



SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY,
VISHNUPURI, NANDED

NEW SYLLABUS

(As Per Pharmacy Council of India, New Delhi)

Pharmacology - MPL

for

MASTER OF PHARMACY (M. PHARM) COURSE

(All Affiliated Colleges and Campus School)

With Effective From

Academic Year – 2017-2018

are distributed semester-wise as shown in Table 14. Courses generally progress in sequence, building competencies and their positioning indicates certain academic maturity on the part of the learners. Learners are expected to follow the semester-wise schedule of courses given in the syllabus.

8. Academic work

A regular record of attendance both in Theory, Practical, Seminar, Assignment, Journal club, Discussion with the supervisor, Research work presentation and Dissertation shall be maintained by the department / teaching staff of respective courses.

9. Course of study

The specializations in M.Pharm program is given in Table 1.

Table – 1: List of M.Pharm. Specializations and their Code

| S. No. | Specialization | Code |
|--------|-----------------------------------|------|
| 1. | Pharmaceutics | MPH |
| 2. | Industrial Pharmacy | MIP |
| 3. | Pharmaceutical Chemistry | MPC |
| 4. | Pharmaceutical Analysis | MPA |
| 5. | Pharmaceutical Quality Assurance | MQA |
| 6. | Pharmaceutical Regulatory Affairs | MRA |
| 7. | Pharmaceutical Biotechnology | MPB |
| 8. | Pharmacy Practice | MPP |
| 9. | Pharmacology | MPL |
| 10. | Pharmacognosy | MPG |

The course of study for M.Pharm specializations shall include Semester wise Theory & Practical as given in Table – 2 to 11. The number of hours to be devoted to each theory and practical course in any semester shall not be less than that shown in Table – 2 to 11.

Table - 10: Course of study for (Pharmacology)

| Course Code | Course | Credit Hours | Credit Points | Hrs./wk | Marks |
|--------------------|--------------------------------------------------------|--------------|---------------|---------|-------|
| Semester I | | | | | |
| MPL 101T | Modern Pharmaceutical Analytical Techniques | 4 | 4 | 4 | 100 |
| MPL 102T | Advanced Pharmacology-I | 4 | 4 | 4 | 100 |
| MPL 103T | Pharmacological and Toxicological Screening Methods-I | 4 | 4 | 4 | 100 |
| MPL 104T | Cellular and Molecular Pharmacology | 4 | 4 | 4 | 100 |
| MPL 105P | Pharmacology Practical I | 12 | 6 | 12 | 150 |
| - | Seminar/Assignment | 7 | 4 | 7 | 100 |
| Total | | 35 | 26 | 35 | 650 |
| Semester II | | | | | |
| MPL 201T | Advanced Pharmacology II | 4 | 4 | 4 | 100 |
| MPL 202T | Pharmacological and Toxicological Screening Methods-II | 4 | 4 | 4 | 100 |
| MPL 203T | Principles of Drug Discovery | 4 | 4 | 4 | 100 |
| MPL 204T | Experimental Pharmacology practical- II | 4 | 4 | 4 | 100 |
| MPL 205P | Pharmacology Practical II | 12 | 6 | 12 | 150 |
| - | Seminar/Assignment | 7 | 4 | 7 | 100 |
| Total | | 35 | 26 | 35 | 650 |

Table - 12: Course of study for M. Pharm. III Semester
(Common for All Specializations)

| Course Code | Course | Credit Hours | Credit Points |
|-------------|------------------------------------------------------|--------------|---------------|
| MRM 301T | Research Methodology and Biostatistics* | 4 | 4 |
| - | Journal club | 1 | 1 |
| - | Discussion / Presentation (Proposal Presentation) | 2 | 2 |
| - | Research Work | 28 | 14 |
| Total | | 35 | 21 |

* Non University Exam

Table - 13: Course of study for M. Pharm. IV Semester
(Common for All Specializations)

| Course Code | Course | Credit Hours | Credit Points |
|-------------|-------------------------------|--------------|---------------|
| - | Journal Club | 1 | 1 |
| - | Research Work | 31 | 16 |
| - | Discussion/Final Presentation | 3 | 3 |
| Total | | 35 | 20 |

Table - 14: Semester wise credits distribution

| Semester | Credit Points |
|----------------------------------------------------------------------------------------------------------------|----------------------------|
| I | 26 |
| II | 26 |
| III | 21 |
| IV | 20 |
| Co-curricular Activities (Attending Conference, Scientific Presentations and Other Scholarly Activities) | Minimum=02 Maximum=07* |
| Total Credit Points | Minimum=95 Maximum=100* |

*Credit Points for Co-curricular Activities

Table – 15: Guidelines for Awarding Credit Points for Co-curricular Activities

| Name of the Activity | Maximum Credit Points Eligible / Activity |
|----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| Participation in National Level Seminar/Conference/Workshop/Symposium/ Training Programs (related to the specialization of the student) | 01 |
| Participation in international Level Seminar/Conference/Workshop/Symposium/ Training Programs (related to the specialization of the student) | 02 |
| Academic Award/Research Award from State Level/National Agencies | 01 |
| Academic Award/Research Award from International Agencies | 02 |
| Research / Review Publication in National Journals (Indexed in Scopus / Web of Science) | 01 |
| Research / Review Publication in International Journals (Indexed in Scopus / Web of Science) | 02 |

Note: International Conference: Held Outside India

International Journal: The Editorial Board Outside India

*The credit points assigned for extracurricular and or co-curricular activities shall be given by the Principals of the colleges and the same shall be submitted to the University. The criteria to acquire this credit point shall be defined by the colleges from time to time.

10. Program Committee

1. The M. Pharm. programme shall have a Programme Committee constituted by the Head of the institution in consultation with all the Heads of the departments.
2. The composition of the Programme Committee shall be as follows:
A teacher at the cadre of Professor shall be the Chairperson; One Teacher from each M.Pharm specialization and four student representatives (two from each academic year), nominated by the Head of the institution.
3. Duties of the Programme Committee:
 - i. Periodically reviewing the progress of the classes.
 - ii. Discussing the problems concerning curriculum, syllabus and the conduct of classes.
 - iii. Discussing with the course teachers on the nature and scope of assessment for the course and the same shall be announced to the students at the beginning of respective semesters.

