M. Pharm.

(PHARMACOLOGY)

COURSE STRUCTURE

First Semester

S. NO.	CODE	SUBJECT	TEACHING SCHEME			CREDITS
			LECTURES	TUTORIALS	PRACTICALS	
1	MPH 1001	Modern Analytical Techniques	4	-	-	4
2	MPH 1002	Product Development	4	-	-	4
3	MPH 1003	Drug Regulatory Affairs Intellectual Property Rights	4	-	-	4
4	MPH 1006	BioPharmaceutics and Pharmacokinetics	4	-	-	4
5	MPH 1007	Pharmacology and Toxicology	4	-	-	4
6	MPH 1081	Modern Analytical Techniques	-	-	4	2
7	MPH 1082	Product Development	-	-	4	2
8	MPH 1083	Pharmacology and Toxicology	-	-	6	3
Total			20		14	27

Second Semester

S. NO.	CODE	SUBJECT	TEACHING SCHEME			CREDITS
			LECTURES	TUTORIALS	PRACTICALS	
1	MPH 2004	Screening Methods and Bioassay	4	-	-	4
2	MPH 2005	Advanced Pharmacology	4	-	-	4
3	MPH 2006	Clinical Pharmacology	4	-	-	4
4	MPH 2081	Advanced Pharmacology	-	-	12	6
5	MPH 2084	Seminar			2	1
Total			12		14	19

Third Semester

S. NO.	CODE	SUBJECT	TEACHING SCHEME			CREDITS
			LECTURES	TUTORIALS	PRACTICALS	
1	MPH-3081	Synopsis of the Proposed Research Work				4
2	MPH 3082	Dissertation- Interim Evaluation				12
Total						16

Fourth Semester

S. NO.	CODE	SUBJECT	TEACHING SCHEME			CREDITS
			LECTURES	TUTORIALS	PRACTICALS	
1	MPH 4081	Dissertation Evaluation				14
Total						14

M. Pharm.
(PHARMACOLOGY)

DETAILED SYLLABUS

MPH 1001: MODERN ANALYTICAL TECHNIQUES

Credits: 04

Semester I

L-T-P: 4-0-0

OBJECTIVE: To impart basic knowledge of spectroscopy (UV,IR, NMR and MASS), chromatography (Paper, TLC, HPLC, column, HPTLC), XRD and basic instruments. They have theoretical as well as practical aspects of the same. The subject is taught in such a way that they can develop analytical method for any drug also they can characterize any organic compounds on the basis of above techniques which they utilize in their research.

Module No.	Content	Teaching Hours
I	<p>UV-Visible Spectroscopy: Principle of UV-Visible Spectroscopy, Chromophores and their interaction with UV-visible radiation and their utilization in qualitative and quantitative analysis of drug molecules. Woodward-Fieser rule and its applications.</p> <p>Infrared Spectroscopy: Infrared radiation and its interaction with organic molecules, vibrational mode of bonds, instrumentation and applications, effect of hydrogen bonding and conjugation on absorption bands, interpretation of IR spectra, FTIR and ATR.</p> <p>Principles and application of light, phase contrast, scanning and transmission. Electron microscopy.</p>	17
II	<p>Nuclear Magnetic Resonance Spectroscopy: Magnetic properties of nuclei, field and precession, chemical shift concept, isotopic nuclei, reference standards and solvents. ^1H NMR spectra, multiplicity, coupling constants, integration of signals, interpretation of spectra, decoupling-double resonance and shift reagent methods. Principles of FT-NMR, Free induction decay, average time domain and frequency domain signals. Spin-spin and spin-lattice relaxation phenomenon. Proton noise decoupled spectra.</p> <p>^{13}C NMR spectra, their interpretation and application. Nuclear overhauser Effect, APT and DEPT techniques. Introduction of 2D NMR techniques, COSY with application.</p>	17
III	<p>Mass Spectrometry: Basic principles and brief outline of instrumentation. Ion formation, molecular ion, metastable ion, fragmentation process in relation to molecular structure and functional groups, relative abundance of isotopes, chemical ionization, API, FAB, ESI, Maldy and GC-MS.</p> <p>Chromatographic Techniques: Principles of separation and application of Column, Paper, Thin layer, GLC, HPLC and HPTLC; Instrumentation, preparative and micro pore columns, Reverse phase columns, mobile phase selection and detectors, Size exclusion chromatography, Affinity chromatography, Electrophoresis.</p> <p>Thermal Methods: Thermogravimetry (TG), Differential thermal Analysis (DTA) and Differential Scanning Calorimetry (DSC) - Basic principles, outline of instrumentation and applications in Pharmacy.</p>	18

