स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ
नांदेड– ४३१६०६ (महाराष्ट्र)
SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY
NANDED-431606, MAHARASHTRA STATE, INDIA.
Established on 17th September 1994 - Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade

ACADEMIC (1-BOARD OF STUDIES) SECTION
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संलग्नित महाविद्यालयांतील औषधनिर्माणशास्त्रे विद्याशाखेतील बी.फार्म. तृतीय वर्ष (सत्र पाचवे व सहावे) आणि चतुर्थ वर्ष (सत्र सातवे व आठवे) हे अभ्यासक्रम शैक्षणिक वर्ष २०१६–१७ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, **दिनांक १२ मे २०१६ रोजी संपन्न झालेल्या ३६व्या मा. विद्या परिषद बैठकीतील ऐनवेळचा विषय क्र.११/३६–२०१६** च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या **संलग्नित महाविद्यालयांतील औषधनिर्माणशास्त्रे विद्याशाखेतील** खालील अभ्यासक्रम शैक्षणिक वर्ष २०१६–१७ पासून लागू करण्यात येत आहेत.

१) बी.फार्म. – तृतीय वर्ष (सत्र पाचवे व सहावे)
२) बी.फार्म. – चतुर्थ वर्ष (सत्र सातवे व आठवे)

सदरील अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.: शैक्षणिक(१)/परिपत्रक/औषधनिर्माणशास्त्रे/
२०१६–१७/**२९६**
दिनांक : ०१.०७.२०१६.

स्वाक्षरित/–
संचालक
महाविद्यालय व विद्यापीठ विकास मंडळ

प्रत माहिती व पुढील कार्यवाहीस्तव :

१) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. परीक्षा नियंत्रक यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) उपकुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
५) साहाय्यक कुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.

Swami Ramanand Teerth Marathwada University, Nanded

Fourth Year B. Pharmacy, VIIth Semester

Subject : **Cosmetic Technology**

Subject Code/Paper No : **BPH71**

Credits : **03 ((02T+01Pr.)**

Objective:

This subject is deal with basic principles in cosmetic production including physicochemical and biological properties of cosmetic products, evaluation for performance and stability, formulation, production processes and product development. Techniques and objectives in coloring, flavoring, use of surfactants and preservatives are also emphasized in order to obtain reliable cosmetic products. Cosmetic production processes, its packaging, quality control, plant layout and equipments used are also included.

Learning Goals:

1. To know basic skills in the development of cosmetic formulation.
2. To get acquainted with Industrial processes included in cosmetic formulation.

Course Content (Theory)

Cosmetic Technology:

1. Scope of cosmetics, status and structure of cosmetic industry. **(02Hrs)**

2. Introduction to anatomy and physiology of Skin. **(01 Hrs)**

3. Raw materials used in cosmetic: surfactants, oils, waxes, gums, hydrophilic colloids, dyes, powders, colors, flavours, propellants, solvents humectants, protective agents, bleaching agents, stabilizers antioxidants, preservatives and other ancillary materials. **(02Hrs)**

4. **Skin care products** **(02 Hrs)**
    a. Cleansing, cold cream, vanishing cream and nutritive cream.
    b. Powders: face powders, Compact powders

5. **Hair care products**

   Shampoos, anti dandruff preparations, hair colorants, hair settings, lotion, epilatory and depilatories **(02 Hrs)**

6. **Colored make up preparations: (03 Hrs)**
   a. Lip care Products: Lipsticks, Rouges , Lip balm
   b. Eye Cosmetics: Mascara, eye shadows, eye liner.
   c. Nail Cosmetics: Nail polishes and cuticle remover.

7. **Dental products (02 Hrs)**

   Dentifrices, tooth powder and tooth paste.

8. **Personal Hygiene Products (03 Hrs)**

   Shaving soaps and creams, after shave preparations, antiperspirants and deodorants

9. Standards of cosmetic ingredients and quality control of finished products mentioned above **(03 Hrs)**

10. Microbiological contamination in cosmetics and its stability. **(02 Hrs)**

11. Requirement of factory premises for manufacturing of Cosmetics **(02 Hrs)**

Recommended Books:

Text Book:

1. B.M.Mithal and R.N.Shha, A Hand book of Cosmetics, 1st edition, Vallabh Prakashan, New Delhi

Reference Books:

1. S.C. Bhatiya Perfumes, Soaps, Detergents & Cosmetics Volume. I and II., CBS, Publishers & distributors. Delhi.
2. E.G. Thomssen, Modern Cosmetics, Universal publishing corporation Mumbai.
3. M.S.Balsam and Edward Sagarin, Cosmetics, Science and Technology, Krieger, Publishing Company, Malabar, Florida, Vol. I,II,III, 1992.
4. J.B.Wilkinsen, R.J.Morre, Harry's Cosmeticology, Langman Scientific and technical, 17th Edition, England.
5. Hamed M. Abelon, Dissolution, Bioavailability and Bioequivalence, Mack Publishing Company, Pennsylvania.

Course Content (Practical/Lab Work)

1. Formulation and evaluation of various types of cosmetics for Skin (04Pr)
   Calamine lotion, cold cream, vanishing cream, Sunscreen lotion
2. Formulation and evaluation of various types of cosmetics for Hair (02 Pr)
   Shampoo, shaving cream
3. Formulation and evaluation of various types of cosmetics for Nails (02 Pr)
   Nail paint, Nail paint remover.
4. Formulation and evaluation of various types of cosmetics for personal hygiene. (02 Pr)
   Deodorants and antiperspirants
5 Formulation and evaluation of various types of cosmetics for colour makeup (04 Pr)
   Lipsticks, mascara, eye shadows, eye liner.

Swami Ramanand Teerth Marathwada University, Nanded

Fourth Year B. Pharmacy, VIIth Semester

Subject : Medicinal Chemistry-III
Subject Code/Paper No : BPH72
Credits : 04 ((03T+01Pr.)

SCOPE

The study of medicinal chemistry play a very important role in understanding the drug design, chemical classification, chemistry, synthesis, SAR, mechanism of drug action by considering site of action or receptor structural components and thus helps in designing the drug molecule for disease with fewer side effects.

Objective of Theory

- Orientation of teaching approach should be focused on discussion of chemistry of drugs rather than pharmacological part.
- Emphasis should be given to **chemical classification** of all topics mentioned
- Synthesis in theory should cover **prototype of the respective category**
- **Review/ study of drugs available in market of each category is highly expected.**

Course Content (Theory)

Classes of drugs discussed in relation to: Introduction to the

- Rational of drug development/ drug design,
- Important physicochemical parameters/aspects in relation to p'kinetics and p'dynamics
- **Chemical classification (prototype drug of each class should be discussed),**
- Structure (nucleus or skeleton) & Nomenclature,
- Stereochemistry of drugs (if any)
- Synthesis of specified/ prototype drugs (given with*)
- mode of action (must be discussed by considering receptor site/structure)
- Structure Activity Relationships (SAR)**,**
- important therapeutic uses
- drug combination (compatibility, synergism, antagonism etc)

1. **ANTIBIOTICS– (12 hrs)**

Introduction to fermentation procedure for production of antibiotics, Beta-lactam antibiotics like penicillin, cephalosporine, beta lactamase inhibitors and its combination with beta lactams.Tetracycline, macrolide, aminoglycoside, peptide, Chloramphenicol and misceeleneous or newly introduced antiobiotic class. Quinolones, Norfloxacin, Ciprofloxacin, Sparfloxacin*

2. **Antineoplastic agents (06 hrs)**

Chemical classification of drugs, Cell growth cycle, and problem faced in cancer chemotherapy, alkylating agents and antimetabolites. Methotrexate*, 5-Flurouracil*, 6-Mercaptopurine*, 6-Thioguanine, Cyclophosphamide, Chlorambucil, Lomustine, Tamoxifen. Plant based drugs-paclitaxel, vincristine