- iv. Communicating its recommendation to the Head of the institution on academic matters.
- v. The Programme Committee shall meet at least twice in a semester preferably at the end of each sessionalexam and before the end semester exam.

11. Examinations/Assessments

The schemes for internal assessment and end semester examinations are given in Table - 16.

11.1. End semester examinations

The End Semester Examinations for each theory and practical course through semesters I to IV shall be conducted by the respective university except for the subject with asterix symbol (*) in table I and II for which examinations shall be conducted by the subject experts at college level and the marks/grades shall be submitted to the university.

Tables – 24: Schemes for internal assessments and end semester examinations
(Pharmacology-MPL)

| Course Code | Course | Internal Assessment | | | | End Semester Exams | | Total Marks |
|--------------------|--------------------------------------------------------|---------------------|-----------------|----------|-------|--------------------|----------|-------------|
| | | Continuous Mode | Sessional Exams | | Total | Marks | Duration | |
| | | | Marks | Duration | | | | |
| SEMESTER I | | | | | | | | |
| MPL10 1T | Modern Pharmaceutical Analytical Techniques | 10 | 15 | 1 Hr | 25 | 75 | 3 Hrs | 100 |
| MPL10 2T | Advanced Pharmacology-I | 10 | 15 | 1 Hr | 25 | 75 | 3 Hrs | 100 |
| MPL10 3T | Pharmacological and Toxicological Screening Methods-I | 10 | 15 | 1 Hr | 25 | 75 | 3 Hrs | 100 |
| MPL10 4T | Cellular and Molecular Pharmacology | 10 | 15 | 1 Hr | 25 | 75 | 3 Hrs | 100 |
| MPL10 5P | Experimental Pharmacology - I | 20 | 30 | 6 Hrs | 50 | 100 | 6 Hrs | 150 |
| - | Seminar /Assignment | - | - | - | - | - | - | 100 |
| Total | | | | | | | | 650 |
| SEMESTER II | | | | | | | | |
| MPL20 1T | Advanced Pharmacology II | 10 | 15 | 1 Hr | 25 | 75 | 3 Hrs | 100 |
| MPL10 2T | Pharmacological and Toxicological Screening Methods-II | 10 | 15 | 1 Hr | 25 | 75 | 3 Hrs | 100 |
| MPL20 3T | Principles of Drug Discovery | 10 | 15 | 1 Hr | 25 | 75 | 3 Hrs | 100 |
| MPL20 4T | Clinical research and pharmacovigilance | 10 | 15 | 1 Hr | 25 | 75 | 3 Hrs | 100 |
| MPL20 5P | Experimental Pharmacology - II | 20 | 30 | 6 Hrs | 50 | 100 | 6 Hrs | 150 |
| - | Seminar /Assignment | - | - | - | - | - | - | 100 |
| Total | | | | | | | | 650 |

PHARMACOLOGY (MPL)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (MPL 101T)

Scope

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Objectives

After completion of course student is able to know about,

- Chemicals and Excipients
- The analysis of various drugs in single and combination dosage forms
- Theoretical and practical skills of the instruments

THEORY

60 Hrs

1. UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy, Difference/ Derivative spectroscopy. IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier - Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy, Data Interpretation. Spectrofluorimetry: Theory of Fluorescence, Factors affecting fluorescence (Characteristics of drugs that can be analysed by fluorimetry), Quenchers, Instrumentation and Applications of fluorescence spectrophotometer. Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications. 10 Hrs
2. NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and ¹³C NMR. Applications of NMR spectroscopy. 10 Hrs

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|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 3 | <p>Mass Spectroscopy: Principle, Theory, Instrumentation Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy.</p> | 10 Hrs |
| 4 | <p>Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution, isolation of drug from excipients, data interpretation and applications of the following:</p> <ul style="list-style-type: none"> j) Thin Layer chromatography k) High Performance Thin Layer Chromatography l) Ion exchange chromatography m) Column chromatography n) Gas chromatography o) High Performance Liquid chromatography p) Ultra High Performance Liquid chromatography q) Affinity chromatography r) Gel Chromatography | 10 Hrs |
| 5 | <p>Electrophoresis: Principle, Instrumentation, Workin conditions, factors affecting separation and applications of the following:</p> <ul style="list-style-type: none"> a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing <p>X ray Crystallography: Production of X rays, Different X ray methods, Bragg's law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X-ray diffraction.</p> | 10 Hrs |
| 6 | <p>Potentiometry: Principle, workin , Ion selective Electrodes and Application o potentiometry.</p> <p>Thermal Techniques: Principle, thermal transitions and Instrumentation (Heat flux and power-compensation and designs), Modulated DSC, Hyper DSC, experimental parameters (sample preparation, experimental conditions, calibration, heating and cooling rates, resolution, source of errors) and their influence, advantage and disadvantages, pharmaceutical applications. Differential Thermal Analysis (DTA): Principle, instrumentation and advantage and disadvantages, pharmaceutical applications, derivative differential thermal analysis (DDTA). TGA: Principle, instrumentation, factors affecting results, advantage and disadvantages, pharmaceutical applications.</p> | 10 Hrs |

REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis - Willards, 7th edition, CBS publishers.
4. Practical Pharmaceutical Chemistry - Beckett and Stenlake, Vol II, 4th editio , CBS Publishers, New Delhi, 1997.
5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
7. Pharmaceutical Analysis - Modern Methods - Part B - J W Munson, Vol 11, Marcel. Dekker Series
8. Spectroscopy of Organic Compounds, 2nd edn., P.S/Kalsi, Wiley estern Ltd., Delhi.
9. Textbook of Pharmaceutical Analysis, KA.Connors, 3rd Edition, John Wiley & Son , 1982.