OUTCOME: The students would be able to perform research work utilizing these techniques.

Books Recommended

- Willard, H.H., Merrit, L.L., Dean, J.A., Settle P.A., Instrumental Methods of Analysis, CBS publishers and distributors, New Delhi.
- Skoog, D.A., Holler, F.J., Nieman, T.A., Principles of Instrumental Analysis, Cengage Learning India Pvt. Ltd. New Delhi.
- Schirmer, R.E., ed. Modern Methods of Pharmaceutical Analysis, Vols 1, 2. Boca Raton F.L., CRC Press, Franchis & Taylor, New York.
- Silverstein, R. B., Wester F. X., Spectrometric identification of Organic Compounds, John Wiley & Sons Inc.
- Beckett A. and Stenlake, S.B. 'Practical Pharmaceutical Chemistry, CBS publishers and distributors, New Delhi.
- Stahl, E., Thin Layer Chromatography- A laboratory Handbook, , Springer-Verlag-Barlein, Heidelberg.
- Kemp W., Organic spectroscopy, Indian reprint, Pal-grave, New York.
- Kalsi, P.S., Spectroscopy of organic compounds, New age International(P) Ltd. Publishers, New Delhi.
- Lee, D.C., Webb, M., Pharmaceutical Analysis, Blackwell Publishing, CRC Press, Wiley India Ltd., New Delhi.
- Fawlins, I.A., Gas Chromatography, John Wiley & Sons, New York.
- Sethi, P.D., HPLC, Quantitative Analysis of Drugs in Pharmaceutical Formulations, CBS Publishers & distributors, New Delhi.
- Sethi P. D., and Charcogankar, A., Identification of Drugs in Pharmaceutical Formulations by TLC, CBS Publishers & distributors, New Delhi.
- Robert D. Braun, Introduction to Instrumental Analysis, Pharm Med Press, Hyderabad.
- George, S., Steroid Analysis in Pharmaceutical Industry.
- Fawlins, I.A., Mass Spectrometry, John Wiley & Sons, New York.
- Jag Mohan , Organic Spectroscopy, Narosa Publing House, New Delhi.
- Pavia, D.L., Lampman G.H, Kriz G.S. Cengage Learning, New Delhi.
- Sharma, B.K, Instrumental methods of Chemical Analysis, Goel Publishing House, Meerut.
- Day R.A, Uderwood A.L, Quantitative Analysis, Indian reprint, Prntice-Hall of India Pvt. Ltd, New Delhi.
- Garratt D.C, Quantitative Analysis of Drugs, CBS Publishers & distributors, New Delhi.
- Mendham J., Denney R.C, Vogel's Quantitative Chemical Analysis, Pearson Education, New Delhi.
- Phase contrast and modulation contrast., Bradbury, S. and Evennett, P., Contrast Techniques in Light Microscopy, BIOS Scientfic Publishers, Ltd., Oxford, England
- Spencer, M., Fundamentals of Light Microscopy, Cambridge University Press, New York

MPH 1081: MODERN ANALYTICAL TECHNIQUE PRACTICAL

Credits: 02

Semester I

L-T-P: 0-0-4

OBJECTIVE: *To impart basic practical knowledge of UV and IR spectroscopy, chromatography (Paper, TLC, HPLC,) and basic instruments. The subject is taught in such a way that they can develop analytical method for any drug also they can characterize any organic compounds on the basis of above techniques which they utilize in their research.*

Practicals based on theory syllabus.

