BABU BANARASI DAS UNIVERSITY
LUCKNOW

SYLLABUS FOR
MASTER OF PHARMACY
(M.PHARM.)

SCHOOL OF PHARMACY

STUDY AND EVALUATION SCHEME

Course : M. Pharm. (Pharmaceutics) **Effective From Session : 2012-2013**

Semester-I

S. No.	Course code	Subject name	Sessional	Exam	Subject total
		Theory			
1.	MPH 111	Advanced Analytical Techniques	30	70	100
2.	MPH 112	Research Methodology & Biostatistics	30	70	100
3.	MPH 113	Regulatory Affairs & Intellectual Property Rights	30	70	100
4.	MPH 1140	Advance Pharmaceutics	30	70	100
5.	MPH 1150	Pharmaceutical Biotechnology	30	70	100
Practical Evaluation				**Day to Day**	
6.	MPHP 111	Advanced Analytical Techniques	30	70	100
7.	MPHP 1140	Advance Pharmaceutics	30	70	100
				Total	**700**

STUDY AND EVALUATION SCHEME

Course : M. Pharm. (Pharmaceutics) **Effective From Session : 2012-2013**

Semester-II

S. No.	Course code	Subject name	Sessional	Exam	Subject total
		Theory			
1.	MPH 1210	Industrial Pharmacy	30	70	100
2.	MPH 1220	Advanced Drug Delivery Systems	30	70	100
3.	MPH 1230	Biopharmaceutics & Clinical Pharmacokinetics	30	70	100
4.	MPHP 1240	Synopsis of the proposed dissertation	30	70	100
Practical Evaluation				**Day to Day**	
5.	MPHP 1220	Advanced Drug Delivery Systems	30	70	100
6.	MPHP 1230	Biopharmaceutics & Clinical Pharmacokinetics	30	70	100
				Total	**600**

STUDY AND EVALUATION SCHEME

Course : M. Pharm. (Pharmaceutics) **Effective From Session : 2012-2013**

Semester-III & IV

S. No.	Course code	Subject name	Subject total
		Theory	
1.	MPHP 1310	Dissertation	300
2.	MPHP 1320	Presentation & Viva Voce	200
		Total	**500**

STUDY AND EVALUATION SCHEME

Course : M. Pharm. (Pharmaceutical Chemistry) **Effective From Session : 2012-2013**

Semester-I

S. No.	Course code	Subject name	Sessional	Exam	Subject total
		Theory			
1.	MPH 111	Advanced Analytical Techniques	30	70	100
2.	MPH 112	Research Methodology & Biostatistics	30	70	100
3.	MPH 113	Regulatory Affairs & Intellectual Property Rights	30	70	100
4.	MPH 1141	Advanced Organic Chemistry	30	70	100
5.	MPH 1151	Design of Drugs	30	70	100
Practical Evaluation				**Day to Day**	
6.	MPHP 111	Advanced Analytical Techniques	30	70	100
7.	MPHP 1141	Advanced Organic Chemistry	30	70	100
				Total	**700**

STUDY AND EVALUATION SCHEME

Course : M. Pharm. (Pharmaceutical Chemistry) **Effective From Session : 2012-2013**

Semester-II

S. No.	Course code	Subject name	Sessional	Exam	Subject total
		Theory			
1.	MPH 1211	Advanced Pharmaceutical Chemistry	30	70	100
2.	MPH 1221	Chemistry of Natural Products	30	70	100
3.	MPH 1231	Polymers & Bio-Actives	30	70	100
4.	MPHP 1241	Synopsis of the proposed dissertation	30	70	100
Practical Evaluation				**Day to Day**	
5.	MPHP 1211	Advanced Pharmaceutical Chemistry	30	70	100
6.	MPHP 1231	Polymers & Bio-Actives	30	70	100
				Total	**600**

STUDY AND EVALUATION SCHEME

Course : M. Pharm. (Pharmaceutical Chemistry) **Effective From Session : 2012-2013**

Semester-III & IV

S. No.	Course code	Subject name	Subject total
		Theory	
1.	MPHP 1311	Dissertation	300
2.	MPHP 1321	Presentation & Viva Voce	200
		Total	**500**

STUDY AND EVALUATION SCHEME

Course : M. Pharm. (Pharmacognosy) **Effective From Session : 2012-2013**

Semester-I

S. No.	Course code	Subject name	Sessional	Exam	Subject total
		Theory			
1.	MPH 111	Advanced Analytical Techniques	30	70	100
2.	MPH 112	Research Methodology & Biostatistics	30	70	100
3.	MPH 113	Drug Regulatory Affairs & Intellectual Property Rights	30	70	100
4.	MPH 1142	Plant Drug Standardization	30	70	100
5.	MPH 1152	Advances in Pharmacognosy	30	70	100
Practical Evaluation				**Day to Day**	
6.	MPHP 111	Advanced Analytical Techniques	30	70	100
7.	MPHP 1142	Plant Drug Standardization	30	70	100
				Total	**700**

STUDY AND EVALUATION SCHEME

Course : M. Pharm. (Pharmacognosy) **Effective From Session : 2012-2013**

Semester-II

S. No.	Course code	Subject name	Sessional	Exam	Subject total
		Theory			
1.	MPH 1212	Pharmacognosy and Phytochemistry	30	70	100
2.	MPH 1222	Plant Drug Cultivation	30	70	100
3.	MPH 1232	Biosynthesis and Phytopharmaceuticals	30	70	100
4.	MPHP 1242	Synopsis of the proposed dissertation	30	70	100
Practical Evaluation				**Day to Day**	
5.	MPHP 1222	Plant Drug Cultivation	30	70	100
6.	MPHP 1232	Biosynthesis and Phytopharmaceuticals	30	70	100
				Total	**600**

STUDY AND EVALUATION SCHEME

Course : M. Pharm. (Pharmacognosy) **Effective From Session : 2012-2013**

Semester-III & IV

S. No.	Course code	Subject name	Subject total
		Theory	
1.	MPHP 1312	Dissertation	300
2.	MPHP 1322	Presentation & Viva Voce	200
		Total	**500**

STUDY AND EVALUATION SCHEME

Course : M. Pharm. (Pharmacology) **Effective From Session : 2012-2013**

Semester-I

S. No.	Course code	Subject name	Sessional	Exam	Subject total
		Theory			
1.	MPH 111	Advanced Analytical Techniques	30	70	100
2.	MPH 112	Research Methodology & Biostatistics	30	70	100
3.	MPH 113	Regulatory Affairs & Intellectual Property Rights	30	70	100
4.	MPH 1143	Advanced Pharmacology & Toxicology	30	70	100
5.	MPH 1153	Clinical Pharmacology	30	70	100
Practical Evaluation				**Day to Day**	
6.	MPHP 111	Advanced Analytical Techniques	30	70	100
7.	MPHP 1143	Advanced Pharmacology & Toxicology	30	70	100
				Total	**700**

STUDY AND EVALUATION SCHEME

Course : M. Pharm. (Pharmacology) **Effective From Session : 2012-2013**

Semester-II

S. No.	Course code	Subject name	Sessional	Exam	Subject total
		Theory			
1.	MPH 1213	Advances in Pharmacological Screening	30	70	100
2.	MPH 1223	Novel Pharmacological Drug Targets	30	70	100
3.	MPH 1230	Biopharmaceutics & Clinical Pharmacokinetics	30	70	100
4.	MPHP 1243	Synopsis of the proposed dissertation	30	70	100
Practical Evaluation				**Day to Day**	
5.	MPHP 1213	Advances in Pharmacological Screening	30	70	100
6.	MPHP 1223	Novel Pharmacological Drug Targets	30	70	100
				Total	**600**

STUDY AND EVALUATION SCHEME

Course : M. Pharm. (Pharmacology) **Effective From Session : 2012-2013**

Semester-III & IV

S. No.	Course code	Subject name	Subject total
		Theory	
1.	MPHP 1313	Dissertation	300
2.	MPHP 1323	Presentation & Viva Voce	200
		Total	**500**

M. PHARM. I SEMESTER- COMMON PAPERS

MPH 111- ADVANCED ANALYTICAL TECHNIQUES

Unit - 1

UV-Visible Spectroscopy: Principle of UV-Visible Spectroscopy, Chromophores and their interaction with UV-visible radiation and their utilization in structural, qualitative and quantitative analysis of drug molecules. Shifts in spectra including solvent induced shifts, Woodward-Fieser rules, Introduction to Derivative spectroscopy.

Unit - 2

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.