3. **Antiviral agents including RT and HIV protease inhibitors. (04 hrs)**

Idoxuridine, Vidarbine, Cyclovir, Zidovudine, Nevirapine**.**

4. **Sulphonamides (02 hrs)**

Chemistry of folate pathway, Sulphanilamide, Sulphcetamide, Sulphamethoxazole, Sulphathiazole and trimethoprim

Course Content (Practical/Lab Work)

Objective of practical

- **Preparation of ppt, presentation by students, review of on line videos related to all practical, will be highly encouraged**
- **Study of reaction mechanism of synthesis included in syllabus is expected**
- **Study of peer Reviewed articles related to all articles time to time is expected**

1. Practical's based on CADD/ drug design soft wares for the molecules studied in theory part (molecules designed by consideration of receptors of bacterial cell wall, cell membrane, nucluoid components, virus, cancer cell and its cycle etc
2. Multistep reaction: Sulfanilamide from acetanilide, sulphagunidine, Diels-Alder reaction of sulpholane (any one)
3. methyl carbostyril from Acetoacetanilide
4. N acetyl glycine
5. Cinnamic acid steam distillation
6. Synthesis of 2,3-diphenyl quinoxaline (02 Practicals)
7. Synthesis of 2,4-Dichlorophenoxy acetic acid (01Practical)
8. Synthesis of N-Phenyl anthranilic acid. (02 Practicals)
9. Synthesis of Methyl orange (01Practical)
10. Preparation of fluorescein.
11. 6 methoxyquinoline
12. Practicals based on microwave synthesis
13. Probable and relevant practicals based on theory portion can also be covered
14. Photochemical reactions using sunlight
15. Solvent free solid phase reactions
16. Solvent recovery
17. Minimization of chemical pollution

Recommended Books

Reference Books, Journals and Weblinks:

1. Wilson & Gisvold's Text book of Organic, Medicinal & P'Ceutical Chemistry, Lippoincott
2. M E Wolff, Burgers Medicinal Chemistry Vol I to V, John Wiley ans Sons
3. Indian Pharmacopoeia
4. Finar I L, Organic Chemistry Vol –II, ELBS publication
5. Willam and Smith, Drug Design series
6. Thomas Nagrady, Medicinal Chemistry (A Biochemical Aproach)
7. Gautam Mulik, Fine Chemicals and Pharmaceuticals
8. Pattrick, Greham L., An Introduction to Medicinal Chemistry, Oxford University.
9. Ales Gringauz, Introduction to Medicinal Chemistry, How Drug Act and why, Wiley.VCH
10. Kadam, Mahidak, Bothra, Principles of Medicinal Chemistry, Vol II, Nirali Prakashan.
11. Profiles in drug synthesis, edited by Dr. Gogte, Vol. – I & II, Gokul Publishers.
12. Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry, Eleventh Edition, edited by J. H. Block and J. M. Beale Jr., Lippincott Williams & Wilkins, Philadelphia.
13. Pharmaceutical Chemicals in Perspective, B.G. Reuben and H.A. Wittcoff, John Wiley & Sons, New York.
14. Foye's, Principles of Medicinal Chemistry, Sixth Edition, Wolters Kluwer (India), Lea & Febiger, Philadelphia, USA.
15. Singh, H. and Kapoor, V.K. Medicinal and Pharmaceutical Chemistry, Second Edition Vallabh Prakashan, Delhi.
16. Vogel's A Text book of Practical Organic Chemistry, A. Vogel, 3rd, 1962, Longman group limited, London.
17. Advanced Practical Organic Chemistry, J. Leonard, trvor P. Toube, B. Lygo, G. Proctor, 2nd , 1990, Stanley Thornes.
18. Practical Organic Synthesis: A Student's Guide, Reinhart Keese, Martin P. Brandle
19. Molecular Modeling and Computer Aided Drug Design. Examples of their Applications in Medicinal Chemistry, Current Medicinal Chemistry, 2000, 7, 141-158, F. Ooms* (http://www3.uah.es/farmamol/Public/Curr_Med_Chem/MolMod_CMC2000.pdf)
20. Integrating research and development: the emergence of rational drug design in the pharmaceutical industry Matthias Adam Department of Philosophy, Bielefeld University (http://philsci-archive.pitt.edu/2397/1/Adam_rational_drug_design.pdf)
21. The Pharmaceutical Industry and the Future of Drug Development, David Taylor- From the book: Pharmaceuticals in the Environment

(http://pubs.rsc.org/en/content/chapterhtml/2015/9781782622345-00001?isbn=978-1-78262-234-5)

22. Software and resources for computational medicinal chemistry, Chenzhong Liao, Markus Sitzmann, Angelo Pugliese, and Marc C Nicklaus Future Med Chem. 2011 Jun; 3(8): 1057–1085.
23. Wadood A, Ahmed N, Shah L, Ahmad A, Hassan H, Shams S. In-silico drug design: An approach which revolutionarised the drug discovery process. OA Drug Design & Delivery 2013 Sep 01; 1(1):3.

Swami Ramanand Teerth Marathwada University, Nanded

Fourth Year B. Pharmacy, VIIth Semester

Subject : **Bio-pharmaceutics**

Subject Code/Paper No : **BPH73**

Credits : **03 (02T+01 Pr.)**

Course Content (Theory)

1. Introduction to Biopharmaceutics and its role in development of drug delivery system. **02 Hours**
2. **Absorption of drug :** Gastro-intestinal Absorption of drugs, cell membrane-structure and physiology, mechanism of drug absorption, factors influencing drug absorption and bioavailability- Physicochemical factors, dosage form related factors, patient related factors, absorption of drugs from non per os extra vascular routes. **06 Hours**
3. **Distribution of drugs:** tissue permeability of drugs, factors affecting drug distribution, volume of distribution. **03 Hours**
4. **Protein binding of drugs:** binding of drug to blood components, tissue binding, factors affecting protein drug binding, significance of protein drug binding, kinetics of protein drug Binding. **04 Hours**
5. **Biotransformation of drugs:** drug metabolizing organs and enzymes, chemical pathways of drug metabolism, factors affecting biotransformation. **03 Hours**
6. **Pro-drugs:** Concept of Pro-drugs, applications of pro-drug design, limitation of pro-drug design. **03 Hours**
7. **Excretion of drugs:** renal excretion, non-renal routes of drug excretion, factors affecting renal excretion of drug. **03 Hours**

TEXT BOOK:

1. Biopharmaceutics and Pharmacokinetics - A Treatise by D.M. Brahmankar, Sunil B, Jaiswal. 1st edition Vallabh Prakashan, Delhi.

REFERENCE BOOKS:

1. Introduction to Biopharmaceutics - by Milo Gibaldi (Lea & Febiger, Filadelphia, 1971) 4th edition
2. Biopharmaceutics & Pharmacokinetics - by Robert F Notary (Marcel Dekkar N.Y. 1971) 4th edition
3. Clinical Pharmacokinetics - concepts and Applications - by Malcolm Rowland & Thomas N. Tozer, Lea and Febiger, B.I. Waverly Pvt. Ltd. 3rd edition.
4. Biopharmaceutics - Current Concepts in the Pharmaceutical Sciences: edited by james swarbrick , Lea & Febiger. Philadelphia. 1970
5. Biopharmaceutics and Pharmacokinetics - by PL Madam Jaypee Brothers Medical Publishers (P) LTD. New Delhi.
6. Introduction to Biopharmaceutics and Pharmacokinetics by Dr.. H.P. Tipnis & Dr.(Mrs.) M.S. Nagarsenkar
7. Biopharmaceutics and clinical Pharmacokinetics by milo Gibaldi lea and febiger 4th edition.
8. Pharmacokinetics by Milo Gibaldi, Donald Perrier, marcel deccer inc. 2nd edtion.
9. Text book of biopharmaceutical analysis by robert v smith and james t stewart, lea and febiger 1981.
10. Applied biopharmaceutics and pharmacokinetics by shargel leon, yu andrew b.c printice – hall international inc. N.Y. 4th edition.
11. Current concepts in the pharmaceutical sciences, dosage for design and bioavailability edited by James Swarbrick, Lea and Febiger Philadelphia 1973.
12. Peter G. Welling, Francis L.S. TSE, Strikant V Dighe, Pharmaceutical Bioequivalence, Mareel Bekker.