OUTCOME: The students would be able to do research work on the basis of above techniques.

MPH 1002: PRODUCT DEVELOPMENT

Credits: 04

Semester I

L-T-P: 4-0-0

OBJECTIVE: *The course is designed to make students familiar with the resources of drug **information**, preformulation study, drug-drug interaction, drug-excipients interaction and interaction with packaging materials and regulatory issues of excipients.*

Module No.	Content	Teaching Hours
I	a) Drug information resources, Study of status of Indian Pharmaceutical Industry, Global Pharmaceutical Industry b) Stages in product development – flow charts, acceptance criteria.	17
II	Excipients – General consideration factors governing selection, Drug-excipient, & Excipient-excipient interactions, Excipient package interactions, Safety and regulatory issues of excipients	17
III	Preformulation studies – Concept including decision trees, Analytical studies, Solid state properties, Physicochemical properties, Stability.	18

OUTCOME:

- The students will be able to use drug information resources, preformulation parameters and its application in designing and stability of dosage form and understand the product development process till submission of its report to ANDA.

Books Recommended

- Lachman L, Lieberman HA, Kanig JL, The Theory and Practice of Industrial Pharmacy, CBS publisher, New Delhi.
- Bean, H.S., Backett, A.H. & Carless, J.E, Advances in Pharmaceutical Sciences, Academic Press, London and New York.
- Florence, Banker G.S., Rhodes C.T., Modern Pharmaceutics, Informa Healthcare, New York.
- Carstensen J., Drug Stability Principles and Practices,
- Carstensen, J.T, Rhodes C.T. “Drug stability”, Informa Healthcare, New York.
- Adeyeye MC., Brittian HG., Preformulation in Solid Dosage Form Development, Informa Healthcare, New York.
- Carstensen., Pharmaceutical Preformulation, CRC Press, Taylor and Francis, London.
- Otterstatter G., Coloring of Food, Drugs, & Cosmetics, CRC Press, Taylor and Francis, London.
- Sinko PJ., Martin's Physical Pharmacy and Pharmaceutical Sciences, Lippincott Williams & Wilkins, Wolters Kluwer pvt. Ltd., New Delhi.
- Relevant websites

MPH 1082: PRODUCT DEVELOPMENT PRACTICALS

Credits: 02

Semester I

L-T-P: 0-0-4

OBJECTIVE: *The course is designed to make students familiar with the practical aspects of utilizing resources of drug information, preformulation study, drug-drug interaction, drug-excipients interaction and interaction with packaging materials and regulatory issues of excipients.*

Practicals based on theory syllabus.

OUTCOME:

The students will be able to use drug information resources, preformulation parameters in designing stable dosage forms.

MPH 1003: DRUG REGULATORY AFFAIRS & INTELLECTUAL PROPERTY RIGHTS

Credits: 04

Semester I

L-T-P: 4-0-0

OBJECTIVE: *To know about regulatory bodies like ICH, USFDA AND CDSCO, rules and regulation to market a product in India and USA, intellectual property rights and patent procedure.*