Unit - 3

Nuclear magnetic resonance spectroscopy: Theory of NMR, chemical shift concept, ^{1}H NMR spectra, chemical shifts, multiplicity, coupling constants, integration of signals, interpretation of spectra, Principles of FT-NMR with reference to ^{13}C NMR, free induction decay, average time domain and frequency domain signals. Protein noise decoupled spectra. Nuclear overhauser enhanced ^{13}C NMR spectra, their interpretation and application. APT and DEPT techniques. Introduction of 2D NMR techniques, COSY, with application.

Unit - 4

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, FAB, ESI, Maldy, LC-MS.

Unit - 5

Chromatographic techniques: Introduction to principles of separation and application of Paper, Column, Thin layer chromatography, Electrophoresis, Instrumentation and applications of HPLC, HPTLC.

Biological standardization and immunochemical techniques: Radioimmunoassays, ELISA.

MPHP 111- ADVANCED ANALYTICAL TECHNIQUES

Practicals based on theory syllabus.

BOOKS RECOMMENDED:

1. Willard, H.H., Merrit, L.L., Dean, J.A., Settle P.A., Instrumental Methods of Analysis, Van Nostrand.
2. Skoog, D.A., Heller, F.J., Nieman, T.A., Principles of Instrumental Analysis, WB Saunders.
3. Hunson, J.W., ed. Pharmaceutical Analysis, Modern Methods, part A & B, Marcel Dekker.
4. Schirmer, R.E., ed. Modern Methods of Pharmaceutical Analysis, Vols 1, 2. Boca Raton F.L., CRC Press.
5. Mann, C.K., et al., Instrumental Analysis Harper & Row.
6. Jaffe, H.H., Orchin M., Theory & Applications of Ultraviolet Spectroscopy, Willy.
7. Silverstein, Spectrometric identification of Organic Compounds, Willy.
8. Bovey, F., Jelinski, L., Miran, P., Nuclear Magnetic Resonance Spectroscopy, Sau: Diego Academic.
9. Stothers, J.B., Carbon-13 NMR.Spectroscopy, Academic.
10. Gordy, W., Theory & Applications of Electron Spin Resonance, Willy.
11. Haswell, S.J., ed. Atomic Absorption Spectroscopy, Elsevier.
12. Ardrey, R.E., Pharmaceutical Mass Spectra, Pharmaceutical Press, London.
13. Budzikiewicz, et al., Interpretation of Mass Spectra of Organic Compounds, Holden-Day San Francisco.
14. Beckett and Stenlake, Practical Pharmaceutical Chemistry, CBS.
15. Stahl, E., Thin Layer Chromatography- A laboratory Handbook, Springer-Verlag
16. Giddings, J.C., Principles and Theory- Dynamics of Chromatography, Marcel Dekker.
17. Sethi, P.D., Quantitative Analysis of Pharmaceutical formulations, CBS Publishers, New Delhi.
18. Kemp William, Organic spectroscopy, Pal grave, New York.
19. Kalsi, P.S., Spectroscopy of organic compounds, New age publishers, New Delhi.
20. Gross - Mass Spectrometry
21. WHO - Quality Assurance of Pharmaceuticals, Vol. I, II.

22. Sethi, P.D., HPLC, Quantitative Analysis of Pharmaceutical Formulations, CBS Publishers, Delhi.
23. Sethi, P.D., HPTLC, Quantitative Analysis of Pharmaceutical Formulations, CBS Publishers, Delhi.
24. Sethi and Charcgankar, Identification of Drugs in Pharmaceutical Formulations by TLC.
25. Robert D. Braun, Introduction to Instrumental Analysis.
26. Wilfried, M.A. Niessen- Liquid Chromatography-Mass Spectrometry.
27. Harry G. Brittain, Spectroscopy of Pharmaceutical Solids.
28. George, S., Steroid Analysis in Pharmaceutical Industry.
29. Higuchi, Pharmaceutical Analysis.
30. Bidingmeyer, Practical HPLC Methodology and Applications.
31. Hoffmann, Mass Spectrometry: Principle and Application.
32. Scott, Techniques and Practice of Chromatography.
33. Wilkins, Identification of Microorganism by Mass Spectrometry.
34. Wu, Handbook for Size Exclusion Chromatography and related Techniques.

MPH 112- RESEARCH METHODOLOGY AND BIOSTATISTICS

1. Introduction: Meaning & Objectives of research, types of research, approaches to research; Research methods, research process; Criteria for good research, common problems, qualitative & quantitative research methods.

   Data Collection:Primary & secondary data collection method, design of questionnaires for data collection, identification of sources of information, searching and classifying information.

   Interpretation of Results and Presentation: Meaning of interpretation, techniques of interpretation; scientific writing & report preparation, types & layout of report, precautions in writing research report; statistical aspects of research output, ethical aspects of research methodology, Design of experiments (DOE).

2. Principles of Experimental Pharmacology: Common laboratory animals in pharmacological research, some standard techniques and anesthetics used in laboratory animals, euthanasia of experimental animals, limitations of animal tests, ethical requirements. Alternatives to animals.

   Pharmacological Techniques to Preclinical Evaluation of the following Classes of Drugs: Antihypertensive agents, Antiepileptics, Drugs affecting memory, Antipyretics, Analgesics, Anti-inflammatory agents, Antidiabetic agents, Dermatological agents, Anti-ulcer agents, Hypolipidemics, Hepatoprotectives, Adaptogenic and Immunomodulatory agents, Antimalarial, Diuretics.

   Basic Concepts In Microbe, Enzyme And Receptor Screening.

3. Graphical representation of data, measures of variation - Standard deviation, Standard error. Sampling, sample size and power. Tests for statistical significance: student t-test, Chi-square test, confidence level, Optimization techniques, Correlation and regression, least square method, significance of coefficient of correlation, nonlinear regression.
4. Linear regression and correlation. Analysis of Variance (one way and two way). Factorial designs (including fraction factorial design), Theory of probability.

5. Bioassays-calculations of doses response relationships, LD_{50}, ED_{50}, probit analysis. Applications of software for statistical calculation. Application of computers in Pharmaceutical sciences.

MPH 113- REGULATORY AFFAIRS AND INTELLECTUAL PROPERTY RIGHTS

1. Drug & Cosmetics Act with special reference to schedule Y and M, requirements of GMP, Schedules of medical devices.
2. Concept of total quality management, concept of QA & IPQC, GLP, GCP, Regulatory requirements of drugs and pharmaceuticals (USFD-NDA/ ANDA, MHRA), ISO Series.
   Analytical methods of validation, Cleaning method validations. DQ,IQ,OQ,PQ. of machine and equipments.
   Pharmaceutical Process Validation: Definition, scope, importance and various terms used in process validation, design and techniques of process validation, process validation as a quality assurance tool.
3. Documentation and Maintenance of records.
4. Intellectual property rights, patents, Trademarks, Copyrights, Patents Act.
5. Environment protection Act, Pollution Control, Factories Act.

BOOKS RECOMMENDED

1. Willing, S.W., & Stoker, Good Manufacturing Practices for Pharmaceuticals, Marcel Dekker, New York.
2. Guarino, R.A., New Drug Approval Process, Marcel Dekker, New York.
3. Drug & Cosmetic Act.
4. Patents Act.
5. Consumer Protection Act.
6. Environmental Protection Act.
7. Federal Food, Drug & Cosmetic Act.
8. Bansol, IPR Guidelines for Pharm students and Researchers.
9. Pisano-FDA Regulatory Affairs.
10. Phillip W. Grubb, Patents for Chemicals, Pharmaceuticals and Biotechnology.
11. D.A.Sawant, The Pharmaceutical Sciences Pharma Pathway, Pragati Books Pvt. Ltd.

M. PHARM. (PHARMACEUTICS) I SEMESTER

MPH 1140- ADVANCE PHARMACEUTICS

1. Controlled Drug Delivery : a) Fundamentals of Controlled Release (CR) Drug Delivery: Rationale of sustained / controlled drug delivery, Physicochemical and biological factors influencing design and performance of CR products, therapeutic status of CDDS.

   b) Theory of mass transfer, Fick's first and second laws and their applications in drug release and permeation.

   c) Pharmacokinetic/ pharmacodynamic basis of controlled drug delivery, bioavailability assessment of CR systems.

   d) Regulatory requirements.