ADVANCED PHARMACOLOGY - I
(MPL 102T)

Scope

The subject is designed to strengthen the basic knowledge in the field of pharmacology and to impart recent advances in the drugs used for the treatment of various diseases. In addition, this subject helps the students to understand the concepts of drug action and mechanisms involved

Objectives

Upon completion of the course the student shall be able to :

- Discuss the pathophysiology and pharmacotherapy of certain diseases
- Explain the mechanism of drug actions at cellular and molecular level
- Understand the adverse effects, contraindications and clinical uses of drug used in treatment of diseases

THEORY

60 Hrs

- | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 1. General | Pharmacology 12 Hrs |
| a. Pharmacokinetics: The dynamics of drug absorption, distribution, biotransformation and elimination. Concepts of linear and non-linear compartment models. Significance of Protein binding. | |
| b. Pharmacodynamics: Mechanism of drug action and the relationship between drug concentration and effect. Receptors, structural and functional families of receptors, quantitation of drug receptors interaction and elicited effects. | |
| 2 Neurotransmission | 12 Hrs |
| a. General aspects and steps involved in neurotransmission. | |
| b. Neurohumoral transmission in autonomic nervous system (Detailed study about neurotransmitters- Adrenaline and Acetyl choline). | |
| c. Neurohumoral transmission in central nervous system (Detailed study about neurotransmitters- histamine, serotonin, dopamine, GABA, glutamate and glycine]. | |
| d. Non adrenergic non cholinergic transmission (NANC). Co-transmission | |

Systemic Pharmacology

A detailed study on pathophysiology of diseases, mechanism of action, pharmacology and toxicology existing as well as novel drugs used in the following systems

Autonomic Pharmacology

Parasympathomimetics and lytics, sympathomimetics and lytics, agents affecting neuromuscular junction

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|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 3 | Central nervous system Pharmacology General and local anesthetics Sedatives and hypnotics, drugs used to treat anxiety. Depression, psychosis, mania, epi epsy, neurodegenerative diseases. Narcotic and non-narcotic analgesics. | 12 Hrs |
| 4 | Cardiovascular Pharmacology Diuretics, antihypertensives, antiischemics, anti- arrhythmics, drugs for heart failure and hyperlipidemia. Hematinics, coagulants , anticoagulants, fibrinolytics and anti-platelet drugs | 12 Hrs |
| 5 | Autocoid Pharmacology The physiological and pathological role of Histamine, Serotonin, Kinins Prostaglandins Opioid autocoids. Pharmacology of antihistamines, 5HT antagonists. | 12 Hrs |

REFEERENCES

1. The Pharmacological Basis of Therapeutics, Goodman and Gillman's
2. Principles of Pharmacology. The Pathophysiologic basis of drug Therapy by David E Golan, Armen H, Tashjian Jr, Ehrin J, Armstrong, April W, Armstrong, Wolters, Kluwer-Lippincott Williams & Wilkins Publishers.
3. Basic and Clinical Pharmacology by B.G Katzung
4. Hand book of Clinical Pharmacokinetics by Gibaldi and Prescott.
5. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew B.C.Yu.
6. Graham Smith. Oxford textbook of Clinical Pharmacology.
7. Avery Drug Treatment
8. Dipiro Pharmacology, Pathophysiological approach.
9. Green Pathophysiology for Pharmacists.

10. Robbins & Cortan Pathologic Basis of Disease, 9th Ed. (Robbins Pathology)
11. A Complete Textbook Medical Pharmacology by Dr. S.K Srivastava published by APC Avichal Publishing Company
12. KD.Tripathi. Essentials of Medical Pharmacology.
13. Modern Pharmacology with Clinical Applications, Craig Charles R. & Stitzel Robert E., Lippincott Publishers.
14. Clinical Pharmacokinetics & Pharmacodynamics : Concepts and Applications - Malcolm Rowland and Thomas N.Tozer, Wolters Kluwer, Lippincott Williams & Wilkins Publishers.
15. Applied biopharmaceutics and Pharmacokinetics, Pharmacodynamics and Drug metabolism for industrial scientists.
16. Modern Pharmacology, Craig CR. & Stitzel RE, Little Brown & Company.

PHARMACOLOGICAL AND TOXICOLOGICAL SCREENING
METHODS - I
(MPL 103T)

Scope

This subject is designed to impart the knowledge on preclinical evaluation of drugs and recent experimental techniques in the drug discovery and development. The subject content helps the student to understand the maintenance of laboratory animals as per the guidelines, basic knowledge of various in-vitro and in-vivo preclinical evaluation processes

Objectives

Upon completion of the course the student shall be able to,

- Appraise the regulations and ethical requirement for the usage of experimental animals.
- Describe the various animals used in the drug discovery process and good laboratory practices in maintenance and handling of experimental animals
- Describe the various newer screening methods involved in the drug discovery process
- Appreciate and correlate the preclinical data to humans

THEORY

60 Hrs

1. Laboratory Animals 12 Hrs
Common laboratory animals: Description, handling and applications of different species and strains of animals.

Transgenic animals: Production, maintenance and applications
Anaesthesia and euthanasia of experimental animals.
Maintenance and breeding of laboratory animals.
CPCSEA guidelines to conduct experiments on animals

Good laboratory practice.
Bioassay-Principle, scope and limitations and methods

- 2 Preclinical screening of new substances for the 12 Hrs
pharmacological activity using in vivo, in vitro, and other possible animal alternative models.

General principles of preclinical screening. CNS Pharmacology: behavioral and muscle coordination, CNS stimulants and

depressants, anxiolytics, anti-psychotics, anti epileptics and
nootropics. Drugs for neurodegenerative diseases like
Parkinsonism, Alzheimers and multiple sclerosis. Drug acting on
Autonomic Nervous System.

- 3 Preclinical screening of new substances for the 12
pharmacological activity using in vivo, in vitro, and other Hrs
possible animal alternative models.