Module No.	Content	Teaching Hours
I	a) Drug & Cosmetics Acts & rules with special reference to schedule Y & M, Drug Regulatory Affairs Requirements of cGMP, GLP, GCP, USFDA, IND, NDA & ANDA (Content & review process) b) BA/BE Studies- USFDA, CDSCO & EUDRA guidelines.	17
II	a) Intellectual Property Rights Processing & its application (patents, Trademarks, Copyrights), Patents Act, Major emphasis on Patents related to: <ul style="list-style-type: none"> ➤ Patentable subject matter ➤ Non-Patentable subject matter ➤ Criteria for getting a patent ➤ Types of patent and its usefulness ➤ Filing procedure for patents b) Patent cooperation treaty: Introduction & their advantage. c) Trade related aspect of intellectual property rights: Introduction & their advantage. d) Environment protection Act, & Factory Act. e) Requirements for factory premises for Medical Devices and In-vitro Diagnostic products in India.	17
III	a) Concepts in validation, Analytical & Process validation & ISO 9000 Series Basic concepts of Quality Control & quality assurance systems control of quality variation of Raw materials, containers & closures. In process quality control tests, b) ICH Guidelines-An introduction of [Q1A (R2), Q3A (R2) & Q6A) guidelines] c) Biosimilars: An introduction d) Fixed dose combination: USFDA Guideline.	18

OUTCOME:

Students will learn about the rules and regulations to market a new drug in India and USA and the procedure for filing of patents.

Books Recommended:

- Guarino, R.A., New Drug Approval Process, Informa Healthcare, New York.
- Drugs & Cosmetic Acts & rules.
- Patents Act.
- Factory Act.
- Consumer Protection Act.
- Environmental Protection Act.
- Federal Food, Drug & Cosmetic Act.
- Loftus, B.T. & Nash RA Pharmaceutical Process Validation , Informa Healthcare, New York.
- Sharma PP., Validation in Pharmaceutical industry, Vandana publication pvt. Ltd, Delhi.
- Nally JD., Good manufacturing practices for Pharmaceuticals, Informa Healthcare, New York.
- Garfiedl, Quality Assurance Principles for Analytical Laboratories.
- Martin RP. And Berry IR., The Pharmaceutical regulatory process, Informa Healthcare, New York.
- Relevant websites.

MPH 1006: BIOPHARMACEUTICS AND PHARMCOKINETICS

Credits: 04

Semester I

L-T-P: 4-0-0

OBJECTIVE: The course is designed to make students understand the concept of bioavailability, bioequivalence and factors affecting bioavailability, Pharmacokinetic parameters like ADME, non-linear and time dependant Pharmacokinetics. They will study the drug interactions & problems associated in calculation of Pharmacokinetic parameters.

Module No.	Content	Teaching Hours
I	A) Introduction to bioPharmaceutics and clinical Pharmacokinetics. ADME of drugs and influence of pH. Basic concepts: Area under curve, apparent volume of distribution, biological half life and concept of clearance. B) One compartment open model, kinetics of intravenous injection , infusion and extra vascular administration. C) Determination of KE from urinary excretion data : Rate excretion method and sigma minus method.	17
II	A) First order absorption kinetics, flip flop method, method of residual and determination of Cmax and Tp. B) Introduction to multi -compartment model, multiple dosage regimen and concept of loading dose. C) Study of physiological transporter system and physiological barriers like BBB, Blood testis barrier and blood placental barrier. Introduction to ChronoPharmacokinetics : Time Dependent Effect Of Drugs.	17
III	A) Nonlinear Pharmacokinetics : Michaelis Menten equation, estimation of K_m and V_{max} , with respect to individualization of drug. B) BioPharmaceutics consideration in drug product design: Absorption of drugs a) Protein binding drugs to blood compartment and factors affecting protein binding, factors influencing drug metabolism, Excretion. C) Non compartmental analysis, estimation of area under curve by Trapezoidal Rules, Bioavailability and Bioequivalence : OBJECTIVE of bioavailability study, method of bioavailability enhancement through enhancement of drug solubility of dissolution rate, Bioequivalence experimental study design.	18

OUTCOME:

The students will be able to utilize knowledge of drugs and various factors which influence ADME and Pharmacokinetics in the design of dosage forms.