2. Design and Fabrication of Technology Based CR Systems:

   a) Polymers in drug delivery: Polymer classifications, biodegradable and nonbiodegradable polymers, water-soluble polymers, and their applications in controlled release, biocompatibility testing.

   b) Oral controlled release delivery systems: Strategies and design of oral controlled release delivery systems, oral systems based on dissolution, diffusion and dissolution, ion-exchange resins, pH independent formulations, altered density formulations. Buccoadhesive/ mucoadhesive system. Osmotic controlled oral drug delivery, fast release-introduction, formulation, evaluation and patented technologies.

   c) Parenteral systems, biopharmaceutical considerations, design and development, an overview of dispersed drug system.

   d) Implantable therapeutic system, biocompatibility of polymers and carriers, Intrauterine devices and intervaginal devices.

   e) Sustained and Controlled release dental systems

3. Transdermal Drug Delivery Systems: Drug absorption through skin, Passive transdermal diffusion route, permeation enhancers, basic components of TDDS, approaches to development and kinetic evaluation, testing of transdermal patches, iontophoresis, sonophoresis.

4. Ocular Drug Delivery Systems: Ocular therapeutics and constraints to effective delivery formulation, consideration to improve the ocular bioavailability, ocular inserts including insoluble and soluble inserts, ocular gels, non-corneal routes and their use for systemic drug delivery.
   Nasal drug delivery systems. pulmonary drug delivery systems .

5. Nutraceuticals- Introduction, evaluation & scope.

MPHP 1140- ADVANCE PHARMACEUTICS

Practical based on theory.

***BOOKS RECOMMENDED*:**

1. Chien YW.,'Novel Drug Delivery Systems- Fundamentals, Developmental concepts, Biomedical Assessment', Marcel Dekker, New York.
2. Chien YW., ed., 'Transdermal Controlled Systemic Medications ' Marcel Dekker, New York.
3. Banker GS & Rhodes C.T. ,'Modern Pharmaceutics', Marcel Dekker, New York.
4. Gennaro A.R., 'Remington, The Science & Practice of Pharmacy,' Lippincott. Williams & Wilkins.
5. Lachman L, Lieberman B.A & Kanig IL.' The Theory & Practice of Industrial Pharmacy, Varghese Publishing House.
6. Aulton M.E.,'Pharmaceutics-The Science of Dosage form Design' Churchill Livingstone.
7. Mathiowitz, E. et al ' Bioadhesive Drug Delivery Systems: Fundamentals, Novel Approaches, and Development', Marcel Dekker, New York.
8. Bronaugh RL & Maibach H.I. ' Percutaneous Absorption Drugs-Cosmetics-Mechanism-Methodology', Marcel Dekker, New York.
9. Potts R.O. & Guy R.H., ' Mechanism of Transdermal Drug Delivery', Marcel Dekker, New York.
10. Rathbone MJ,' Oral Mucosal Drug Delivery ' Marcel Dekker, New York.
11. Saltzman WM,'Drug Delivery-Engineering principles for drug therapy', Oxford University Press, New York,2001.
12. Kreuter J, 'Colloidal Drug Delivery Systems' Marcel Dekker, New York.

MPH 1150- PHARMACEUTICAL BIOTECHNOLOGY

1. Introduction to biotechnology, Enzyme immobilization- Animal and Plant cell immobilization. Principles and Pharmaceutical applications.

2. Gene cloning, cloning vectors, PCR, gene silencing, gene knockout, Micro array, gene delivery, Biotechnology based pharmaceutical usings recombinant DNA Technology, interferons and reverse transcriptase.

3. Design of a fermenter and construction of bioreactors. Optimization of fermentation processes-Ethyl Alcohol, Antibiotics (penicillin, cephalosporin, chloramphenicol), Vitamins (ascorbic acid, vitamin B12), Amino-acids (glutamine, alanine) and their production by fermentation and process validation .

4. Site directed mutagenesis, production of tagged proteins, Formulation approaches to protein stabilization, Regulatory aspects of Biotechnology based pharmaceuticals.

5. Basic principles of immunology, cellular and humoral immunity, applications of antigen-antibody reactions (ELISA, RIA, Western blotting), Introduction to Bio-informatics with reference to multiple sequence alignment.

BOOKS RECOMMENDED:

1. Primrose S, Twyman R, Old B,'Principles of Gene Manipulation',6th ed, Blackwell Science, USA.
2. Brown TA, 'Gene Cloning and DNA Analysis', 4th ed, Blackwell Science, USA.
3. Wiseman A.,ed, Principles of Bio-technology", Chapman & Hall.
4. Antebi E, Fishlock D., " Biotechnology- Strategies for life", Cambridge.
5. Higgins 1.1., Best, DJ & Jones " Biotechnology, Principles & Applications" Blackwell Scientific Publications, Oxford.
6. Stanbary P.F. and Whitaker, A " Principles of Fermentation Technology" Pergamon
7. Press, Oxford.
8. Golub E " The limits of Medicine: How Science shapes our Hope for the cure " Time Books, New York.
9. Bickerstaff GF. " Enzymes in Industry and Medicine,New Studies in Biology" Edwin Arnold, London.
10. Glick. BR, Pasternak J.I., "Molecular Biotechnology-Principles and Applications of Recombinant DNA" ASM Press Washington.
11. LEJR Casida, "Industrial Microbiology", New Age Publishers, Delhi.

M. PHARM. (PHARMACEUTICS) II SEMESTER

MPH 1210- INDUSTRIAL PHARMACY

1. Preformulation Studies: Introduction, goals of preformulation, physicochemical properties, criteria for selection of drug and excipients, Drug –Excipient interactions and incompatibilities, methods to detect Drug –excipient interactions, Solubility and Solubilization – Development of theoretical relationships of prognostic relevance, techniques of solubilization of drugs, Pharmaceutical significance of partition co-efficient, choice of solvent systems, correlation with in-vivo performance, effect of various variants like temp., pH etc. on partition coefficient.

   A study of list of equipments used in pharmaceutical plant in change room, parenteral product manufacturing, manufacturing of aerosols, tablets, capsules, liquid orals, powders, ointments and creams, equipments used in QC for microbiological and instrumental analysis.

2. Improved tablet production systems: Benefits, types, granulation, compression, evaluation, production, process design considerations, material handling, unit operation improvement, tablet production equipments, tablets compression machinery and its maintenance, overview of the process of tablet production.

   Validation of solid dosage forms: Introduction, validation of raw materials, analytical methods validation, definition and control of process validation, definition and control of process variables, guidelines for process validation of solid dosage forms.

   Tablet Production: Layout of facilities, materials flow, design of facilities, construction consideration, equipment consideration, material management.

   Coating Techniques : Various coating techniques, coating defects, advances in coating process, coating equipments. Fluid bed coating, particle coating, techniques and problems.

   Spray Drying: Introduction, advantages, equipment, process variables, applications.

3. Parenteral production systems: Processing of small volume parenterals and related sterile products: Planning and scheduling, material and personnel management, documentation control, Facilities- AHU's, humidity and temperature controls, air filtration systems, dust collectors etc. manufacturing, SVP solutions, suspensions, powders/freeze dried powders for reconstruction, filling sealing, inspection and labelling.

   Manufacture of LVPS: Raw materials, stability , storage and inventory control, batch mixing, clarification by membrane filters and support systems.

   Environmental factors in the design of Parenteral production facilities: Site selection, facility area use planning including type of production line environmental control needs and product

characteristics, environmental control zone groupings and functional groupings, design concepts. Validation of sterilization processes and sterile products – Validation of steam, dry heat, gaseous and radiation sterilization processes, validation of sterilizing filters, validation of equipment, container and closures, sterilization processes and environmental conditions employed in manufacturer of sterile products.

4. Stability:Theoretical considerations, Degradative pathways, Stability indicating assays, Influence of packaging components on dosage form stability, Stabilization of Pharmaceutical (solid, liquid and semi solid) formulations, Accelerated stability testing, ICH guidelines for stability testing of various dosage forms.

5. Pilot plant scale up techniques, Master formula generation and SOP.

BOOKS RECOMMENDED:

1. Banker GS & Rhodes C.T., ' Modern Pharmaceutics', Marcel Dekker, New York.
2. Liberman H.A. et al, 'Pharmaceutical Dosage Forms-Tablets.' Marcel Dekker, New York.
3. Gennaro A.R.,Remington, 'The Science & Practice of Pharmacy.' Lippincott. William & Wilkins.
4. Lachman L, Lieberman H.A. & Kanig J.L. 'The Theory & Practice of Industrial Pharmacy.' Varghese Publishing Home.
5. Aulton M.E., ' Pharmaceutics-The Science of Dosage form Design ' Churnchill Livingstone.
6. Bontempo J.A.,' Development of Bio-Pharmaceutical Parenteral Dosage Forms' Marcel Dekker, New York.
7. Jain UK, Goupale DC, Nayak S,'Pharmaceutical Packaging Technology', PharmaMed Press,Hyderabad.
8. J.I.Wells, Pharmaceutical Preformulation : The Physico-chemical Properties of Drug Substances, Ellis Horwood, Chiechester (UK), 1998
9. C. Doornbos, and P. Hann, Optimization Techniques in Formulation and processing, in Encyclopedia of Pharmaceutical technology, Vol. II, J. Swarbrick and J.C. Boylan, Eds., PP. 77-160. Marcel Dekker, N.Y., 1995.
10. J.Swarbrick and J.C. Boylan, Eds., Encyclopedia of Pharmaceutical Technology Vol. 12, Marcell Dekker, N.Y., 1995, PP.1.
11. Saltzman WM,'Drug Delivery-Engineering principles for drug therapy', Oxford University Press, New York,2001.