Respiratory Pharmacology: anti-asthmatics, drugs for COPD and
anti allergics. Reproductive Pharmacology: Aphrodisiacs and
antifertility agents Analgesics, antiinflammatory and antipyretic
agents. Gastrointestinal drugs: anti ulcer, anti -emetic, anti-
diarrheal and laxatives.

- 4 Preclinical screening of new substances for the 12
pharmacological activity using in vivo, in vitro, and other Hrs
possible animal alternative models.

Cardiovascular Pharmacology: antihypertensives, antiarrhythmics,
antianginal, antiatherosclerotic agents and diuretics. Drugs for
metabolic disorders like anti-diabetic, antidyslipidemic agents.
Anti cancer agents. Hepatoprotective screening methods.

- 5 Preclinical screening of new substances for the 12
pharmacological activity using in vivo, in vitro, and other Hrs
possible animal alternative models.

Immunomodulators, Immunosuppressants and immunostimulants

General principles of immunoassay: theoretical basis and
optim ation of immun assay, heterogeneous and homogenous
immunoassay systems. Immunoassay methods evaluation;
protocol outline, objectives and preparation. Immunoassay for
digoxin and insulin

Limitations of animal experimentation and alternate animal
experiments.

Extrapolation of in vitro data to preclinical and preclinical to
humans

REFERENCES

1. Biological standardization by J.H. Burn D.J. Finney and I.G. Goodwin
2. Screening methods in Pharmacology by Robert Turner. A
3. Evaluation of drugs activities by Laurence and Bachrach
4. Methods in Pharmacology by Arnold Schwartz.
5. Fundamentals of experimental Pharmacology by M.N.Ghosh
6. Pharmacological experiment on intact preparations by Churchill Livingstone
7. Drug discovery and Evaluation by Vogel H.G.
8. Experimental Pharmacology by R.K.Goyal.
9. Preclinical evaluation of new drugs by S.K. Guta
10. Handbook of Experimental Pharmacology, SK.Kulkarni
11. Practical Pharmacology and Clinical Pharmacy, SK.Kulkarni, 3rd Edition.
12. David R.Gross. Animal Models in Cardiovascular Research, 2nd Edition, Kluwer Academic Publishers, London, UK.
13. Screening Methods in Pharmacology, Robert A.Turner.
14. Rodents for Pharmacological Experiments, Dr.Tapan Kumar chatterjee.
15. Practical Manual of Experimental and Clinical Pharmacology by Bikash Medhi (Author), Ajay Prakash (Author)

CELLULAR AND MOLECULAR PHARMACOLOGY (MPL 104T)

Scope:

The subject imparts a fundamental knowledge on the structure and functions of cellular components and help to understand the interaction of these components with drugs. This information will further help the student to apply the knowledge in drug discovery process.

Objectives:

Upon completion of the course, the student shall be able to,

- Explain the receptor signal transduction processes.
- Explain the molecular pathways affected by drugs.
- Appreciate the applicability of molecular pharmacology and biomarkers in drug discovery process.
- Demonstrate molecular biology techniques as applicable for pharmacology

THEORY

60 Hrs

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|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 1. | Cell biology Structure and functions of cell and its organelles Genome organization. Gene expression and its regulation, importance of siRNA and micro RNA, gene mapping and gene sequencing Cell cycles and its regulation. Cell death– events, regulators, intrinsic and extrinsic pathways of apoptosis. Necrosis and autophagy. | 12 Hrs |
| 2 | Cell signaling Intercellular and intracellular signaling pathways. Classification of receptor family and molecular structure ligand gated ion channels; G-protein coupled receptors, tyrosine kinase receptors and nuclear receptors. Secondary messengers: cyclic AMP, cyclic GMP, calcium ion, inositol 1,4,5-trisphosphate, (IP3), NO, and diacylglycerol. Detailed study of following intracellular signaling pathways: cyclic AMP signaling pathway, mitogen-activated protein kinase (MAPK) signaling, Janus kinase (JAK)/signal transducer and activator of transcription (STAT) signaling pathway. | 12 Hrs |

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|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 3 | <p>Principles and applications of genomic and proteomic tools DNA electrophoresis, PCR (reverse transcription and real time), Gene sequencing, micro array technique, SDS page, ELISA and western blotting, Recombinant DNA technology and gene therapy Basic principles of recombinant DNA technology-Restriction enzymes, various types of vectors. Applications of recombinant DNA technology. Gene therapy- Various types of gene transfer techniques, clinical applications and recent advances in gene therapy.</p> | 12 Hrs |
| 4 | <p>Pharmacogenomics Gene mapping and cloning of disease gene. Genetic variation and its role in health/ pharmacology Polymorphisms affecting drug metabolism Genetic variation in drug transporters Genetic variation in G protein coupled receptors Applications of proteomics science: Genomics, proteomics, metabolomics, functionomics, nutrigenomics Immunotherapeutics Types of immunotherapeutics, humanisation antibody therapy, Immunotherapeutics in clinical practice</p> | 12 Hrs |
| 5 | <p>a. Cell culture techniques Basic equipments used in cell culture lab. Cell culture media, various types of cell culture, general procedure for cell cultures; isolation of cells, subculture, cryopreservation, characterization of cells and their application. Principles and applications of cell viability assays, glucose uptake assay, Calcium influx assays Principles and applications of flow cytometry</p> <p>b. Biosimilars</p> | 12 Hrs |

REFERENCES:

1. The Cell, A Molecular Approach. Geoffrey M Cooper.
2. Pharmacogenomics: The Search for Individualized Therapies. Edited by J. Licinio and M -L. Wong
3. Handbook of Cell Signaling (Second Edition) Edited by Ralph A. et.al
4. Molecular Pharmacology: From DNA to Drug Discovery. John Dickenson et.al
5. Basic Cell Culture protocols by Cheril D.Helgason and Cindy L.Miller
6. Basic Cell Culture (Practical Approach) by J. M. Davis (Editor)
7. Animal Cell Culture: A Practical Approach by John R. Masters (Editor)
8. Current protocols in molecular biology vo I to VI edited by Frederick M.Ausvel et la.