Books Recommended:

- J.G. Wagner, Fundamentals of Clinical Pharmacokinetics, Drug Intelligence Publications, Hamilton, III.
- J.G. Wagner, Pharmacokinetics for the Pharmaceutical Scientist, Penna, Technomic Publishing.
- L. Shargel, and A. Yu, Applied BioPharmaceutics and Pharmacokinetics, Appleton and Large, Norwalk, CT.
- M. Gibaldi and D. Perrier, Pharmacokinetics, J. Swarbrick, ed., Marcel Dekker, New York.
- M. Gibaldi, BioPharmaceutics and Clinical Pharmacokinetics, Lea & Febiger, Philadelphia.
- W.R. Gillespie, Non-compartmental versus Compartmental Modeling in Clinical Pharmacokinetics, Clinical Pharmacokinetics, 20, 253-262 .
- R.D.Purves, "Optimum Numerical integration methods for the estimation of area under the curve (AUC) and area under the moment curve (AUMC)". J.Pharmac. BioPharm., 20 (3), 211-226, 1992.
- P.G.Welling, F.L.S. Tse and S.V. Dighe (eds) Pharmaceutical Bioequivalence, Marcel Dekker Inc. New York, USA .
- Prabakaran, L. and Purushothaman, M. Text book of Modern Pharmacokinetics and BioPharmaceutics. Manglam Publication, Tamilnadu, India
- A.Yacobi, J.P.Skelly and V.K.Batra (ed.) Toxicokinetics and new drug development, Pergamon Press, New York USA.
- Singh, B. Protein binding of drugs: A review, Pharmcos, 1991.

MPH-1007 PHARMACOLOGY AND TOXICOLOGY

Credits: 04

Semester I

L-T-P: 4-0-0

OBJECTIVE: This course is designed to provide basic understanding in the principles of Pharmacology and toxicology. It is intended primarily for post graduate students in the Pharmacology who have an interest in the therapeutic and toxic effects of drugs. The course will cover disorders of most of the systems of human body. Moreover, the course will provide critical analysis on several aspects of management of toxicity.

Module No.	Content	Teaching Hours
I	A detailed study of the mechanism of action & Pharmacology of drugs used in a. ANS- Parasympathomimetics and lytics, sympathomimetics and lytics. b. CNS – General anesthetics, sedatives, hypnotics. Drugs used to treat anxiety, depression, psychosis, mania and epilepsy. c. CVS- Diuretics, anti ischemics antihypertensives, antiarrythmics,drugs and for heart failure.	17
II	a. GIT Pharmacology- Antiulcer, prokinetics and antiemetics. b. Antibiotics (Sulphonamides, Cephalosporins, Macrolides, Aminoglycosides, Penicillins, Tetracyclin and Chloramphenicol). c. Chemotherapeutic agents (Antiviral, Antifungal, Antitubercular, Antileprotic and Antimalarial)	17
III	a. Chemotherapy of neoplstic diseases. b. Principles of toxicology and heavy metal poisoning. c. Drug Interactions & Rationale for Drug Combinations Its implications and possible means to avoid them. Drug – Drug interactions involving antibiotics (Cephalosporins, Macrolides, Aminoglycosides, Penicillins, Tetracyclin, Chloramphenicol) cardiovascular drugs(Calcium channel blockers, Beta blockers, ACE Inhibitors) antihistaminic drugs (Cetrizine and Levocetizine). Various mechanisms of drug interaction, drug-food interaction and drug - drug interaction.	18

OUTCOME: On successful completion of Pharmacology and Toxicology, students should be able to:

- Outline and critically appraise the therapeutic and toxic effects of drugs.
- Explain the rationale for considering a suitable drug in the management of a disorder.
- Critically review the issues involved in the management of a disease.