Course Content (Practical/Lab work)

1. To compare in-vitro acid neutralization capacity of different marketed antacid preparations. (01Pr)
2. To study effect of cosolvent on solubility of given drug. (02 Pr)
3. To study the in-vitro disintegration time of marketed tablets. (03 Pr)
4. To study the in-vitro drug release of marketed tablets. (03 Pr)
5. Experiments designed for the estimation of various pharmacokinetic parameters with given data. (software base exercises wherever possible) (Practice problems–05Pr)

Swami Ramanand Teerth Marathwada University, Nanded

Fourth Year B. Pharmacy, VIIth Semester

Subject : Spectro-analytical Techniques
Subject Code/Paper No : BPH74
Credits : 03 ((02T+01Pr.)

Course content (Theory)

1. **Introduction to Spectroscopy/ Spectro-analytical Techniques (03 hrs)**

   Electromagnetic radiations (EMR) and its characteristics, Wavelength, Wavenumber, Frequency, EMR Spectrum, Problems
   Definition and Classification of spectroscopy, significance of spectroscopy in pharmaceutical analysis
2. **Flame Photometry (03 hrs)**
   Introduction, Basic concepts, Principle, Instrumentation, Interferences in flame photometry, Applications
3. **Nephelometry and Turbidimetry: (04 hrs)**
   Introduction, Basic concepts, Principle, Factors affecting measurement, Instrumentation Applications
4. **Fluorometry and Phosphorimetry (04 hrs)**
   Introduction, Basic concepts, Principle, Fluorogenic substances and its structural requirement, Instrumentation, Applications, Comparison of fluorometry and phosphorimetry
5. **Atomic Absorption Spectroscopy (AAS) (04 hrs)**
   Introduction, Basic concepts, Principle, Instrumentation, Applications, Comparison of AAS with flame photometry
6. **Emission Spectroscopy (03 hrs)**
   Introduction, Basic concepts, Instrumentation, Advantages and disadvantages, Applications
7. **X-Ray Diffraction (03 hrs)**
   Generation of X-rays, Basic concepts, Principle, Bragg's law, Instrumentation, Applications

Course Content (Practical/Lab Work)

I. Nephelo-Turbidimetry

1. Determination of chloride in sample by nepheloturbidimetry.
2. Determination of chloride l in sample by nepheloturbidimetry.
3. Determination of sulphate limits in sample by nepheloturbidimetry.
4. Determination of sulphate limits in sample by nepheloturbidimetry.
5. Determination of carbonate in sample by nepheloturbidometry.

II. Fluorometry -

1. Assay of quinine sulphate by fluorometry.
2. Fluorometric estimation of vit. B1.
3. Fluorometric estimation of riboflavin.

III Flame photometry -

1. Determination of concentration of potassium in dil. aqueous solution of potassium chloride
2. Determination of concentration of calcium in dil. aqueous solution of Calcium chloride
3. Determination of sodium and potassium from electrolyte powder.
4. Determination of sodium and potassium from haemodialysis solution / intraperitoneal dialysis solution.

IV Demonstrations

Recommended Books:

Text Book:

1. K. A. Connors, A Text Book of Pharmaceutical Analysis, John Wiley & Sons.

Reference Books:

1. A.H. Beckett and J.B. Stenlake, Practical Pharmaceutical Chemistry, Vol. I & II.
2. Willard and Meritt, Instrumental methods of Analysis, CBS Publication.
3. J.W.Munson, Pharmaceutical Analysis, Modern methods, Part A & B
4. G.W. Ewing, Instrumental methods of chemical Analysis, McGraw Hill International Edition.
5. Skoog, Principles of Instrumental Analysis, Saunders college publishing.
6. D.C. Harris, Exploring chemical Analysis, W.H. Freeman and Company.
7. Gary D. Christian, Analytical Chemistry, John Wiley and Sons. Inc.
8. P. parimoo, Pharmaceutical Analysis, CBS Publishing.
9. Robert de Levie, Principles of quantitative chemical Analysis McGraw Hill International Series.
10. Chatwal and Anand, Instrumental methods of chemical analysis, Himalaya publishing house
11. S. W. Rajbhoj., Dr. T. K. Chondhekar., Systematic Experimental Physical Chemistry, Anjali Publication.
12. Indian Pharmacopoeia 1996 Ministry of Health Government of India.
13. British Pharmacopoeia.
14. Dyer J R, Application of Absorption Spectroscopy of organic compounds.
15. Nagavi B.G., Laboratory hand book of Instrumental Drug Analysis.
16. Journals related to pharmaceutical analysis.

Swami Ramanand Teerth Marathwada University, Nanded

Fourth Year B. Pharmacy, VIIth Semester

Subject : Herbal Technology
Subject Code/Paper No : BPH75
Credits : 03 ((02T+01Pr.)

Course Content (Theory)

I. Fundamentals of herbal technology: (03 Hrs)

Definition of Herbal drug, Importance of Herbal therapies, Herbal verses conventional drugs, Safety in herbal drugs, W.H.O. policy on herbal medicine.

II. Traditional Drugs: (05 Hrs)

Common vernacular names, botanical source, morphology, chemical nature of chief constituents, pharmacological categories, common uses & marketed formulations of following indigenous drugs.

Amla, Kantkari, Satavari, Tylophora, Bhilawa Kalijiri, Bach, Rasna, Punarnava, Chitrack Aparmarg, Gokhru, Shankhapushpi, Brahmi, Adulsa, Arjuna, Ashoka, Methi, Lahsun, Guggsal, Gymnema, Shilajit, Nagarmotha and Neem.

III. Holistic concept of Drug Administration in Traditional System of Medicine. (05 Hrs)

Emphasis shall be on introduction, methods of preparation, characteristics, preservation, storage, general standardization, methods, therapeutics uses with few examples of ayurvedic preparations Ayurvedic preparations like Arishtas, Asvas, Gutikas, Tailas, Churna, Lehyas & Bhasmas.

IV. Nutraceuticals: (03 Hrs)

Definition, use of herbs as nutraceuticals, regulatory requirements for manufacturing of nutraceuticals. Difference between nutraceuticals and traditional plant based preparations.

V. Chromatography: (05 Hrs)

Introduction, classification and study of different chromatographic methods and their application in evaluation of herbal drugs

VI. Herbal cosmetics: (04 Hrs)

Definition, classification, method of preparation of commercial herbal cosmetic formulations such as Shampoos, Conditioners, Hair darkeners.