MPH 1220- ADVANCED DRUG DELIVERY SYSTEMS

1. Targeted Drug Delivery : History, concept, types and key elements, ideal carrier system and approach with special reference to organ targeting (e.g brain, lung, liver and lymphatics).

   Targeted Drug Delivery : Concepts of temperature, pH and magnetically induced targeting tactics.

2. Colloidal Polymeric Delivery systems: Microspheres, Nanoparticles, Niosomes: Method of preparation, characterization, evaluation and pharmaceutical applications. Nanotubes, dendrimers.

3. Colloidal Lipidic Delivery systems: Multiple w/o/w emulsions as drug vehicles: Introduction, composition of the multiple emulsion and stability, influence of the nature of oily phase, methods for stabilizing w/o/w multiple emulsions, mechanisms of transport of solutes, in vivo studies.

   Microemulsions : Introduction, structure of mircoemulsions, solubilization and formulation of microemulsions, transport properties and pharmaceutical applications of emulsions.

   Solid lipid nanoparticles, Lipid coated nanocapsules, NLCs.

   Closed Bilayered system : Historical background. Structural aspects, preparation, characterization, evaluation and applications, specialized liposomes in drug targeting, pharmacosomes.

4. Protein and Peptide Drug Delivery: Considerations in the physiological delivery of therapeutic proteins, carrier mediated transport of peptides and peptide analogues. Problems associated with the delivery of protein and peptides (stability and membrane barriers, delivery systems for protein and peptide drugs, toxicity aspects. Enzyme and enzyme immobilization, recent trends in vaccine and vaccine delivery systems.

5. Packaging Development- Packaging materials, Types, Labeling, Preformulation screening of packaging components, Evaluation Of Packaging Material, regulatory aspects of packaging.

MPHP 1220- ADVANCED DRUG DELIVERY SYSTEMS

Practical based on theory.

BOOKS RECOMMENDED:

1. J.R. Robinson & V.H.L. Lee (Eds.) Controlled Drug Delivery, Fundamentals and Applications. Vol 29 & Vol 3, .2nd Edition, Marcel Dekker, N.Y. 1987
2. S.D. Bruck, Controlled Drug Delivery, Vol-I9 (Basic Concepts) CRC Press, Florida,1983
3. S.D. Bruck, Controlled Drug Delivery, Vol II (Clinical Applications), CRC Press, Florida, 1983.
4. P. Tyle and B. Ram. Targetted Therapeutic Systems, Marcel Dekker, N.Y., 1990.
5. Torchillin
6. Chien YW., 'Novel Drug Delivery Systems- Fundamentals, Development concepts.' Biomedical Assessment , Marcel Dekker, New York.
7. Schreier H., 'Drug Targeting Technology Physical, Chemical & Biological Methods,' Marcel Dekker, New York.
8. Banker GS & Rhodes C.T. ,'Modern Pharmaceutics', Marcel Dekker, New York.
9. Gennaro A.R., 'Remington, The Science & Practice of Pharmacy,' Lippincott. Williams & Wilkins.

MPH 1230- BIOPHARMACEUTICS AND PHARMACOKINETICS

1. Drug Absorption and Distribution.
2. Metabolism and Disposition.
3. Pharmacokinetics: Open one compartment, two compartment & three compartment models & their limitations.

   Non-compartmental pharmacokinetics. Graphical methods of calculating pharmacokinetic parameters.
4. Bioavailability and Bioequivalence: Factors influencing bio-availability, evaluation of bioavailability, bio-equivalence with reference to BCS. Evaluation of Pharmaceutical formulations-in vitro and in vivo studies and their correlation. Levels and types of IVIVC.
   Dosage Regimens, dose adjustments in renal and hepatic failure, individualization of dosage regimen.
5. Pharmacokinetic applications in Clinical practice. Principles of clinical trials.

MPHP 1230- BIOPHARMACEUTICS AND PHARMACOKINETICS

Practicals:
1. Based on theory syllabus
2. Computer use in Pharmacokinetics

BOOKS RECOMMENDED:

1. J.G. Wagner, Fundamentals of Clinical Pharmacokinetics, Drug Intelligence Publications, Hamilton, USA., 1971
2. J.G Welling, F. L. S Tse and S. V Dighe (eds.), Pharmaceutical Bioequivalence, Marcel Dekker Inc. New York, USA, 1991
3. M. Gibaldi and D. Perrier, Pharmacokinetics, Second edition, Marcel Dekker Inc. New York USA, 1982
4. L. Shargel and A. Yu, Applied Biopharmaceutics and pharmacokinetics, Appleton and Large, Norwalk, CT, 1993.
5. R.E. Notari, Biopharmaceutics and Clinical Pharmacokinetics – an introduction. 4th edition, Marcel Dekker, N.Y., 1987M. Rowland & T. N. Tozer, Clinical pharmacokinetics: Concepts and Applications,Henry, UK 1995.
6. Yacobi, J. P Skelly and V. K Batra (ed) Toxicokinetics and New drug development, Pergamon Press, New York, USA, 1989.

M. PHARM. (PHARMACEUTICAL CHEMISTRY) I SEMESTER

MPH 1141- ADVANCED ORGANIC CHEMISTRY

Unit-I

a. Aliphatic electrophilic substitution.

b. Aromatic electrophilic substitution.

c. Aliphatic nucleophilic substitution.

d. Aromatic nucleophilic substitution.

Unit-II

a. Free radical reactions.

b. Elimination reactions.

c. Addition to carbon-carbon multiple bonds.

Unit-III

Study of reactions of Synthetic importance:

Biginelli reaction; Mannich reaction; Diel's alder reaction; Meerwin Ponndorf-Verley reduction; Oppeneaur oxidation; Beckmann rearrangement; Vielsmeir-Haak reaction; Hoffmann rearrangement; Claisen-Schmidt condensation; Knoevenagel reaction, Reformatsky reaction; Micheal addition.

Unit-IV

a. Uses of achiral and chiral heterogenous and homogenous catalysts, New synthetic methodologies for drugs: Green chemistry, solvent free synthesis, Microwave assisted synthesis.

b. Industrial synthesis of chiral drugs

Unit-V

a. Stereochemistry of five & six membered rings fused & bridged rings.

b. Stereoselective synthesis and stereoregulated polymerization.

MPHP 1141- ADVANCED ORGANIC CHEMISTRY

Practical based on theory syllabus

BOOKS RECOMMENDED:

1. Eliel, EL, Stereochemistry of Carbon compounds. MC.Graw Hill Book Company, Inc.New York.
2. March, J, Advanced Organic Chemistry, Reaction Mechanism and Structure , John Wiley and sons, New York.
3. Singh, H and Kapoor, VK, Organic Pharmaceutical Chemistry, Vallabh Prakashan Delhi.
4. Gould, ES, Mechanism and structure in Organic Chemistry, Holt, Rinewart and Winston , New York.
5. Abraham DJ, ed.,Burger's Medicinal Chemistry & Drug Discovery, Vol.-I-VI,John Wiley & sons, New Jersey.
6. Ford ME, Catalysis of organic reactions, Marcel Dekker Inc., New York.
7. Laszlo Kurti, Barbara Czako, Strategic Applications of Name reaction in Organic Synthesis, Elsevier, Academic Press, New York.
8. Kappe, CO, Stdler A, Microwaves in Organic and Medicinal Chemistry. Vol 25, Wiley-VCH Verlog GmbH nd Co. KGaA.
9. Matlack, AS, Introduction to Green Chemistry. Marcel Dekker Inc., New York.

MPH 1151- DESIGN OF DRUGS

Unit-I

Introduction to Drug Design Concept, Lead Discovery, Interactions (Forces) Involved in Drug-Receptor Complex, Physicochemical Properties in Relation to Biological Action, Stereochemical Aspects in Drug Design.