Books Recommended:

- Goodman and Gilman's, The Pharmacological basis of therapeutics, Mc Graw Hill Publication
- . Katzung G., Bertram M.,and susan B., Basic and clinical Pharmacology, 11th ed. Mc Graw Hill
- Ghosh M.N. Fundamentals of experimental Pharmacology 4th ed. Hillton and company Kolkata.
- Kulkarni S.K., Handbook of experimental Pharmacology ,Vallabh Prakashan, New Delhi,
- Gibaldi Milo and Donald Perrier, "Pharmacokinetics".Vol 15. Marcel Dekker, new York.

MPH 1083: PHARMACOLOGY AND TOXICOLOGY

Credits: 03

Semester I

L-T-P: 0-0-6

OBJECTIVE: *This course is designed to provide basic understanding in the principles of Pharmacology and toxicology. It is intended primarily for post graduate students in the Pharmacology who have an interest in studying the therapeutic and toxic effects of drugs.*

Practicals based on theory syllabus.

OUTCOME: On successful completion of Pharmacology and Toxicology, students will be able to outline and critically appraise the therapeutic and toxic effects of drugs.

MPH 2004: SCREENING METHODS AND BIOASSAYS

Credits: 04

Semester II

L-T-P: 4-0-0

OBJECTIVE: This course is designed to provide basic understanding in the principles of bioassay and several screening methods of different class of Pharmacological agents. It is intended primarily for post graduate students in the Pharmacology who have an interest in the selection of appropriate models for a specific treatment strategy. The course will explain several regulatory and ethical guidelines in the selection of suitable experimental models. Further, the course will provide a strong knowledge in the selection of experimental models for different class of Pharmacological agents which would be useful in the process of drug development in the Institute of Pharmaceutical Research and beyond.

Module No.	Content	Teaching Hours
I	Regulations for Laboratory Animals care and Ethical Requirements Guidelines and regulatory agencies- CPCSEA, OECD, USFDA, ICH, FHSA and WHO Basic concepts of high throughput screening Laboratory animals: a. Commonly used laboratory animals, transgenic and other genetically prone animal models (viz., nude mice, SH rats etc). Development of new bioassay methods.	17
II	Organization of screening for the Pharmacological activity of new substances with emphasis on evaluation using <i>in vivo</i>, <i>in vitro</i>, <i>ex vivo</i>, <i>in situ</i>, <i>in silico</i> and other possible animal alternative models a. Anti-hypertensives, anti-arrhythmics, vasodilators and diuretics b. CNS Pharmacology – Behavioural and muscle co-ordination, CNS stimulants and depressants, anxiolytics, anti-epileptics and Nootropics c. Drugs for neurodegenerative diseases like Parkinsonism, Alzheimers, multiple sclerosis, etc	17
III	Screening for Pharmacological Activity a. Analgesics, anti-inflammatory and antipyretic agents. b. Anti-ulcer, anti-emetic, anti-diarrhoeal and laxatives c. Anti-diabetic, anti-hyperlipidemic and hepatoprotective agents. d. Anti-oxidants and Anti-fertility agents	18

OUTCOME: On successful completion of Screening methods and Bioassay, students should be able to:

- Outline and critically appraise the regulatory and ethical steps involved in Pharmacological experiments.
- Explain the rationale for selection of a suitable experimental model for a specific class of drugs.
- Critically review the issues involved in the selection of a suitable experimental model for a specific class of drugs.

Books Recommended:

- Indian Pharmacopoeia, Govt of India.
- Lorraine D, R. and Bacharach A.I Evaluation of drugs activities vol I-II Academic Press, New York
- Turner A Robert and Heeborn Peter. Screening methods in Pharmacology,, Academic Press, New York.
- Ghosh M.N. Fundamentals of experimental Pharmacology, Hillton and company Kolkata.
- 5. Pharmacological experiment on intact preparations by L. J. McLeod; Churchill Livingstone.
- Vogel HG. Drug Discovery and Evaluation: Pharmacological assay Maas J. Springer, New York.