Recommended Books:

1. W.C. Evans Trease and Evens, Text book of Pharmacognosy
2. C.K.Atal and B.M.Kapur, “Cultivation and Collection of Medicinal Plants”.
3. C.K.Atal and B.M. Kapur, “Cultivation and Collection of Aromatic Plants”.
4. C.K.Kokate, A.P.Purohit, S.B.Gokhale, “Text book of Pharmacognosy”.
5. T.E.Wallis, Text book of Pharmacognosy.
6. V.E.Taylor, L.R.Brady and J.E.Robbers, “Pharmacognosy”
7. Brain and Turner, The Practical Evaluation of Phyto Pharmaceuticals.Wagner, Bladt and zgainski, Plant Drug Analysis.
8. C.K.Kokate, Practical Pharmacognosy.
9. Pharmacognosy – Tyler, Brady and Robbers, Lea sn Febiger.
10. The Practical Evaluation of Phyto pharmaceuticals Brain and Turner.
11. Modern Methods or Plant Analysis – Peach and Tracey.
12. Plant drug analysis – Wanger, Baldt and Zgainski Wright scientechnics, bristol;
13. Phytochemical methods – J.B. Harborne
14. Quantitative paper and thin Layer Chromatography – E.,J. Shellard. Academic press, Newyork.
15. Thin Layer Chromatography – Egon Stahl, Soringer – Verlag, Newyork.
16. The Ayurvedic formulary of India, part – I first edition, Govt. of India, ministry of Health and family planning (Dept. of Health).
17. S S Agrawal and M Paridhavi, Herbal drug Technology, University Press, Hydrabad.

Course Content (Practical/Lab Work)

1) Morphological Identification of crude drugs listed under category of Traditional drugs. **(04)**
2) Chromatographic study of some herbal drugs constituents. **(03)**
3) Standardization of some traditional drugs formulations. **(03)**
4) Manufacturing of herbal cosmetics listed in theory **(04)**

Recommended Books:

1. C.K.Kokate; Practical pharmacognosy; Vallabh prakashan;Delhi.
2. K.R. Khendelwal; practical pharmacognosy; Nirali prakashan, Pune.
3. V.D. Rangari; Pharmacognosy & Phytochemistry; Part II; First edition; Career publication; Nashik.
4. A N Kalia , Text book of Industrial Pharmacognosy, CBS Publishers & distributers, New Delhi.
5. S S Agrawal and M Paridhavi, Herbal drug Technology, University Press, Hyderabad.
6. T. N Vasudevan and K S Laddha, Herbal Drug Microscopy, Yucca Publishing House, Mumbai.
7. The Practical Evaluation of Phyto pharmaceuticals Brain and Turner.

Swami Ramanand Teerth Marathwada University, Nanded

Fourth Year B. Pharmacy, VIIth Semester

Subject : **Modern Pharmaceutics**

Subject Code/Paper No : **BPH76**

Credits : **02 ((02T)**

Objective:

The course is divided in to two parts Novel drug delivery systems and cosmetic technology. The first part concentrates on the specialized aspects of Novel drug delivery techniques, capable of controlling the rate of drug delivery, sustaining the duration of therapeutic activity, targeting the delivery of drug to a tissue in an effective, reliable, reproducible and safe manner. It is to minimize the drawbacks of conventional drug delivery system, which has to be taken several times a day to maintain the drug concentration within the therapeutic window. The course aims at learning the basic concepts for developments of various novel drug delivery systems like sustained and controlled released, implants, aerosols, neosomes and liposomes, micro-encapsulation, resealed erythrocyte, etc.

Learning Goals:

1. To maintain therapeutic concentration of drug in blood circulation by changing release kinetics from a dosage form.
2. To target maximum concentration of drug at specific site by altering pharmacokinetic parameters of dosage forms.
3. To minimize quantity of a drug embedded within dosage form by reducing fluctuation at therapeutic window.
4. To develop a Novel drug delivery system more efficient, reliable and cost effective

Course Content (Theory)

1. **Introduction to Modern Pharmaceutics-**

   (01Hrs)
2. **Fundamental Concept of Modified Drug Release:** Definitions of controlled release, sustained release time release drug delivery systems. Pre requisites of drug candidates, various approaches and classification, dose calculation for controlled release. Brief

introduction to polymers parameters affecting selection of polymers for modified release systems **(10Hrs)**

3. **Aerosols** - **(05Hrs)**

   Definition, propellants, general formulation, containers, selection of components, manufacturing and packaging methods, pharmaceutical applications, evaluation

4. **Trans-dermal drug delivery system** - **(08Hrs)**

   Introduction, structure of the skin, passage of drug through skin, factors affecting percutaneous absorption, advantages and disadvantages of trans-dermal drug delivery system, iontophoresis, Electroporation, sonophoresis

   Basic concepts: polymer matrix, the drug permeation enhancer, excipients. Approaches used in development of trans-dermal drug delivery system.

Recommended Books:

Text book:

1. N.K. Jain, Controlled and Novel drug delivery. CBS Publishers and distributors. New Delhi.

2. B.M.Mithal and R.N.Shha, A Hand book of Cosmetics, 1st edition, Vallabh Prakashan, New Delhi

Reference Books:

1 Leon Lachman, Theory and Practice of Industrial Pharmacy, Varghese publishing house, 3rd edition.

2 Remington's, The Sciences and practice of pharmacy- Volume I, II., Lippincott Williams and Wilkins London, 20th edition.

3 Hillery and loyed, Drug delivery and targeting., Tylor and franicis London. 1st edition.

4 Yie W. Chien ,Novel drug delivery systems., Mareel Dekker Inc.

5 Ansel, Howard, Pharmaceutical Dosage Forms and Drug Delivery Systems, Lippincott Williams and Wilkins London, 7th edition.

6 S.C. Bhatiya Perfumes, Soaps, Detergents & Cosmetics Volume. I and II., CBS, Publishers & distributors. Delhi.

7 E.G. Thomssen, Modern Cosmetics, Universal publishing corporation Mumbai.

8 M.S.Balsam and Edward Sagarin, Cosmetics, Science and Technology, Krieger, Publishing Company, Malabar, Florida, Vol. I,II,III, 1992.

9 J.B.Wilkinsen, R.J.Morre, Harry's Cosmeticology, Langman Scientific and technical, 17th Edition, England.

10 Hamed M. Abelon, Dissolution, Bioavailability and Bioequivalence, Mack Publishing Company, Pennsylvania.

Swami Ramanand Teerth Marathwada University, Nanded

Fourth Year B. Pharmacy, VIIth Semester

Subject : **Pharmaceutical Management**

Subject Code/Paper No : **BPH77**

Credits : **02 ((02T)**

Course Content (Theory)

1. Introduction to management (04 hrs)

Concepts of management, Principles of management, functions of management and Levels of management, pharmaceutical management. Social responsibilities of management. Sales forecasting, plant utilities, production technology, plant location, plant lay out, materials handling, purchasing, purchasing policies and inventory management.

2. Product Marketing, Sales promotion and advertising management (10 hrs)

Marketing – objective an scope, developing marketing opportunities and strategies, marketing research and information system, market segmentation, developing the marketing mix – product and service strategies, new product development and product life cycle strategies.

Field sales management, sales organization, training of sales personnel, field sales planning control and risk, sales forecasting,

Concepts and nature of advertising, advertising and marketing, effects of advertising, social effects of advertising, ethics, advertising process.

3. Macroeconomics for management studies - (06 hrs)

a) Introducing macroeconomics to management studies macroeconomics defined, and its necessity, macro and micro economics, macroeconomic and business management, basic macroeconomics concepts like stock and flow, capital and investment,

b) National income and related aggregates -

National income and related concepts – Gross and net income, domestic and national income, market prices and factors costs, GDP, GNP, NDP and NNP personal income. The concept of value added. Demand and supply of money time value of money, inflation definition, cripping and galloping, open and suppressed inflation, effects of inflation, control of inflation.

4) Environmental management (04 hrs)

Pollution control, waste management in case of pharmaceutical industry – a green organization- Environment, need of environmental management, human interference with environment, impact of technology on environment, green organization, environmental movements and legislation.