PHARMACOLOGICAL PRACTICAL - I
(MPL 105P)

1. Analysis of pharmacopoeial compounds and their formulations by UV Vis spectrophotometer
2. Simultaneous estimation of mult component containing formu ations by UV spectrophotometry
3. Experiments based on HPLC
4. Experiments based on Gas Chromatography
5. Estimation of riboflavin/quinine sulphate by fluorimetry
6. Estimation of sodium/potassium by flame photometry

Handling of laboratory animals.

1. Various routes of drug administration.
2. Techniques of blood sampling, anesthesia and euthanasia of experimental animals.
3. Functional observation battery tests (modified Irwin test)
4. Evaluation of CNS stimulant, depressant, anxiogenics and anxiolytic, anticonvulsant activity.
5. Evaluation of analgesic, anti-inflammatory, local anesthetic, mydriatic and miotic activity.
6. Evaluation of diuretic activity.
7. Evaluation of antiulcer activity by pylorus ligation method.
8. Oral glucose tolerance test.
9. Isolation and identification of DNA from various sources (Bacteria, Cauliflower, onion, Goat liver).
10. Isolation of RNA from yeast
11. Estimation of proteins by Braford/Lowry's in biological samples.
12. Estimation of RNA/DNA by UV Spectroscopy
13. Gene amplification by PCR.
14. Protein quantification Western Blotting.
15. Enzyme based in-vitro assays (MPO, AChEs, α amylase, α glucosidase).
16. Cell viability assays (MTT/Trypan blue/SRB).
17. DNA fragmentation assay by agarose gel electrophoresis.
18. DNA damage study by Comet assay.
19. Apoptosis determination by fluorescent imaging studies.
20. Pharmacokinetic studies and data analysis of drugs given by different routes of administration using softwares
21. Enzyme inhibition and induction activity
22. Extraction o drug from various biolo cal samples and estimation of drugs in biological fluids using different analytical techniques (UV)
23. Extraction o drug from various biological samples and estimation o drugs in biological fluids using dif erent analytical techniques (HPLC)

REFERENCES

1. CPCSEA, OECD, ICH, USFDA, Schedule Y, EPA guidelines,
2. Fundamentals of experimental Pharmacology by M.N.Ghosh
3. Handbook of Experimental Pharmacology by S.K. Kulkarni.
4. Drug discovery and Evaluation by Vogel H.G.
5. Spectrometric Identification of Organic compounds - Robert M Silverstein,
6. Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman,
7. Vogel's Text book of quantitative chemical analysis - Jeffery, Basset, Mendham, Denney,
8. Basic Cell Culture protocols by Cheril D. Helgason and Cindy L.Mille
9. Basic Cell Culture (Practical Approach) by J. M. Davis (Editor)
10. Animal Cell Culture: A Practical Approach by John R. Masters (Editor)
11. Practical Manual of Experimental and Clinical Pharmacology by Bikash Medhi(Author), Ajay Prakash (Author) Jaypee brothers' medical publishers Pvt. Ltd

ADVANCED PHARMACOLOGY - II
(MPL 201T)

Scope

The subject is designed to strengthen the basic knowledge in the field of pharmacology and to impart recent advances in the drugs used for the treatment of various diseases. In addition, the subject helps the student to understand the concepts of drug action and mechanism involved

Objectives

Upon completion of the course the student shall be able to:

- Explain the mechanism of drug actions at cellular and molecular level
- Discuss the Pathophysiology and pharmacotherapy of certain diseases
- Understand the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases

| THEORY | | 60 Hrs |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 1. | Endocrine Pharmacology Molecular and cellular mechanism of action of hormones such as growth hormone, prolactin, thyroid, insulin and sex hormones Anti-thyroid drugs, Oral hypoglycemic agents, Oral contraceptives, Corticosteroids. Drugs affecting calcium regulation | 12 Hrs |
| 2 | Chemotherapy Cellular and molecular mechanism of actions and resistance of antimicrobial agents such as β -lactams, aminoglycosides, quinolones, Macrolide antibiotics. Antifungal, antiviral, and anti-TB drugs. | 12 Hrs |
| 3 | Chemotherapy Drugs used in Protozoal Infections Drugs used in the treatment of Helminthiasis Chemotherapy of cancer Immunopharmacology Cellular and biochemical mediators of inflammation and immune response. Allergic or hypersensitivity reactions. Pharmacotherapy of asthma and COPD. Immunosuppressants and Immunostimulants | 12 Hrs |

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|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 4 | <p>GIT Pharmacology Antiulcer drugs, Prokinetics, antiemetics, anti-diarrheals and drugs for constipation and irritable bowel syndrome. Chronopharmacology Biological and circadian rhythms, applications of chronotherapy in various diseases like cardiovascular disease, diabetes, asthma and peptic ulcer</p> | 12 Hrs |
| 5 | <p>Free radicals Pharmacology Generation of free radicals, role of free radicals in etiopathology of various diseases such as diabetes, neurodegenerative diseases and cancer. Protective activity of certain important antioxidant Recent Advances in Treatment: Alzheimer's disease, Parkinson's disease, Cancer, Diabetes mellitus</p> | 12 Hrs |

REFERENCES

1. The Pharmacological basis of therapeutics- Goodman and Gilman's
2. Principles of Pharmacology. The Pathophysiologic basis of drug therapy by David E Golan et al.
3. Basic and Clinical Pharmacology by B.G -Katzung
4. Pharmacology by H.P. Rang and M.M. Dale.
5. Hand book of Clinical Pharmacokinetics by Gibaldi and Prescott.
6. Text book of Therapeutics, drug and disease management by E T. Herfindal and Gourley.
7. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew B.C.Yu.
8. Handbook of Essential Pharmacokinetics, Pharmacodynamics and Drug Metabolism for Industrial Scientists
9. Robbins & Cotran Pathologic Basis of Disease, 9th Ed. (Robbins Pathology)
10. A Complete Textbook of Medical Pharmacology by Dr. S.K Srivastava published by APC Avichal Publishing Company.
11. K.D.Tripathi. Essentials of Medical Pharmacology
12. Principles of Pharmacology. The Pathophysiologic basis of drug Therapy by David E Golan, Armen H, Tashjian Jr, Ehrin J, Armstrong, April W, Armstrong, Wolters, Kluwer-Lippincott Williams & Wilkin Publishers

PHARMACOLOGICAL AND TOXICOLOGICAL SCREENING
METHODS-II
(MPL 202T)

Scope:

This subject imparts knowledge on the preclinical safety and toxicological evaluation of drug & new chemical entity. This knowledge will make the student competent in regulatory toxicological evaluation.