MPH 2005: ADVANCED PHARMACOLOGY

Credits: 04

Semester II

L-T-P: 4-0-0

OBJECTIVE: *This course is designed to provide basic understanding in the advanced principles of Pharmacology. It is intended primarily for post graduate students in the Pharmacology who have an interest in the treatment of disease processes. The course will emphasize molecular signaling concepts of drugs with special attention on endogenous bioactive molecules. Further, the course will provide critical analysis on several classes of receptors and ion channels involved in the Pharmacodynamic action of drugs. In addition, this course will provide a strong knowledge base of chronoPharmacology, immunoPharmacology and gene-based Pharmacology which would be a framework for future Pharmacological approach to a specific problem in the field of drug development in the Institute of Pharmaceutical Research and beyond.*

Module No.	Content	Teaching Hours
I	<p>a. Molecular mechanism of drug action: Cellular signaling systems such as G-proteins, cyclic nucleotides.</p> <p>b. Endogenous bioactive molecules: Neuropeptides and their modulators, neurosteroids, nitric oxide, phosphodiesterase enzyme, protein kinase C and endothelins.</p> <p>c. Arachidonic acid metabolites, COX-2 regulators and their role in inflammation.</p>	17
II	<p>Pharmacology of atrial peptides and Cytokines (Chemokines, Growth Factors, Interferon, Interleukin, Tumor necrosis factor)</p> <p>Recent trends on different classes of receptors as follows and drugs acting on them)</p> <p>a) Angiotensin receptors b) Kinin receptors c) Adrenoceptors d) Cholinergic receptors e) Dopamine receptors f) Serotonin receptors g) GABA and Benzodiazepine receptors h) Opioid receptors</p>	17
III	<p>Ion channel and their modulators: calcium, potassium, sodium and chloride channels</p> <p>a. Apoptosis: Pharmacological and clinical implications</p> <p>b. Basic Concepts of ChronoPharmacology and their implications to Drug Therapy.</p> <p>c. Immuno Pharmacology: Introduction, Immuno modulators, Immuno suppressants, Immuno stimulants.</p> <p>d. Concept of gene therapy and recent development in the treatment of various hereditary diseases.</p>	18

OUTCOME: On successful completion of Advanced Pharmacology, students should be able to:

- Outline and critically appraise the principal steps involved in advancement of Pharmacology.
- Explain the rationale for considering the Pharmacological targets (receptors and ion channels) according to the proposed therapeutic agents.
- Critically review the issues involved in the undertaking of chronoPharmacological, immunoPharmacological and gene-based Pharmacological research.

Books Recommended:

- Katzung G., Bertram M., and Susan B., Basic and clinical Pharmacology , Mc Graw Hill
- Barar, F.S.K., Essentials of Pharmacotherapeutics, S. Chand and Company, New Delhi.
- Goodman and Gilman's, The Pharmacological basis of therapeutics, Mc Graw Hill Publication.
- Rang, H.P., Dale, M.N., Pharmacology, Churchill Livingstone, UK.

MPH 2081 ADVANCED PHARMACOLOGY

Credits: 06

Semester II

L-T-P: 0-0-12

OBJECTIVE: *This course is designed to provide basic understanding the practical aspects of advanced principles of Pharmacology. The course will emphasize molecular signaling concepts of drugs with special attention on endogenous bioactive molecules. Further, the course will provide critical analysis on several classes of receptors and ion channels involved in the Pharmacodynamic action of drugs.*

Practicals based on theory syllabus.

OUTCOME: On successful completion of Advanced Pharmacology, students should be able to:

- Outline and critically appraise the principal steps involved in advancement of Pharmacology.
- Explain the rationale for considering the Pharmacological targets (receptors and ion channels) according to the proposed therapeutic agents.