Recommended books:

1. K.Aswathappa and K. Sridhara Bhat, Production and Operations Management, Himalaya Publishing House, New Delhi.
2. M. N. Mishra, Sales promotion and advertising management,Himalaya Publishing House, New Delhi.
3. Kotler and Armstrong, Principles of marketing, Prentice-Hall of India Pvt ltd, New Delhi.
4. T.M. Joseph, Enviormental Management, Himalaya Publishing House, New Delhi.
5. K.Aswathappa, Essentials of production management, Himalaya Publishing House, New Delhi.
6. S.A. Chunawala, Sales Management, Himalaya Publishing House, New Delhi.
7. S.A. Chunawala, Product Management, Himalaya Publishing House, New Delhi.
8. SVR Subbarao, Hand book of pharmaceutical marketing in India, Universal book corporation, Mumbai.
9. Heinz Weihrich and Harold Koontz, Management, A global Perspective, McGraw-hill International edition.
10. Nikhilesh Dholkia, Rakesh Khurana, Labdhi Bhandari & Ashinandan K. Jain, Marketing Management cases and Concepts, Macmillan India Limited.
11. S.A. Sherlekar, K. Nirmala Prasad and S. J. Salvadore victor, Principples of Marketing, Himalaya Publishing House, New Delhi.
12. S.A.Chunawalla and K.C., Sethia, Foundation of advertising, Theory and practice, Himalaya Publishing House, New Delhi.
13. R.B.Smarta, Revitalizing the pharmaceutical business, innovative marketing approaches, Universal book corporation, Mumbai.
14. D.Gopalkrishana, A study of managerial economics, Himalaya Publishing House, New Delhi.
15. Dr. M.M. Varma and R.K. Agarwal, managerial economics, King Books, Delhi.

Swami Ramanand Teerth Marathwada University, Nanded

Fourth Year B. Pharmacy, VIIth Semester

Subject : Autacoids & Immunomodulators
Subject Code/Paper No : BPH78
Credits : 02 (02T)

The Course & Objective

Autacoids are local hormones and have a paracrine effect. Some notable autacoids are: eicosanoids, angiotensin, kinins, histamine, serotonin, endothelins, etc. Autacoid therapy is based on the use of autacoids to enhance healing effects. Such classes of autacoids have quite promising effects for a great number of indications, from dry eye, chronic gingivitis up to asthma and chronic neuropathic pain. This course content focuses on understanding mechanism behind autacoids action and their clinical applications. This course also includes drugs acting on GIT & Respiratory system along with treatment & management approach for asthma, ulcer like conditions beside role of immunomodulators in disease conditions.

Course Content (Theory)

1. **Allergy, Allergens and Autocoids (02)**
2. **Histamine, 5-HT and their antagonists. (03)**
3. **Antihistaminic agents (02)**
4. **Prostaglandins, thromboxanes and leukotrienes. (02)**
5. **Pentagastrin, Cholecystokinin, Angiotensin, Bradykinin and Substance P. (02)**
6. **Drugs Acting on the Respiratory System: (04)**
   a) Anti-asthmatic drugs including bronchodilators.
   b) Mucolytics and nasal decongestants, Anti-tussive and expectorants.
   c) Respiratory stimulants.
7. **Pharmacology of drugs acting on gastrointestinal tract (05)**
   a) Antacids, antisecretory and antiulcer drugs
   b) Emetics and anti-emetics
   c) Purgatives and anti-diarrhoeal
8. **Vaccines, Antisera and Immunomodulators (04)**

   Basic introduction to immunity and its products; Brief description, role and clinical importance of immunomodulators in diseases conditions like cancer, viral infections etc including in organ transplantation.

Recommended Books:

1. Barar F.S.K., A Text Book Of Pharmacology, Mehta Publications
2. Tripathi K.D., Essentials of medical Pharmacology, Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi,
3. R.S. Satoskar, S.D. Bhandarkar, Pharmacology and Pharmacotherapeutics, Popular Prakashan, Mumbai
4. Katzung B.G., Basic And Clinical Pharmacology, Lange Medical Publications
5. Vogel H.G., Drug Discovery And Evaluation, Springer House
6. Barar F.S.K., Essentials Of Pharmacotherapeutics, S. Chand &Co. Pvt. Ltd.,
7. Rang M.P., Dale M.M., Riter J. M./4thed, Pharmacology, Churchill, Livingstone

Swami Ramanand Teerth Marathwada University, Nanded

Fourth Year B. Pharmacy, VIIIth Semester

Subject : Novel Drug Delivery System and Targeted Drug Delivery System

Subject Code/Paper No: BPH81

Credits : 03 (02T+01 Pr.)

Objective:

This subject concentrates on the specialized aspects of Novel drug delivery techniques, capable of controlling the rate of drug delivery, sustaining the duration of therapeutic activity, targeting the delivery of drug to a tissue in an effective, reliable, reproducible and safe manner. It is to minimize the drawbacks of conventional drug delivery system, which has to be taken several times a day to maintain the drug concentration within the therapeutic window. The course aims at learning the basic concepts for developments of various novel drug delivery systems like , implants, polymers, ocular drug delivery, Neosomes and liposomes, micro-encapsulation, resealed erythrocyte, etc.

Learning Goals:

1. To maintain therapeutic concentration of drug in blood circulation by changing release kinetics from a dosage form.
2. To target maximum concentration of drug at specific site by altering pharmacokinetic parameters of dosage forms.
3. To minimize quantity of a drug embedded within dosage form by reducing fluctuation at therapeutic window.
4. To develop a Novel drug delivery system more efficient, reliable and cost effective.

Course content (Theory)

1. **Introduction: Fundamentals of Novel Drug Delivery Systems- (02Hrs)**
   Basic concepts, different terms used, classification, advantages and disadvantages, Comparative study with conventional release, commercial importance
2. **Implants and inserts- (05 Hrs)**
   Introduction, Rational, advantages and disadvantages, approach to the development of implantable drug delivery system, biodegradable polymers and non degradable polymers,

classification, chemical structure, properties and mechanism of biodegradation of polymers.

3. **Ocular drug delivery system -** **(03 Hrs)**

   Introduction, Requirement for controlled ocular drug delivery system, concept of Osmosis. Erodible and Non-erodible ocular inserts. Role of polymers in ocular drug delivery

4. **Colon targeted drug delivery system-** **(03 Hrs)**

   Physiology of colon, Rational, Difficulties in colonic drug delivery and Approaches

5. **Mucoadhesive Drug delivery systems.** **(03 Hrs)**

   Introduction, Rational, Factors affecting mucoadhesion, Polymers used for Mucoadhesive Drug Delivery System.

6. **Carrier mediated drug delivery systems-** **(09 Hrs)**

   Introduction, Rational, components, advantages and disadvantages, preparations, stability, application of Liposome, Neosomes, Resealed erythrocytes

   Micro-encapsulation – Introduction, Rational, Techniques of micro encapsulation, evaluation and application.

Recommended Books:

Text book:

1. N.K. Jain , Controlled and Novel drug delivery., CBS Publishers and distributors. New Delhi.

Reference Books :

1. Leon Lachman ,Theory and Practice of Industrial Pharmacy , Varghese publishing house, 3rd edition.
2. Joseph R. Robinson; Sustained and controlled drug and delivery, Marcel Dekker Inc.,New York
3. Remington's ,The Sciences and practice of pharmacy- Volume I, II., Lippincott Williams and Wilkins London, 20th edition.
4. Hillery and loyed, Drug delivery and targeting., Tylor and franicis London. 1st edition.
5. Yie W. Chien ,Novel drug delivery systems., Mareel Dekker Inc.
6. Ansel, Howard, Pharmaceutical Dosage Forms and Drug Delivery Systems, Lippincott Williams and Wilkins London, 7th edition.