Unit-II

Drug metabolism- Phase-I & Phase-II Metabolic Reactions, Introduction to Drug Designing on the Basis of Metabolic Pathways.

Prodrugs- Bioprecursor & Carrier Linked Prodrugs, Hard and Soft Drugs.

Unit-III

Analog Based Drug Design-Introduction, Designing of Analogs.

Structure Based Drug Design- Introduction, Drug Design on Structure Based.

Unit-IV

Combinatorial Chemistry- Introduction , Solid Phase Synthesis, Liquid Phase Synthesis, Methods of Parallel and Mixed Combinatorial Synthesis, Deconvolution and High Throughput screening .

Unit-V

Molecular Modeling- Introduction to Molecular Mechanics, Quantum Mechanics, Molecular Dynamics, Molecular Graphics and Molecular Docking.

QSAR- Introduction, Physicochemical Parameters, Quantitative Models , Introduction to 2D and 3D QSAR.

BOOKS RECOMMENDED:

1. Smith HJ, Williams H, eds, " Introduction to the principles of Drug Design" Wright Boston.
2. Silverman RB " The organic Chemistry of Drug Design and Drug Action" Academic Press New York.
3. Robert GCK, ed., " Drug Action at the Molecular Level" University Prak Press Baltimore.
4. Martin YC " Quantitative Drug Design" Dekker, New York.
5. Lien EJ. "SAR, Side effects and Drug Design" Dekker, New York.
6. William H, Malick JB " Drug Discovery and Dovelopment" Humana Press Clifton.
7. Delgado JN, Remers WA eds " Wilson & Gisvolds's Text Book of Organic Medicinal & Pharmaceutical Chemistry" Lippincott, New York.
8. Foye WO " Principles of Medicinal chemistry" Lea & Febiger.
9. Koro lkovas A, Burckhalter JH. "Essentials of Medicinal Chemistry" Wiley Interscience.
10. Wolf ME, ed "The Basis of Medicinal Chemistry, Burger's Medicinal Chemistry" John Wiley & Sons, New York.
11. Ariens EJ " Drug Design" Academic Press New York.
12. Olson EC "Computer Assisted Drug Design" American Chemical Society ACS Symposium Series 112.
13. Roberts SM, Price BJ Eds. " Medicinal Chemistry. The Role of Organic Chemistry in Drug Research " Academic Press New York.
14. Pope & Perruuns " Computer Aided Drug Design " Academic Press New York.
15. Thomas , G. Medicinal Chemistry-An Introduction John Wiley and sons Ltd.
16. Patrick Graham, L, An Introduction to Medicinal Chemistry, Oxford University Press.
17. Fischer Janos, Ganellin C. Robin "Analogue-based drug Discovery, Wiley-VCH Verlag Gmb H & Co. KG &A.
18. Pandi, Veerapandian "Structure based drug design New York Marcel Dekker, inc.,1997.
19. Wermuth GC, "The Practice of Medicinal Chemistry" Second edition, Academic Press, Elsevier

M. PHARM. (PHARMACEUTICAL CHEMISTRY) II SEMESTER

MPH 1211- ADVANCED PHARMACEUTICAL CHEMISTRY

Unit-I

Classification, mechanism of action, SAR, synthetic approach and recent advances of Beta lactam and fluoroquinolone antibiotics.

Unit-II

Classification, mechanism of action, SAR, synthetic approach and recent advances of CNS depressant agents: General anaesthetics, Sedative-Hypnotics, Anticonvulsants, Antipsychotics and Anxiolytic agents

Unit-III

Classification, mechanism of action , SAR, synthetic approach and recent advances of-

a. Sex Harmones and corticosteroids.
b. Adrenergic agents.

Unit-IV

Classification, mechanism of action, synthetic approach & recent advances of-

a. Anti- HIV agents.
b. ACE inhibitors.
c. Antihyperlipidemics.

Unit-V

Classification, mechanism of action and recent advances of-

a. Drugs used in peptic ulcer.
b. COX-2 inhibitors
c. Artemisin derivatives

MPHP 1211- ADVANCED PHARMACEUTICAL CHEMISTRY

Practical Based on Theory syllabus

BOOKS RECOMMENDED:

1. Foye W, “Principles of Medicinal Chemistry” Lea & Febiger.
2. Delgado J.N., Remers WA eds, “Wilson & Giswolds Text Book of organic Medicinal & Pharmaceutical chemistry” Lippincott, New York.
3. Monographs and relevant review articles appearing in various periodicals and journals.
4. Alex Gringauz-“ Introduction to Medicinal Chemistry” Wiley-VCH, Inc. New York.
5. Abraham D.J,ed., Burger’s Medicinal Chemistry & Drug Discovery, Vol-I-VI, John Wiley & sons, New Jersey.

MPH 1221- CHEMISTRY OF NATURAL PRODUCTS

Unit-I

Role of Natural Products in new Drug Development, novel drug templates, plant derived drugs with special reference to antineoplastic, cardiovascular, anti-inflammatory, respiratory drugs, antiprotozoals, antidiabetic, hepatoprotectives, antioxidants and antidiarrhoeals.

Unit-II

Bioactive compounds from micro-organism with reference to antibiotics, anti-protozoals and marine natural products.

Unit-III

Structural elucidation insights for natural products by combination of classical, synthetic, degradative and spectral methods with reference to quercetin, tropanes and morphinan type alkaloids, quinine, digitoxigenin, camphor and caffeine.

Unit-IV

Classification, structural determination, linkages, stereochemistry and biological activity of carbohydrates.

Unit-V

Biomedicinals from plant tissue culture- Introduction, profile of plant tissue culture, bioproduction of commandable secondary metabolites, Hi-Tech products from plant sources with reference to Genistein, Comptophein, Rhein & Taxanes, Recombinant DNA technology.

BOOK RECOMMENDED:

1. Trease and Evans, Pharmacognosy, 15th edition, Elsevier.
2. Burger's Medicinal Chemistry, 6th edition,Vol-I-VI, Wiley Interscience, New York.
3. Chemistry of natural products by SV Bhat, BA Nagasampegi, Springer publications. New York.
4. Finar, Organic Chemistry, Vol-I and II.
5. Drug Discovery and Evaluation, Pharmacological assays, H.Gerhard Vogel, 2nd edition, Springer publications,
6. Quality Control of Herbal drugs, An approach to evaluation of botaniocals, by Pulok Mukherjee, Business Horizon Publications.
7. Pharmacognosy and Pharmacobiotechnology, by Ashutosh Kar, New age International publications.
8. Role of Biotechnology in Medicinal and Aromatic plants, Vol-XIII, Ukaaz Publications, Hyderabad.
9. Supplement to cultivation and utilization of medicinal plants, S.S.Handa and M.K.Kaul, RRL Jammu.
10. Chemistry of Natural Products, by O.P.Agarwal, Vol-I & II.

MPH 1231- POLYMERS AND BIOACTIVES

Unit-I

Polymers- Classification, Synthesis, reactions, crystallinity, polymer degradation mechanism,copolymerization and their applications in Pharmacy.

Unit-II

Classification, Chemistry, Structure elucidation and biological activity of vitamins.

Unit-III

Classification, structural determination, linkages, stereochemistry, biological activity of steroids with reference to cholesterol, bile acids, sex hormones, corticoids (gluco & mineralo-corticoids) cardiac glycosides and saponins.

Unit-IV

1. Introduction to glycoproteins and lipoproteins.
2. Fullerenes- Introduction, chemical reactions and applications.
3. Enzymes-Immobilized enzymes/ cells in organic synthesis.

Unit-V

Bioactive polymers, Drug polymer conjugates, Hydrogels and cross linking agents.

MPHP 1231- POLYMERS AND BIOACTIVES

Practical Based on Theory syllabus

BOOK RECOMMENDED :

1. Text Book of Polymer Science, Fred. W.Billmeyer, 3rd edition, Wiley Interscience Publication, John Wiley and Sons.
2. Introduction to Polymers Sciences and Technology, S.D. Dawande,1st edition, Denett and Co., Nagpur.
3. Polymer Science, V.R.Gowarikar, N.V.Vishwanathan, Jayadev Sreedhar, New Age International , New Delhi.
4. Polymers in Drug Discovery,Ijeoma.F.Vihegbu,Andreas G.Scchatzlein, Taylor and Francis.
5. Biodegaradable hydrogels for drug delivery, Kinam Park, Waleed S.W.Shalaby, CRC Publisher.
6. Organic Chemistry, IL Finar, Vol.-I and II,6th Edition , Pearson Education Asia.
7. Chemistry of Natural Products, S.V.Bhat, B.A.Nagasampegi, M.Sivakumar, Springer Publication.
8. Glycopeptides and Glycoproteins, Synthesis, structure and Applications Volume Edition, V.Whittmann, Springer Publications.
9. Current Science, Vol.-91, No.5, 10th September 2006.
10. New J.Chem,.2008, Royal Society of Chemistry, 2008.
11. Perfect Symmetry, Jim Baggott, 1994, Oxford University Press.
12. Charles E.Carraher Jr ' Polymer Chemistry sixth edition, Marcel Dekker Inc. New York.