Objectives:

Upon completion of the course, the student shall be able to,

- Explain the various types of toxicity studies.
- Appreciate the importance of ethical and regulatory requirements for toxicity studies.
- Demonstrate the practical skills required to conduct the preclinical toxicity studies.

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| | THEORY | 60 Hrs |
| 1. | Basic definition and types of toxicology (general, mechanistic, regulatory and descriptive) Regulatory guidelines for conducting toxicity studies OECD, ICH, EPA and Schedule Y OECD principles of Good laboratory practice (GLP) History, concept and its importance in drug development | 12 Hrs |
| 2. | Acute, sub-acute and chronic- oral, dermal and inhalational studies as per OECD guidelines. Acute eye irritation, skin sensitization, dermal irritation & dermal toxicity studies. Test item characterization- importance and methods in regulatory toxicology studies | 12 Hrs |
| 3. | Reproductive toxicology studies, Male reproductive toxicity studies, female reproductive studies (segment I and segment III), teratogenicity studies (segment II) Genotoxicity studies (Ames Test, in vitro and in vivo Micronucleus and Chromosomal aberrations studies) In vivo carcinogenicity studies | 12 Hrs |
| 4. | IND enabling studies (IND studies)- Definition of IND, importance of IND, industry perspective, list of studies needed for IND submission. | 12 Hrs |

Safety pharmacology studies- origin, concepts and importance of safety pharmacology.

Tier1- CVS, CNS and respiratory safety pharmacology, HERG assay. Tier2- GI, renal and other studies

- 5 Toxicokinetics- Toxicokinetic evaluation in preclinical studies, 12 saturation kinetics Importance and applications of toxicokinetic Hrs studies.
Alternative methods to animal toxicity testing.

REFERENCES

1. Hand book on GLP, Quality practices for regulated non-clinical research and development (<http://www.who.int/tdr/publications/documents/glp-handbook.pdf>).
2. Schedule Y Guideline: drugs and cosmetics (second amendment) rules, 2005, ministry of health and family welfare (department of health) New Delhi
3. Drugs from discovery to approval by Rick NG.
4. Animal Models in Toxicology, 3rd Edition, Lower and Bryan
5. OECD test guidelines.
6. Principles of toxicology by Karen E. Stine, Thomas M. Brown.
7. Guidance for Industry M3(R2) Nonclinical Safety Studies for the Conduct of Human Clinical Trials and Marketing Authorization for Pharmaceuticals (<http://www.fda.gov/downloads/drugs/guidancecomplianceregulatoryinformation/guidances/ucm073246.pdf>)

PRINCIPLES OF DRUG DISCOVERY (MPL 203T)

Scope:

The subject imparts basic knowledge of drug discovery process. This information will make the student competent in drug discovery process

Objectives:

Upon completion of the course, the student shall be able to,

- Explain the various stages of drug discovery.
- Appreciate the importance of the role of genomics, proteomics and bioinformatics in drug discovery
- Explain various targets for drug discovery.
- Explain various lead seeking method and lead optimization
- Appreciate the importance of the role of computer aided drug design in drug discovery

THEORY

60 Hrs

1. An overview of modern drug discovery process: Target identification, target validation, lead identification and lead Optimization. Economics of drug discovery. Target Discovery and validation-Role of Genomics, Proteomics and Bioinformatics. Role of Nucleic acid microarrays, Protein microarrays, Antisense technologies, siRNAs, antisense oligonucleotides, Zinc finger proteins. Role of transgenic animals in target validation. 12 Hrs
2. Lead Identification- combinatorial chemistry & high throughput screening, in silico lead discovery techniques, Assay development for hit identification. Protein structure 12 Hrs
Levels of protein structure, Domains, motifs, and folds in protein structure. Computational prediction of protein structure: Threading and homology modeling methods. Application of NMR and X-ray crystallography in protein structure prediction
3. Rational Drug Design 12 Hrs
Traditional vs rational drug design, Methods followed in traditional drug design, High throughput screening, Concepts of Rational Drug Design, Rational Drug Design Methods: Structure and Pharmacophore based approaches

- Virtual Screening techniques: Drug likeness screening, Concept of pharmacophore mapping and pharmacophore based Screening,
- | | | |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 4 | Molecular docking: Rigid docking, flexible docking, manual docking; Docking based screening. De novo drug design. Quantitative analysis of Structure Activity Relationship | 12 Hrs |
| 5 | History and development of QSAR, SAR versus QSAR, Physicochemical parameters, Hansch analysis, Fee Wilson analysis and relationship between them. | |
| 5 | QSAR Statistical methods – regression analysis, partial least square analysis (PLS) and other multivariate statistical methods. 3D-QSAR approaches like COMFA and COMSIA | 12 Hrs |
| | Prodrug design-Basic concept, Prodrugs to improve patient acceptability, Drug solubility, Drug absorption and distribution, site specific drug delivery and sustained drug action. Rationale of prodrug design and practical consideration of prodrug design | |

REFERENCES

1. MouldySioud. Target Discovery and Validation Reviews and Protocols: Volume 2 Emerging Molecular Targets and Treatment Options. 2007 Humana Press Inc.
2. Darryl León. Scott Markelln. Silico Technologies in Drug Target Identification and Validation. 2006 by Taylor and Francis Group, LLC.
3. Johanna K. DiStefano. Disease Gene Identification. Methods and Protocols. Springer New York Dordrecht Heidelberg London.
4. Hugo Kubiny. QSAR: Hansch Analysis and Related Approaches. Methods and Principles in Medicinal Chemistry. Publisher Wiley-VCH
5. Klaus Gubernator, Hans-Joachim Böhm. Structure-Based Ligand Design. Methods and Principles in Medicinal Chemistry. Publisher Wiley-VCH
6. Abby L . Parrill. M . Rami Reddy. Rational Drug Design. Novel Methodology and Practical Applications. ACS Symposium Series; American Chemical Society: Washington, DC, 1999.
7. J. Rick Turner. New drug development design, methodology and, analysis. John Wiley & Sons, Inc., New Jersey.