7. Hamed M. Abelon, Dissolution, Bioavailability and Bioequivalence, Mack Publishing Company, Pennsylvania.

Course Content (Practical/Lab Work)

3. Introduction to polymers, excipients and instruments/machines required for development of Novel Drug Delivery System (02 pr)
4. To study the effect of pH on swelling properties of polymers (01 pr)
5. To study the effect of pH on rheological properties of Carbopol gel (01 pr)
6. Preparation of micro capsule by co- acervation phase separation method. (02 pr)
7. Preparation of micro capsule by Spray congealing method. (01pr)
8. Preparation and evaluation of transdermal patch. (01 pr)
9. Evaluation of controlled release marketed formulations. (03 pr)
10. Evaluation of sustained release marketed formulations. (03 pr)

Swami Ramanand Teerth Marathwada University, Nanded

Fourth Year B. Pharmacy, VIIIth Semester

Subject : Medicinal Chemistry -IV
Subject Code/Paper No : BPH82
Credits : 03 (02T+01 Pr.)

SCOPE

The study of medicinal chemistry play a very important role in understanding the drug design, chemical classification, chemistry, synthesis, SAR, mechanism of drug action by considering site of action or receptor structural components and thus helps in designing the drug molecule for disease with fewer side effects.

Objective of Theory

- Orientation of teaching approach should be focused on discussion of chemistry of drugs rather than pharmacological part.
- Emphasis should be given to **chemical classification** of all topics mentioned
- Synthesis in theory should cover **prototype of the respective category**
- **Review/ study of drugs available in market of each category is highly expected.**

Course Content (Theory)

Classes of drugs discussed in relation to: Introduction to the

- Rational of drug development/ drug design,
- Important physicochemical parameters/aspects in relation to p'kinetics and dynamics
- **Chemical classification (prototype drug of each class should be discussed),**
- Structure (nucleus or skeleton) & Nomenclature,
- Stereochemistry of drugs (if any)
- Synthesis of specified/ prototype drugs (given with*)
- mode of action (must be discussed by considering receptor site/structure)
- Structure Activity Relationships (SAR)**,**
- important therapeutic uses
- drug combination (compatibility, synergism, antagonism etc)

Antiprotozoal agents. **(08 Hrs)**

i) Antimalarial agents.
Life cycle of malarial parasite, Chloroquin, amodiquin, primaquin, pyrimethamine, cycloguanil.

ii) Antiamoebic agents.
Metronidazole, Tinidazole, Diloxinide furoate
iii) Antihelmintics
Niclosamide, Diethyl carbamizine citrate, Pyrantel, Lucanthone, Mebendazole.
iv) Tripano somicidal agents.

Antimycobacterial agents - (04 Hrs)

i) Antitubercular agents.
First line and Second line drugs, combination therapy for tuberculosis. INH, Ethionamide, Ethambutol, PAS, Clofazimine, drugs used in MDR-TB, combination therapy.
ii) Antileprotic agents-Dapsone

Antifungal agents. - (02 Hrs)

Clotrimazole, Tolnaftate, Flucytocine.

Metabolism (07 Hrs)

CYP-450, its chemistry, nomenclature, Phase –I(Oxidation, Reduction and Hydrolysis) & II reactions (Glucuronide conjugation, acylation, methylation, sulphate congugation, etc), factors affecting metabolism.

Brief introduction to combinatorial chemistry (3 hrs)

Course Content (Practical/Lab Work)

Objective of practical

- **Preparation of ppt, presentation by students, review of on line videos related to all practical, will be highly encouraged**
- **Study of reaction mechanism of synthesis included in syllabus is expected**
- **Study of peer Reviewed articles related to all articles time to time is expected**

1. Practical's based on CADD/ drug design soft wares for the molecules studied in theory part (molecules designed by consideration of receptors of protozoal infection, fungi and mycobaterium etc (05)
2. Determination of all physic chemical aspects of drug design (ex ionization, partition coefficient, dissociation constant and molar refractivity of compounds for QSAR analysis); values and out come should be compared with available literature. Exercises based on QSAR: Hansch & Free-Wilson methods (3-4)
3. Metabolism related in silico practical (Ex. effect of different CYP's on drugs), phase I and phase II examples (03)

4. CADD practical based on stereochemistry of receptors and drugs (geometrical, optical isomers & conformers,) drug-receptor interactions, forces involved in D-R interactions
5. Practical based on how resistance and drug design (02)
6. 1-phenylazo 2-naphthol from aniline and 2-naphthol
7. INH (02 step)
8. green chemistry approach (03)
9. Practicals based on microwave synthesis
10. Probable and relevant practicals based on theory portion can also be covered
11. Photochemical reactions using sunlight
12. Solvent free solid phase reactions
13. Solvent recovery
14. Minimization of chemical pollution

Reference Books, Journals and Weblinks:

24. Wilson & Gisvold's Text book of Organic, Medicinal & P'Ceutical Chemistry, Lippoincott
25. M E Wolff, Burgers Medicinal Chemistry Vol I to V, John Wiley ans Sons
26. Indian Pharmacopoeia
27. Finar I L, Organic Chemistry Vol –II, ELBS publication
28. Willam and Smith, Drug Design series
29. Thomas Nagrady, Medicinal Chemistry (A Biochemical Aproach)
30. Gautam Mulik, Fine Chemicals and Pharmaceuticals
31. Pattrick, Greham L., An Introduction to Medicinal Chemistry, Oxford University.
32. Ales Gringauz, Introduction to Medicinal Chemistry, How Drug Act and why, Wiley.VCH
33. Kadam, Mahidak, Bothra, Principles of Medicinal Chemistry, Vol II, Nirali Prakashan.
34. Profiles in drug synthesis, edited by Dr. Gogte, Vol. – I & II, Gokul Publishers.
35. Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry, Eleventh Edition, edited by J. H. Block and J. M. Beale Jr., Lippincott Williams & Wilkins, Philadelphia.
36. Pharmaceutical Chemicals in Perspective, B.G. Reuben and H.A. Wittcoff, John Wiley & Sons, New York.
37. Foye's, Principles of Medicinal Chemistry, Sixth Edition, Wolters Kluwer (India), Lea & Febiger, Philadelphia, USA.
38. Singh, H. and Kapoor, V.K. Medicinal and Pharmaceutical Chemistry, Second Edition Vallabh Prakashan, Delhi.
39. Vogel's A Text book of Practical Organic Chemistry, A. Vogel, 3rd, 1962, Longman group limited, London.

40. Advanced Practical Organic Chemistry, J. Leonard, trvor P. Toube, B. Lygo, G. Proctor, 2nd , 1990, Stanley Thornes.
41. Practical Organic Synthesis: A Student's Guide, Reinhart Keese, Martin P. Brandle
42. Molecular Modeling and Computer Aided Drug Design. Examples of their Applications in Medicinal Chemistry, Current Medicinal Chemistry, 2000, 7, 141-158, F. Ooms* (http://www3.uah.es/farmamol/Public/Curr_Med_Chem/MolMod_CMC2000.pdf)
43. Integrating research and development: the emergence of rational drug design in the pharmaceutical industry Matthias Adam Department of Philosophy, Bielefeld University (http://philsci-archive.pitt.edu/2397/1/Adam_rational_drug_design.pdf)
44. The Pharmaceutical Industry and the Future of Drug Development, David Taylor- From the book: Pharmaceuticals in the Environment (http://pubs.rsc.org/en/content/chapterhtml/2015/9781782622345-00001?isbn=978-1-78262-234-5)
45. Software and resources for computational medicinal chemistry, Chenzhong Liao, Markus Sitzmann, Angelo Pugliese, and Marc C Nicklaus Future Med Chem. 2011 Jun; 3(8): 1057–1085.
46. Wadood A, Ahmed N, Shah L, Ahmad A, Hassan H, Shams S. In-silico drug design: An approach which revolutionarised the drug discovery process. OA Drug Design & Delivery 2013 Sep 01;1(1):3.