MPH-2006 CLINICAL PHARMACOLOGY

Credits: 04

Semester II

L-T-P: 4-0-0

OBJECTIVE: This course is designed to provide basic understanding in the principles of clinical Pharmacology. It is intended primarily for post graduate students in the Pharmacology who have an interest in the therapeutic and toxic effects of drugs in human subjects. The course will emphasize several regulatory and ethical guidelines in conducting clinical Pharmacological experiments. Moreover, the course will provide critical analysis on several clinical Pharmacokinetic parameters. In addition, this course will provide a strong knowledge base of clinical management of several disorders.

Module No.	Content	Teaching Hours
I	<p>a. Introduction to clinical Pharmacology, Terminology, basic components and scope.</p> <p>b. New drug discovery process- Process of drug development, preclinical studies, types of clinical trials, choice of patients and exclusion criteria of patients.</p> <p>c. Drugs in Pregnancy- Prescribing in pregnancy, harmful effects on foetus, Pharmacokinetics in pregnancy.</p> <p>Drugs in Infants and Children- Practical aspects of prescribing, Pharmacokinetic</p> <p>Drugs in Elderly- Pharmacokinetics changes, Pharmacodynamic changes.</p> <p>Pharmcotherapeutics of following diseases: Management and clinical Practice Guidelines</p> <p>Cardio-vascular -: Hypertension (HTN) including hypertension in pregnancy, Angina pectoris (AP), Acute myocardial Infarction AMI), Congestive heart failure(CHF), Cardiac arrhythmia (CA) and Atherosclerosis.</p>	17
II	<p>Pharmcotherapeutics of following diseases: Management and clinical Practice Guidelines</p> <p>a. Renal Disease- Acute and chronic renal failure (ARF and CRF), End stage renal disease (ESRD), Renal dialysis (Heamodialysis and Peritoneal dialysis), Clinical alerts associated with drug dose selection in renal impairment.</p> <p>b. Hepatic Disorders- Hepatitis (A,B,C), jaundice and Liver cirrhosis, Alcohol and drug induced complications associated with hepatic impairment</p> <p>c. Autoimmune and meatabolic disorder-Rheumatic fever, Pain management Rheumatoid arthritis, Osteoarthritis, gout and Hyperuricemia, Diabetes mellitus(DM).</p> <p>d. General guidelines for rational use of antibiotics and Resistance to antibiotics.</p>	17
III	<p>a.Respiratory Diseases- Chronic obstructive pulmonary disease (COPD) and Asthma.</p> <p>b.Gastrointestinal Diseases- Peptic ulcer, Diarrhea and constipation</p> <p>c.Adverse drug reaction (ADR)-Type of reaction (Type A&B), anaphylactic reaction management and monitoring.</p> <p>d.Therapeutic Drug Monitoring (TDM)-Clinical significance and its need on patients associated with narrow therapeutic range of drugs Eg. digoxin, amino glycosides, Phenytoin.</p>	18

OUTCOME: On successful completion of Clinical Pharmacology, students should be able to:

- Outline and critically appraise the principal steps involved in practice of clinical Pharmacology.
- Explain the rationale for considering the appropriate model in clinical trials.
- Critically review the issues involved in the management of clinical studies.

Books Recommended

- Roger and Walker; Clinical Pharmacy and Therapeutics, Churchill, Livingston, London.
- Koda and Kimble; Applied Therapeutics: The Clinical Uses of Drugs, Lippincott New York Pharmacology Reviews Articles.
- Harrison's Principles of Internal Medicine, Vol-I and II, Mc Graw-Hill.
- Davidson's Principle and Practice Of Medicine, Churchill, Livingston, London.
- Chaudhari, S.K. Quintessence of Medical Pharmacology; Central Publishers, New Delhi
- Kundu, A.K.; Bedside Clinics in Medicine, Academic Publishers, Part-I and II.

MPH 2084: SEMINAR

Credits: 01

Semester II

L-T-P: 0-0-2

THIRD SEMESTER

MPH 3081: Synopsis of the Proposed Research Work

MPH 3082: Dissertation- Interim Evaluation

FOURTH SEMESTER

MPH4081: Dissertation Evaluation