M. PHARM. (PHARMACOGNOSY) I SEMESTER

MPH 1142- PLANT DRUG STANDARDIZATION

Unit 1:

Concept, considerations, parameters and methods of quality control for medicinal plant materials as per various pharmacopoeia and other guidelines. Preparation of monograph according to WHO / I.P. guidelines. Comparative study of different Pharmacopoeia's in reference to quality control parameters.

Unit 2:

Factors Affecting Quality of Plant Drugs: Moisture, temperature, light, oxygen, living organisms.

Substitution and adulteration of crude drugs: Types with examples

Principle and procedure involved in biological test of the following:

i. Presence of *Mycobacterium tuberculosis*

ii. Living contaminants in vaccines

Unit 3:

Methods & Techniques for establishing identity, purity and quality of crude drugs:

A: Determination of pesticide residues, arsenic and heavy metals. Determination of micro-organisms and aflatoxins in crude drugs.

B: Quantitative microscopy: Lycopodium spore methods, Palisade ratio, stomatal number, stomatal index, vein-islet number of veinlet termination number. Micro-chemical and Histo-chemical techniques as applied to pharmacognosy with principles and procedures of microtomy.

Unit 4:

C: Physico-chemical Parameters: Ash values, moisture content (loss on drying), extractive values and volatile oil determination, Solubility, specific gravity, optical rotation, specific rotation, refractive index, melting point, swelling index, foaming index and bitterness value

D: Qualitative chemical tests and chromatographic analysis (TLC, HPLC and HPTLC)

Unit 5:

Concept of biomarkers, fingerprinting by DNA based techniques, HPTLC and other chromatographic techniques. Stability testing of natural products. Quality assurance in herbal drug industry.

MPHP 1142- PLANT DRUG STANDARDIZATION

Practical based on theory.

RECOMMENDED READING:

1. Vogel, Drug Discovery and Evaluation.
2. Dhawan, B.N., Shrimal, R.C., Use of Pharmalogical Techniques for the Evaluation of Natural Products, CDRI, Lucknow.
3. Ayurvedic Formulary of India.
4. Ayurvedic Pharmacopoeia of India.
5. Indian herbal Pharmacopoeia.
6. Ashutosh Kar, Pharmacognosy and Pharmacobiotechnology, New Age International Publishers.
7. Indian Pharmacopoeia 2007.
8. European Pharmacopoeia 6th Edn. 2008.
9. Pulok K. Mukherjee, Quality Control of Herbal drugs. An Approach to Evaluation of Botanicals.
10. Quality Control Methods for Medicinal Plant Material, WHO Headquarters, Geneva.
11. Standardization of Botanicals by V. Rajpal, Vol. I & II, Eastern Publishers, New Delhi.
12. Evans, W.C., Trease & Evans Pharmacognosy, W.B. Saunders & Co. London.
13. WHO guidelines, Methodologies on Research for Drug Development and Evaluation of Traditional Medicines.
14. Willard, H.H., Merrit, L.L., Dean, J.A., Settle P.A., Instrumental Methods of Analysis, Van Nostrand.
15. Skoog, D.A., Heller, F.J., Nieman, T.A., Principles of Instrumental Analysis, W.B Saunders.
16. Hunson, J.W., Pharmaceutical Analysis - Modern Methods, part A & B, Marcel Dekker.
17. Schirmer, R.E., Modern Methods of Pharmaceutical Analysis, Vol. 1, 2, Boca Raton F.L: CRC Press.
18. Mann, C.K. et al., Instrumental Analysis, Harper & Row.
19. Jaffe, H.H., Orchin, M., Theory & Applications of Ultraviolet Spectroscopy, Willy.
20. Silverstein, R.M., et al., Spectrometric Identification of Organic Compounds, Willy.
21. Bovey, F., Jelinski, L, Miran, P., Nuclear Magnetic Resonance Spectroscopy, Sau: Diego Academic.

22. Stothers, J.B., Carbon-13 NMR.Spectroscopy, Academic.
23. Gordy, W., Theory & Applications of Electron Spin Resonance, Willy.
24. Haswell, S.J., Atomic Absorption Spectroscopy, Elsevier.
25. Ardrey, R.E., Pharmaceutical Mass Spectra, Pharmaceutical press, London.
26. WHO Monographs on Selected Medicinal Plants, Vol. I & II.
27. WHO Quality Control Methods of Medicinal Plant Materials.
28. WHO, International Pharmacopoeia, Vol. I-V.
29. Wilfried, M.A., Niessen, Liquid Chromatography-Mass Spectrometry.
30. Harry, G. Brittain, Spectroscopy of Pharmaceutical Solids.
31. Indian Herbal Pharmacopoeia,Vol. 1 & 2.
32. Wallis, T.E., Practical Pharmacognosy.
33. Gorag, Steroid Analysis in Pharmaceutical Industry.
34. Wagner's, Plant Drug Analysis, A Thin layer Chromatography, Atlas.
35. Bogers, Medicinal and Aromatic plants, Agricultural, Commercial, Ecological, Legal, Pharmacological and Social Aspects.

MPH 1152- ADVANCES IN PHARMACOGNOSY

Unit 1:

Study of plants and plant products having following types of biological activity:

- Anti-inflammatory
- Hypolipidaemic
- Anticancer
- Antidiabetic
- Hepatoprotective
- Adaptogenic and Immunomodulatory
- C.N.S.(Nootropic, antiepileptic)
- Biological active compounds from marine sources
- Biological Allergens and Hallucinogens.

Unit 2:

Isolation & Estimation of Clove Oil, Curcumin, Glycyrrhizine, Sennosides, β-sitosterol, Quercetin, Gallic Acid in a plant extract

Unit 3:

Plant growth regulators: Their use, scope and limitations in Pharmacognosy, effect of growth hormones on production of secondary plant metabolites.

Unit 4:

Biotechnological Techniques: Mutation, polyploidy and hybridization to improve the quality of vegetable drugs and their constituents, concept of chemodemes.

Unit 5:

Nutraceuticals: A biochemical background of use of herbal products and concept of free radicals with reference to diseased conditions (cataract, neurological, aging) Anthocyanins, proanthocyanidins, and resveratrol.

RECOMMENDED READING:

1. Evans, W.C., Trease and Evans Pharmacognosy W.B., Saunders & Co. London.
2. Plant Drug Analysis by Wagner.
3. Rajdan, M., Introduction to Plant Tissue Culture, Oxford IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Martin Dean F, Gorge Padilla, Marine Pharmacognosy.
5. Human Medicinal Agents from Plants Manual F. Balandrin, American Chemical Society.
6 Natural Products, Drug Discovery and Therapeutic Medicines, Human press.
7. Pharmacognosy and Phytochemistry by Mohammad Ali, CBS Publishers & Distribution, New Delhi.
8. Kalia, A.N., Text Book of Industrial Pharmacognosy.
9. Vyas, S.P., Dixit, V.K., Pharmaceutical Biotechnology.
10. Tyler, Brady and Robbers, Pharmacognosy.
11. Jarald, Text Book of Pharmacognosy and Phytochemistry.
12. PDR for Nutritional Supplements.

M. PHARM. (PHARMACOGNOSY) II SEMESTER

MPH 1212- PHARMACOGNOSY AND PHYTOCHEMISTRY

Unit 1:

Ethnopharmacognosy / Ethnomedicine/ Ethnobotany: Concepts and importance.

Unit 2:

- **Aromatic Plant resources in India.**
- **Discovery of Lead Molecules from Natural Sources and their Contribution to Modern Therapeutics with Reference to following:**
  - Aspirin
  - Morphine
  - Podophyllum lignans
  - Silymarin,
  - Artemisinin,
  - *β*-lactam,
  - Cannabinoids.
  - Paclitaxel

Unit 3:

General methods of extraction, isolation and characterization of bioactive constituents.

- Solvent extraction
- Isolation: Role of fractionation, various chromatographic techniques including
- Column chromatography, TLC, Preparative TLC, HPTLC
- Bioactivity directed fractionation.