CLINICAL RESEARCH AND PHARMACOVIGILANCE (MPL 204T)

Scope:

This subject will provide a value addition and current requirement for the students in clinical research and pharmacovigilance. It will teach the students on conceptualizing, designing, conducting, managing and reporting of clinical trials. This subject also focuses on global scenario of Pharmacovigilance in different methods that can be used to generate safety data. It will teach the students in developing drug safety data in Pre-clinical, Clinical phases of Drug development and post market surveillance.

Objectives:

Upon completion of the course, the student shall be able to,

- Explain the regulatory requirements for conducting clinical trial
- Demonstrate the types of clinical trial designs
- Explain the responsibilities of key players involved in clinical trials
- Execute safety monitoring, reporting and close-out activities
- Explain the principles of Pharmacovigilance
- Detect new adverse drug reactions and their assessment
- Perform the adverse drug reaction reporting systems and communication in Pharmacovigilance

THEORY

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| | 60 Hrs |
| 1. | Regulatory Perspectives of Clinical Trials: 12 Origin and Principles of International Conference on Hrs Harmonization - Good Clinical Practice (ICH-GCP) guidelines Ethical Committee: Institutional Review Board, Ethical Guidelines for Biomedical Research and Human Participant- Schedule Y, ICMR Informed Consent Process: Structure and content of an Informed Consent Process Ethical principles governing informed consent process |
| 2 | Clinical Trials: Types and Design 12 Experimental Study- RCT and Non RCT, Hrs Observation Study: Cohort, Case Control, Cross sectional Clinical Trial Study Team Roles and responsibilities of Clinical Trial Personnel: Investigator, Study Coordinator, Sponsor, Contract Research Organization and its management |

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|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 3 | <p>Clinical Trial Documentation- Guidelines to the preparation of documents, Preparation of protocol, Investigator Brochure, Case Report Forms, Clinical Study Report Clinical Trial Monitoring-Safety Monitoring in CT</p> <p>Adverse Drug Reactions: Definition and types. Detection and reporti methods. Severity and seriousness assessment. Predictability and preventabilit assessment, Management of adverse drug reactions; Terminologies of ADR.</p> | 12 Hrs |
| 4 | <p>Basic aspects, terminologies and establishment of pharmacovigilance</p> <p>History and progress of pharmacovigilance, Significance of safety monitoring, Pharmacovigilance in India and international aspects, WHO international drug monitorin programme, WHO and Regulatory terminologies of ADR, evaluation of medication safety, Establishing pharmacovigi ance centres in Hospitals, Industry and National programmes related to pharmacovigilance. Roles and responsibilities in Pharmacovigilance</p> | 12 Hrs |
| 5 | <p>Methods, ADR reporting and tools used in Pharmacovigilance</p> <p>International classification of diseases, International Non-proprietary names for drugs, Passive and Active surveillance, Comparative observational studies, Targeted clinical investigations and Vaccine safety surveillance. Spontaneous reporti system and Reporting to regulatory authorities, Guidelines for ADRs reporting. Argus, Aris G Pharmacovigilance, VigiFlow, Statistical methods for evaluating medication safety data.</p> | 12 Hrs |
| 6 | <p>Pharmacoepidemiology, pharmacoconomics, safety pharmacology</p> | 12 Hrs |

REFERENCES

1. Central Drugs Standard Contro Organization- Good Clinical Practices, Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry o Health;2001.
2. International Conference on Harmonization of Technical requirements for registration of Pharmaceuticals for hu an use. ICH Harmonized Tripartite Guideline. Guideline for Good Clinical Practice.E6; May 1996.

3. Ethical Guidelines for Biomedical Research on Human Subjects 2000. Indian Council of Medical Research, New Delhi.
4. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March 2005, John Wiley and Sons.
5. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.
6. Handbook of clinical Research. Julia Lloyd and Ann Raven Ed. Churchill Livingstone.
7. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.

PHARMACOLOGICAL PRACTICAL - II
(MPL 205P)

1. To record the DRC of agonist using suitable isolated tissues preparation.
2. To study the effects of antagonist/potentiating agents on DRC of agonist using suitable isolated tissue preparation.
3. To determine to the strength of unknown sample by matching bioassay by using suitable tissue preparation.
4. To determine to the strength of unknown sample by interpolation bioassay by using suitable tissue preparation
5. To determine to the strength of unknown sample by bracketing bioassay by using suitable tissue preparation
6. To determine to the strength of unknown sample by multiple point bioassay by using suitable tissue preparation.
7. Estimation of PA_2 values of various antagonists using suitable isolated tissue preparations.
8. To study the effects of various drugs on isolated heart preparations
9. Recording of rat BP, heart rate and ECG.
10. Recording of rat ECG
11. Drug absorption studies by averted rat ileum preparation.
12. Acute oral toxicity studies as per OECD guidelines.
13. Acute dermal toxicity studies as per OECD guidelines.
14. Repeated dose toxicity studies- Serum biochemical, haematological, urine analysis, functional observation tests and histological studies.
15. Drug mutagenicity study using mice bone-marrow chromosomal aberration test.
16. Protocol design for clinical trial.(3 Nos.)
17. Design of ADR monitoring protocol.
18. In-silico docking studies. (2 Nos.)
19. In-silico pharmacophore based screening.
20. In-silico QSAR studies.
21. ADR reporting

REFERENCES

1. Fundamentals of experimental Pharmacology-by M.N.Ghosh
2. Hand book of Experimental Pharmacology-S.K.Kulakarni
3. Text book of in-vitro practical Pharmacology by Ian Kitchen
4. Bioassay Techniques for Drug Development by Atta-ur-Rahman, Iqbal choudhary and William Thomsen
5. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew B.C.Yu.
6. Handbook of Essential Pharmacokinetics, Pharmacodynamics and Drug Metabolism for Industrial Scientists.