Swami Ramanand Teerth Marathwada University, Nanded

Fourth Year B. Pharmacy, VIIIth Semester

Subject : **Pharmacokinetics and its Clinical Application**

Subject Code/Paper No : **BPH83**

Credits : **03 (02T+01 Pr.)**

Course Content (Theory)

1. Pharmacokinetics: basic considerations, plasma drug concentration time profile, rates, rate constants and orders of reaction, pharmacokinetics models. **03 hours**
2. Pharmacokinetics drug interactions: mechanism of drug interaction. **02 hours**
3. Compartment Modelling: one compartment open model I.V. Bolus administration, I.V. Infusion, extra vascular administration, multi compartment models, and urinary excretion data. **08 hours**
4. Non-linear pharmacokinetics: causes of nonlinearity, Michaelis Menten Equation, estimation of K_m and V_{max}. **02 hours**
5. Bioavailability and Bioequivalence: objectives and measurement of bioavailability, *in-vitro* drug dissolution, *in vitro-in vivo* correlation, bioequivalence studies, methods for enhancement of bioavailability. **05 hours**
6. Applications of pharmacokinetics principles: design of dosage regimens, individualization, monitoring drug therapy. **04 hours**

Recommended books:

Text Book:

1. Biopharmaceutics and Pharmacokinetics - A Treatise by D.M. Brahmankar, Sunil B, Jaiswal. Ist edition Vallabh Prakashan, Delhi.

Reference Books:

1. Introduction to Biopharmaceutics - by Milo Gibaldi (Lea & Febiger, Filadelphia, 1971) 4th edition
2. Biopharmaceutics & Pharmacokinetics - by Robert F Notary (Marcel Dekkar N.Y. 1971) 4th edition

3. Clinical Pharmacokinetics - concepts and Applications - by Malcolm Rowland & Thomas N. Tozer, Lea and Febiger, B.I. Waverly Pvt. Ltd. 3rd edition.
4. Biopharmaceutics - Current Concepts in the Pharmaceutical Sciences: edited by james swarbrick , Lea & Febiger. Philadelphia. 1970
5. Biopharmaceutics and Pharmacokinetics - by PL Madam Jaypee Brothers Medical Publishers (P)LTD. New Delhi.
6. Introduction to Biopharmaceutics and Pharmacokinetics by Dr.. H.P. Tipnis & Dr.(Mrs.) M.S. Nagarsenkar
7. Biopharmaceutics and clinical Pharmacokinetics by milo Gibaldi lea and febiger 4th edition.
8. Pharmacokinetics by Milo Gibaldi, Donald Perrier, marcel deccer inc. 2nd edtion.
9. Text book of biopharmaceutical analysis by robert v smith and james t stewart, lea and febiger 1981.
10. Applied biopharmaceutics and pharmacokinetics by shargel leon, yu andrew b.c printice – hall international inc. N.Y. 4th edition.
11. Current concepts in the pharmaceutical sciences, dosage for design and bioavailability edited by James Swarbrick, Lea and Febiger Philadelphia 1973.
12. Peter G. Welling, Francis L.S. TSE, Strikant V Dighe, Pharmaceutical Bioequivalence, Mareel Bekker.

Course Content (Practical/Lab Work)

1. Introduction to Biopharmaceutics laboratory (01pr)
2. To prepare calibration curve of few pure drug. (04 pr)
3. To compare in-vitro drug release of marketed tablet dosage form. (04 pr)
4. To study different methods of enhancing bioavailability. (02 pr)
5. Experiments designed for the estimation of various pharmacokinetic parameters with given data. (software base exercises wherever possible) (Practice problems –04)

Swami Ramanand Teerth Marathwada University, Nanded

Fourth Year B. Pharmacy, VIIIth Semester

Subject : Potentials of Herbal Based Industries
Subject Code/Paper No : BPH84
Credits : 03 (02T+1Pr.)

Course Content (Theory)

1. A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India. Role of AYUSH for promotion of plant based industry worldwide with special focus on hurdles for ayurvedic medicines in global markets. Regulatory challenges faced by manufacturers. **(04 Hrs)**
2. Utilization and production of phytoconstituents such as quinine, calcium sennosides, podophyllotoxin, diosgenin, solasodine, and tropane alkaloids. **(03 Hrs)**
3. Introduction, advantages, source & pharmacological activity of newer medicinal agents from marine sources. **(02 Hrs)**
4. Commonly grown spices of the region.
   Emphasis shall be given on cultivation collection, preservation, storage and export potential of spices. General industrial extraction methods / technology employed for following drugs –
   Capsicum, Ginger, Garlic, Curry leaf, Mustard, Pomegranate, sweet flag, Nutmeg, Tamarind & Turmeric. **(05 Hrs)**
5. Biodiversity and its conservation. In situ conservation of biodiversity. Threats to biodiversity. Endangered and endemic species of India, germ plasm conservation **(02 Hrs)**
6. Spectral approaches to natural products: Applications of UV, IR, NMR spectroscopy and Mass spectrometry in natural products. **(05 Hrs)**
7. Role of medicinal and aromatic plants in national economy. **(02 Hrs)**
8. Importance of Organic farming of medicinal plants in India **(02 Hrs)**

Recommended Books:

1. Agarwal SS, Paridhavi M, Herbal Drug Technology. Orient Longmann Pvt. Ltd, Hydrabad.
2. Trease GE and Evans WC, Pharmacognosy, Lea and Febiger, Philadelphia.
3. Wallis TE, Test Book of Pharmacognosy, J & A Churchill Limited, London.
4. Tyler VC, Bready lR and Robert JE, Pharmacognosy, Lea and Febiger, Philadelphia.
5. Manitto P, The Biosynthesis of Natural Products. Ellis Horwood Chichester.

6. Robbers JE, Speedle MB and Tyler VE, Pharmacognosy and Pharmacobiotechnology, Williams and Wilkins, Philadelphia.
7. Harbone JB, Phytochemical methods, Chapman and Hall, International Edition,London.
8. Kokate CK, Purohit AP and Gokhale SB. Pharmacognosy, Nirali Prakashan, Pune.
9. Clark, ECG, Isolation and Identification of Drugs, The Pharmaceutical Press, London.
10. Indian Herbal Pharmacopoeia, Indian drug manufacturers association,Mumbai.
11. Ansari SH, Essentials of Pharmacognosy. Birla publications Pvt Ltd.Delhi.
12. Ashutosh Kar, Pharmacognosy & Pharmaco biotechnology, New age International publishers, New Delhi.
13. Dewik, Medicinal Natural Products- A Biosynthetic Approach.
14. Stahl E, Thin layer chromatography – A Laboratory hand book, Springer Verlag, Berlin.
15. Rajpal V, Standardization of Botanicals, Vol- I & II.
16. Chatwal, Organic Chemistry of Natural Products, Vol- I & II.
17. Medicinal plants of India, Indian Council of Medical Research, New Delhi.

Course Content (Practical/Lab Work)

1) Determination of percentage of volatile oil in crude drug **(01)**
2) Isolation of some selected phytoconstituents. **(09)**
3) Estimation of some selected phytoconstituents. **(03)**

Recommended Books:

1. C.K.Kokate; Practical pharmacognosy; Vallabh prakashan;Delhi.
2. K.R. Khendelwal; practical pharmacognosy; Nirali prakashan, Pune.
3. V.D. Rangari; Pharmacognosy & Phytochemistry; Part II; First edition; Career publication; Nashik.