Unit 4:

Natural sources of drugs and their contribution to modern therapeutics

- Gymnosperms
- Angiosperms
- Animals
- Minerals

Unit 5:

Phytochemical Screening Procedures and Comparative Phytochemistry.

MPH 1222- PLANT DRUG CULTIVATION

Unit 1:

Scope of plant drug cultivation: Problems of cultivation and processing medicinal and aromatic plants

Introduction to important properties of soils. General constitution of soils, Texture and soil Structure, Soil conditions for medicinal plant cultivation.

Unit 2:

WHO guidelines on good agricultural and collection practices (GACP) for medicinal plants (Collection and Cultivation).

Unit 3:

Problems and recent trends in pest management, scope of biological control and use of environment friendly pesticides especially plant derived products, Pyrethroids, pheromones and juvenile hormones.

Unit 4:

General Techniques of Cultivation and management of medicinal plants with special reference to:

- Dioscorea
- Cinnamon
- Opium
- Senna
- Plantago
- Mentha
- Rauwolfia
- Hyoscyamus
- Lemon grass

Utilization of waste product of herbal industries.

Unit 5:

Plant tissue culture

- Callus cultures, suspension cultures, protoplast cultures and immobilization.
- Regeneration of plants from tissue cultures.
- Biosynthetic potential of tissue cultures and factors affecting production of secondary metabolites by tissue culture technique.

MPHP 1222- PLANT DRUG CULTIVATION

Practical based on theory.

RECOMMENDED READING:

1. Atal, C.K., Kapur, B.M., Cultivation and Utilization of Medicinal and Aromatic Plants, R.R.L. Jammu
2. Farooqui, A.A., Sreeramu, B.S., Cultivation of Medicinal and Aromatic Plants University press, 2001.
3. Yoganasimhan, S.N., Medicinal Plants of India, 1st Edition, Interlive Publishing Pvt. Ltd.
4. Medicinal and Aromatic Plant abstracts (MAPA) CSIR, New Delhi.
5. Evans, W.C., Trease and Evans Pharmacognosy, W.B. Saunder & co., London.
6. Wallis, T.E., Text Book of Pharmacognosy.
7. Indian Herbal Pharmacopoeia.
8. Kalia, A.N., Textbook of Industrial Pharmacognosy.
9. Natural Products for Innovative Pest Management, Eds, David L., Whitehead and
10. William S., Bowers, Pergamon Press, Oxford, 1983.
11. The Nature and Properties of Soils, 9th Edn, Hyle C. Brady, Macmillian Publishing Co.,

MPH 1232- BIOSYNTHESIS AND PHYTOPHARMACEUTICALS

Unit 1:

Methods of investigation of biosynthetic pathways, tracer techniques and autoradiography.

Unit 2:

Structural elucidation of natural products using conventional synthetic, degradative and spectral methods - an insight, giving examples.

Unit 3:

Drug Constituent Biosynthesis:

- **Alkaloids:**
  - Ephedrine
  - Hyoscyamine

- Morphine
- Reserpine

- **Glycosides:**
  - Scillaren
  - Glycyrrhizin
- **Steroids:**
  - Hecogenin
  - Diosgenin
- **Coumarin:** Umbelliferone
- **Flavones:** Hesperidin

- **Antibiotics:**
  - Penicillin
  - Tetracycline

Unit 4:

Isolation, Purification and Characterization of the following bioactive chemical constituents:

Steroids: Diosgenin, Hecogenin, guggulsterone and withanolides.

Alkaloids: Ephedrine, Hyoscyamine, Morphine, Reserpine

Glycosides: Sennosides, Glycyrrhizin

Volatile oils: Lemongrass oil, menthol, Eugenol.

Antibiotics: Penicillin, Tetracycline

Unit 5:

- Purification techniques for isolated phytoconstituents.
- Quantitation estimation of marker compounds

MPHP 1232- BIOSYNTHESIS AND PHYTOPHARMACEUTICALS

Practical based on theory

RECOMMENDED READING:

1. Evans, W.C., Trease and Evans Pharmacognosy, W.B., Saunders & co. London.
2. Jean Bruneton, Pharmacognosy and Phytochemistry of medicinal plants Techniques and Documentation, Lavoiser, 1995.
3. Wickery, M.L., Secondary Plant Metabolism, MC Millan Press, London.
4. Introduction to Alkaloids, A Biogentic Approach, Willy, New York.
5. Vinod D. Rangari, Pharmacognosy and Phytochemistry, Career publication, Nashik.
6. Tyler, E., Brady, R., Pharmacognosy, Philadelphia P.A., U.S.A.

M. PHARM. (PHARMACOLOGY) I SEMESTER

MPH 1143- ADVANCED PHARMACOLOGY AND TOXICOLOGY

UNIT-I

Drugs acting on ANS

Parasympathomimetics,parasympatholytics, sympathomimetic drugs, sympathetic blockers, ganaglionic stimulants, ganglionic blockers.

UNIT-II

Drugs acting on CNS:

General anaesthetics, anxiolytics, sedative and hypnotic drugs, antiepileptics, analgesics, antipsychotics, antidepressants , centrally acting muscle relaxants and anti Parkinsonian drugs.

Drugs acting on peripheral nervous system: Local anaesthetics and neuromuscular blockers .

UNIT-III

Drugs acting on Renal and CVS: Cardiotonics, antiarrythmic drugs, antianginal drugs, antihypertensives , antiatherosclerotics, diuretics **.**

Drugs acting on Digestive system: Drugs used in gastric ulcer, laxative and purgatives, emetics and antiemetics, antidiarrhoeals.

UNIT-IV

Pharmacology of Chemotherapeutic and Antimicrobial Agents:

General considerations of antimicrobial therapy, sulfonamides, trimethoprim, quinolones and other related agents, penicillins, cephalosporins, and other beta-lactam antibiotics, aminoglycosides, protein synthesis inhibitors, antifungal agents, antiviral agents (Non-retroviral), antineoplastic agents.

Unit –V

Safety Pharmacology / regulatory toxicology:-

Principles of toxicology, Preparation of protocol for safety assessment.

Toxicity testing by acute, sub-acute, chronic toxicity and abnormal action of drugs

ED50, LD50 and TD value estimation. International guidelines and regulatory agencies for toxicity studies.

MPHP 1143- ADVANCED PHARMACOLOGY AND TOXICOLOGY

Practical based on theory.

RECOMMENDED STUDY MATERIAL

1. Goodman & Gilman, The Pharmacological basis of Therapeutics, Pergamon Press. editors :- J.G. Hardman, Le Limbird, PB Molinoss, RW Ruddon & AG Gil, Pergamon Press.
2. Barar F.S.K: Text Book of Pharmacology, Interprint, New Delhi.
3. Katzung, B.G. Basic & Clinical Pharmacology, Prentice Hall, International.
4. Laurene, DR & Bennet PN; Clinical Pharmacology, Churchill Livingstone.
5. Rang MP, Dale MM, Riter JM, Pharmacology Churchill Livingstone.
6. Tripathi, K.D. Essentials of Medical Pharmacology, Jay Pee Publishers, New Delhi.
7. Satoskar & Bhandarkar : Pharmacology & Pharmacotheropeutics, Popular Prakashan Pvt. Ltd., Bombay.
8. Paul. L., Principles of Pharmacology, Chapman and Hall.
9. Singh, Surender; Essentials of Pharmacology, Academa Publishers, Delhi.
10. Sheffield Bioscience Programs, U.K., ISBN. 1-874758-02-6.
11. Dipiro, Joseph L.; Pharmacotherapy: A Pathophysiological Approach, Elsevier,2005.
12. Herfindal, E.T. and Hirschman, J L.; Clinical Pharmacy and Therapeutics.
13. Relevant Reviews Articles from Medical and Pharmaceutical Literature.
14. Scott, L.T; Basic skills in interpreting laboratory data, American Society of Health System Pharmacist, 1996.
15. Harrison's Principles of Internal Medicine, Vol-I and II, 17th Edition, 2008, Mc Graw-Hill.

MPH 1153- CLINICAL PHARMACOLOGY

Unit-I

Definition and scope of clinical pharmacology, evaluation of drugs in humans, official regulation of medicines, Classification and naming of drugs.

Drug therapy monitoring in special situations such as pediatric, geriatric and pregnancy.

Racial gender and ethnic differences in drugs response, Patient counseling and interviewing techniques.

Clinical Trials: Clinical evaluation of new drug, phases of clinical trial, ethics and protocol, designing of clinical trial, new drug development process .