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M. Pharmacy (2021-22)

Communication Skills

Syllabus

25 Hours

Course Objective:

- This course is designed to facilitate our young amitiens to communicate effectively by emphasizing on practical communication through refurbishing their existing language skills and also to bring one and all to a common take-off level.
- To develop good presentation skills by learning the essential steps for its planning and preparation, and effective use of verbal & non-verbal communication for delivering a business presentation.
- To develop academic writing skills.
- To enhance employability skills of the learners by enabling them to write effective resume and face the interview with confidence.
- To develop competencies to form written communication strategies necessary in the workplace, and to execute them for effective communication.

Learning Outcomes:

Upon completion of the course the student shall be able to

- Understand the behavioural needs for a Pharmacist to function effectively in the areas of pharmaceutical operation.
- Communicate effectively (Verbal and Non Verbal)
- Effectively manage the team as a team player
- Develop interview skills
- Develop Leadership qualities and essentials

Course Contents:

CHAPTER 1 - BASICS OF COMMUNICATION

(8 Hrs)

Module I: Introduction to communication skills

Definition

Types of Communication

Importance of communication

Module II: Fundamentals of communication

Ways of effective communication

Models of communication

Module III: Tools of communication

Stages of Communication

Communication Cycle

Module IV: Effective use of language

Grammar (Tenses, Parts of Speech)

Vocabulary Building

Conversion Starters

CHAPTER 2 - PRESENTATION SKILLS

(5 Hrs)

Module I: Social Communication Skills

Conversational English

Body Language

Voice and accent neutralization

Module II: Presentation

Audience Analysis

Preparing effective PowerPoint presentation

Delivering of presentation

Handling questions

Group Discussions

Practical/ Seminar Modules

CHAPTER 3 – ACADEMIC WRITING

(4 Hrs)

Module I:

Introduction to Writing Skills

Effective Writing Skills

Avoiding Common Errors

Paragraph Writing

Note Taking

Writing Assignments

Manuscript Writing

Case study

Article Writing

News Writing

CHAPTER 4 - EMPLOYABILITY SKILLS

(8Hrs)

Module I

Effective Public Speaking

Business Conversation

Module II: Interviews

Types of Interview

Styles of Interview

Facing Interviews-Fundamentals and Practice Session

Conducting Interviews- Fundamentals and Practice Session

Module III

Resume Writing

Covering Letters

Interview Follow Up Letters

Joining letter/ Application for Job

Official Applications

Leave Application

Module IV: Business Etiquette

Introduction

Dressing up

Exchanging Business card

Shaking hands

Dining etiquette

Module II: Professional Skills

Meetings

Email Writing

Telephonic Skills



A handwritten signature in black ink, appearing to be "S. S. S.", written over a horizontal line.

Principal
Bayanand College of Pharmacy,
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M. Pharmacy (2021-22)

COMPUTER APPLICATIONS IN PHARMACY

25Hrs (2 Hrs/Week)

Scope: This subject deals with the introduction Database, Database Management system, and computer application in clinical studies and use of databases.

Objectives: Upon completion of the course the student shall be able to

1. Know the various types of application of computers in pharmacy
2. Know the various types of databases
3. Know the various applications of databases in pharmacy

Learning Outcomes

- Work effectively with a range of current, standard, Office Productivity software applications.
- Evaluate, select and use office productivity software appropriate to a given situation.
- Apply basic adult learning and assessment principles in the design, development, and presentation of material produced by office productivity applications.
- Demonstrate employability skills and a commitment to professionalism.
- Operate a variety of advanced spreadsheet, operating system and word processing functions.
- Solve a range of problems using office productivity applications, and adapt quickly to new software releases.
- Maintain quality assurance through critically evaluating procedures and results.

Chapter - 1

- **Basic Introduction Of Computer :-**

3Hr

RAM, ROM, LAN, Types Of Hardware Scanning Software How To Create Linking Profile.

Chapter - 2

- **Microsoft Office :-**

10Hr

- 1) **MS Word :-** Formatting Text: Importance Of Formatting, Paragraphs And Alignment, Bold Text, Italic Text, Underline , HTML Headings, Font Attributes, Marquee Tag And Attributes Heading Tag Links & Tables : How Hyperlinks Work, Border E-Mail Links, And Table Tags & Table Attributes, Tow Attributes, Cell Attributes, Merging Rows & Columns, Font Setting.
- 2) **MS Excel & MS PowerPoint Images:-** Different Image Formats, Image Tags And Attributes, Background Images And Color Inserting Audio And Video Files, Images Link ,Effective Presentation By Using Power point Calibration Curve , Calculation Technique By Using MS- Excel .

Chapter - 3

- **Internet & Web Designing Concepts Internet:-**

6Hr

Introduction To Internet, Internet Services, WWW, Hypertext Transfer Protocol (HTTP), URL, Web Server, Proxy Servers Web Site Concepts: Web Page , Static And Dynamic Web Page, Web Site Development Phases, GoogleScholar, Pub Med , Science Direct, Research Gate, Scihub, Drtical Searching E-mail:

Chapter -4

- **Computer Application In Pharmacy:-**

6Hr

Drug Design And Development Of Pharmaceutics Products Through Optimization, Pharmaceutical Analysis, Stability, Bioequivalence, Statistical Quality Control (SQC), Statistics And Design Of Experiments (DOE), Validation, Diagnosis And Data Analysis,



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