Unit-II

Application to therapeutic drug monitoring (TDM), Pharmacist interventions in case of renal impairment, hepatic impairment etc.

Concepts of rational drug use, General Guidelines for rational use of drugs including antibiotics, multi drug therapy and fixed dose combinations.

Adverse drug reaction (ADR):-Type of reactions (Type A&B), Yellow card system, anaphylactic reaction management and monitoring, Drug Interactions.

Unit-III

Drug therapy and management of cardiovascular disorders: Hypertension, congestive heart failure, cardiac arrythmias, angina pectoris, hyperlipidaemia and atherosclerosis.

Unit-IV

Drug therapy and management of neurological and psychiatric disorders: Parkinsonism, epilepsy, anxiety, depression, Alzheimer's disease.

Drug therapy and management of respiratory disorders: Bronchial asthma and COPD.

Unit V

Drug therapy and management of infectious diseases: Tuberculosis, HIV

Drug therapy and management of GIT disorders: Peptic ulcer

Drug therapy and management of endocrine disorders: Diabetes mellitus, hyper/hypo thyroidism.

RECOMMENDED STUDY MATERIAL:

1. Roger and Walker; Clinical Pharmacy and Therapeutics, Churchill, Livingston, London 4th ed., 2007.
2. Dipiro, Joseph L.; Pharmacotherapy: A Pathophysiological Approach, Elsevier,2005.
3. Herfindal, E.T. and Hirschman, J L.; Clinical Pharmacy and Therapeutics.
4. Relevant Reviews Articles from Medical and Pharmaceutical Literature.
5. Scott, L.T; Basic skills in interpreting laboratory data, American Society of Health System Pharmacist ,1996.
6. Harrison's Principles of Internal Medicine, Vol-I And II, 17 hEdition, 2008, Mc Graw-Hill.
7. Davidson's Principle And Practice Of Medicine, 20thEdition,2009, Churchill, Livingston, London.

8. Chaudhari, S.K. Quintessence of Medical Pharmacology; Central Publishers, New Delhi.
9. Kundu, A.K.; Bedside Clinics in Medicine, Academic Publishers, Part-I and II, 2009.
10. Balakrishan, K.V., Komar's Manual of Medical Prescriptions, Paras Publications.
11. Oxford Textbook of Medicine,5th ed., Edited by David A. Warrell, Timothy M. Cox and John D.Firth, Blackwell Science.

M. PHARM. (PHARMACOLOGY) II SEMESTER

MPH 1213- ADVANCES IN PHARMACOLOGICAL SCREENING

Unit I

Drug Discovery Process: Principles, techniques and strategies used in new drug discovery, high throughput screening. Regulations for laboratory animal care and ethical requirements. Knowledge of the CPCSEA for performing experiments on animals. Dose calculation, different type of canulation methodology, Bleeding techniques and routes of drug administration in animals. Alternatives to animal studies.

Unit II

Bioassays: Basic principles of bioassays, official bioassays, experimental models, design of bioassays and statistical methods used in biological standardization.

Unit III

Preclinical and clinical models employed in the screening of new drugs belonging to following categories: Antipsychotic agents, sedatives and hypnotics, antianxiety, antidepressant, anticonvulsant, behavioural and muscle co-ordination, Alzheimer's disease, opioid analgesics.

Unit IV

Preclinical Evaluation: Preclinical and clinical models employed in the screening of new drugs belonging to following categories: Analgesics, anti-inflammatory, antipyretics, local anaesthetics, cardiac glycosides, antiarrythmics, antihypertensives, antianginals, antiatherosclerotic, diuretics, antidiarrhoeals, antiulcers, hepatoprotective, antidiabetics, antithyroids, antifertility agents

Unit V

Alternatives to animal screening procedures, cell line handling, maintenance and propagation of cell lines, their uses and limitations, in-vitro testing of drugs

MPHP 1213- ADVANCES IN PHARMACOLOGICAL SCREENING

Practical based on theory.

RECOMMENDED STUDY MATERIAL:

1. H.G. Vogel (ed), Drug Discovery and Evaluation-Pharmacological Assays, 2nd edition, Springer Verlag, Berlin, Germany, 2002.
2. M.N. Ghosh, Fundamentals of Experimental Pharmacology, 2nd edition, Scientific Book Agency,Calcutta, India, 1984.
3. D.R. Laurence and A.L. Bacharach (eds), Evaluation of Drug Activities: Pharmacometerics, Vol. 1 and 2, Academic Press, London, U.K., 1964.
4. David R. Gross, Animal Models in Cardiovascular Research, 2nd edition, Kluwer Academic Publishers,London, U.K., 1994.
5. Indian Pharmacopoeia, Govt of India press2009.
6. Robert A. Turner, Screening methods in Pharmacology, 1971, Academic Press, New York.
7. L. J. Mc Leod Pharmacological experiment on intact preparations; Churchill Livingstone.1970
8. Laurence and Bachrach, Evaluation of drugs activities.1971, Academic Press, New York.

MPH 1223- NOVEL PHARMACOLOGICAL DRUG TARGETS

Unit I

Introduction of Molecular Pharmacology. Techniques for the study of Molecular Pharmacology such as Western Blotting, Immunostaining, RT-PCR, Cloning, RIA, Cell Cultures etc.

Unit-II

Molecular mechanisms of drug action: Receptor occupancy and cellular signaling system such as G-proteins, cyclic nucleotides, phosphatidylinositol, Ionic channels and their modulators.

Endogenous bioactive molecules as TNF Interleukins, Process of apoptosis, arachidonic acid metabolites, COX-2 regulators and their role in inflammation.

Unit III

Recent trends on different classes of receptors and drugs acting on them

Dopamine receptors, angiotensin receptors, serotonin receptors, opioid receptors, purinergic receptors, glutamate receptors, kinin receptors, excitatory amino acid receptors.

Unit-IV

Endothelium derived vascular substances (NO, endothelins), sodium, calcium and potassium channels and their modulators.

Pharmacology of atrial peptides, reactive oxygen intermediates, antioxidants and their therapeutic implications.

Unit-V

Receptors on T and B lymphocytes, Antibody dependent and cellular cytotoxicity,

Concept of gene therapy and recent development in the treatment of various hereditary diseases, Human genome mapping and its potential in drug research.

Antisence genes as a research tool.

MPHP 1223- NOVEL PHARMACOLOGICAL DRUG TARGETS

Practical based on theory.

***RECOMMENDED BOOKS*:**

1. Goodman & Gilman, The Pharmacological basis of Therapeutics, Pergamon Press. editors :- J.G. Hardman, Le Limbird, PB Molinoss, RW Ruddon & AG Gil, Pergamon Press.23.
2. Katzung, B.G. Basic & Clinical Pharmacology, Prentice Hall, International.
3. Laurene, DR & Bennet PN; Clinical Pharmacology, Churchill Livingstone.
4. Rang MP, Dale MM, Riter JM, Pharmacology Churchill Livingstone.
5. D.M. Glover, Genetic Engineering, Cloning DNA, Chapman and Hall, New York, 1980 Recombinant DNA, 2nd edition, Watson.
6. B.R. Glick & J.J. ,Molecular Biotechnology – Principle and Application of recombinant DNA . Pasternak. Genes VIII, Lewin Benjamin.
7. S.P. Vyas and V. K. Dixit ,Pharmaceutical Biotechnology . 2005, CBS Publishers.
8. D.J.A. Crommelin & R.D. Sindelar (Eds.),Pharmaceutical Biotechnology – An Introduction for Pharmacists & Pharmaceutical Scientists , 2002, Routledge (Pub.).
9. Lehninger, Nelson & Cox ,Principles of Biochemistry, CBS Publishers,.
10. R.W & Primrose, S.B ,The Principles of Gene Manipulation .

MPH 1230- BIOPHARMACEUTICS AND PHARMACOKINETICS

1. Drug Absorption and Distribution.

2. Metabolism and Disposition.

3. Pharmacokinetics: Open one compartment, two compartment & three compartment models & their limitations.
   Non-compartmental pharmacokinetics. Graphical methods of calculating pharmacokinetic parameters.

4. Bioavailability and Bioequivalence: Factors influencing bio-availability, evaluation of bioavailability, bio-equivalence with reference to BCS. Evaluation of Pharmaceutical formulations-in vitro and in vivo studies and their correlation. Levels and types of IVIVC.
   Dosage Regimens, dose adjustments in renal and hepatic failure, individualization of dosage regimen.

5. Pharmacokinetic applications in Clinical practice. Principles of clinical trials.