Swami Ramanand Teerth Marathwada University, Nanded

Fourth Year B. Pharmacy, VIIIth Semester

Subject : Molecular Spectroscopy
Subject Code/Paper No : BPH85
Credits : 03 (02T+01 Pr.)

Course content (Theory)

1. Course content (Theory)

1. UV-VISIBLE SPECTROSCOPY: - (06 hrs)

a. Introduction, UV-Visible radiation range, Principle, Absorption Maxima Beer and Lambert's law, Deviations from Beer's law

b. Theory: Electronic transitions, Absorption bands, Chromophore, Auxochrome, Red shift, Blue Shift, Hyperchromic and hypochromic shift, factors affecting on absorption band

c. Instrumentation: Basic components, Design and working of spectrophotometer, Single beam and Double beam Instrument

d. Applications: Qualitative analysis, Quantitative analysis, Structure elucidation

e. Problems based on absorptivity equation

2. INFRARED SPECTROSCOPY: - (05 hrs)

a. Introduction, IR Region, Principle, Vibrational Frequency, Hooke's Law

b. Theory: Vibrational –rotational spectroscopy, Molecular vibrations, Fundamental Band, Overtone, Factors affecting vibrational frequency

c. Instrumentation: Basic components, Design and working of spectrophotometer, Single beam and Double beam Instrument, Sampling of Solid, liquid and gases

d. Applications: Qualitative analysis, Structure elucidation

e. Introduction of FTIR, Advantages of FTIR over Dispersive IR

3. NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY: - (06 hrs)

a. Introduction, Magnetic and Non magnetic nuclei, Rules to find out nuclear spin Precessional motion and precessional frequency, Fundamental Principle of NMR, Excitation and relaxation of Magnetic nuclei

b. Theory: Equivalent and nonequivalent proton, Shielding and Deshielding effects, Chemical shift, Scale for measuring chemical shift, factor affecting chemical shift

Internal standard (TMS), NMR Solvents, Shift reagents

Peak Splitting, Spin-Spin coupling, Coupling Constant, Pascal triangle

c. PMR Spectra, their characteristic,

d. Instrumentation: Basic components, Design and working of spectrophotometer

e. Applications

4. MASS SPECTROMETRY: - (05 hrs)

a. Introduction, Basic principle of Mass Spectrometry

b. Instrumentation.

1) Sample handling system.

2) Ionization methods in Mass Spectrometry.

3) Mass Analyzers.

4) Ion collection system.

5) Vacuum system

c. Resolution

d. Type of Ions produced.

e. Fragmentation Patterns.

f. Mc-Lafferty rearrangement.

g. Mass Spectrum, Interpretation Rules

h. Application of Mass Spectrometry.

5**. Introduction of hyphenated techniques and its importance** (02 hrs)

GC-MS, LC-MS, LC-NMR

Course content (Practical/Lab work)

1. To study use, care and calibration of UV spectrophotometer.
2. Determination of absorption maxima for a given sample.
3. Verification of Beer's law.
4. Determination of λ_{max}, preparation of standard curve, determination of working range for any drug.
5. To study effect of pH on UV spectrum of any compound.
6. To study effect of solvent on UV spectrum of any compound.
7. Determination of isosbestic point.
8. Spectrophotometric estimation of drug from its formulation
9. Simultaneous estimation of compounds from their mixture by simultaneous equation method

10. Simultaneous estimation of compounds from their mixture by absorption ratio method
11. Simultaneous estimation of compounds from their mixture by absorption correction method
12. Simultaneous determination of dichromate & permanganate ions in the given solution by colorimetric measurement.
13. Determination of the dissociation constant of indicator using UV-visible spectrophotometer.
14. Determine stability constant of Ferric salicylate complex by colorimetric measurement.
15. Assay of dextrose injections by colorimeter.

Recommended Books:

Text Book:

1. Chatwal and Anand, Instrumental methods of chemical analysis, Himalaya publishing house

Reference Books:

1. A.H. Beckett and J.B. Stenlake, Practical Pharmaceutical Chemistry, Vol. I & II.
2. Willard and Meritt, Instrumental methods of Analysis, CBS Publication.
3. J.W.Munson, Pharmaceutical Analysis, Modern methods, Part A & B
4. G.W. Ewing, Instrumental methods of chemical Analysis, McGraw Hill International Edition.
5. Skoog, Principles of Instrumental Analysis, Saunders college publishing.
6. D.C. Harris, Exploring chemical Analysis, W.H. Freeman and Company.
7. Gary D. Christian, Analytical Chemistry, John Wiley and Sons. Inc.
8. P. parimoo, Pharmaceutical Analysis, CBS Publishing.
9. Robert de Levie, Principles of quantitative chemical Analysis McGraw Hill International Series.
10. K. A. Connors, A Text Book of Pharmaceutical Analysis, John Wiley & Sons.
11. S. W. Rajbhoj., Dr. T. K. Chondhekar., Systematic Experimental Physical Chemistry, Anjali Publication.
12. Indian Pharmacopoeia 1996 Ministry of Health Government of India.
13. British Pharmacopoeia.
14. Dyer J R, Application of Absorption Spectroscopy of organic compounds.
15. Nagavi B.G., Laboratory hand book of Instrumental Drug Analysis.
16. Journals related to pharmaceutical analysis.
17. Pharm Methods. 2010 Oct-Dec; 1(1): 2–13. Introduction to hyphenated techniques and their applications in pharmacy, Kalpesh N Patel, Jayvadan K Patel, Manish P Patel, Ganesh C Rajput, and Hitesh A Patel

Swami Ramanand Teerth Marathwada University, Nanded

Fourth Year B. Pharmacy, VIIIth Semester

Subject : Total Quality Management
Subject Code/Paper No : BPH86
Credits : 03 (3T)

Objective

A course on total quality management is aimed for understanding and application of managerial tools to plan for quality. It is also aimed to attain the quality, follow up, improvement, as well as organize and its development of work place.

In pharmaceutical companies (industrial) specialized departments like product development, process development, production, marketing etc. are in function. These departments are assigned a share of the responsibility of carrying out certain companywide functions, particularly here regarding the quality i.e. to make the pharmaceutical product fit for use, this quality function results in quality assurance among all stake holders, that the quality function is being effectively performed. The effectiveness of the performance of quality function is evidence needed to establish confidence among all concerned.

Course content (Theory)

1. **Introduction** **(4 Hrs.)**

   Quality concept, Need for quality, Evolution of quality, Contributions of Quality Gurus(Deming, Juran and Crosby), Definition of quality, Dimensions of manufacturing and service quality, Customer focus (Customer satisfaction, Customer orientation, Customer satisfaction, Customer complaints, Customer retention), Basic concepts of TQM, Approaches, scope and barriers to TQM,

2. **TQM Principles** **(4 Hrs.)**

   Leadership, Strategic quality planning, Quality statements, Human resource development and Management(Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal), Continuous process improvement (PDSA cycle, 5s, Kaizen), Supplier partnership (Partnering, Supplier selection, Supplier Rating), Interpersonal characteristics, Honest and ethics in quality..

3. **TQM Tools and Techniques** **(4 Hrs.)**

   The seven traditional tools of quality, New management tools, Quality circles, Quality Function Deployment (QFD), Quality Management System, Bench marking – Six-sigma: Concepts, methodology, applications to manufacturing, Life cycle Management, QbD approach in industry.

4. **Quality and Society** **(02 Hrs)**

   Consumerism, Govt. regulation of quality, product safety and product reliability

5. Quality Assurance (03 Hrs)

Historical development of QC & QA, Concept of Quality control and Quality Assurance, Quality Assurance and Quality Management in the Pharma industry, Functions & advantages of QC & QA, Organizational structure of QA, Customer requirement of Quality. Documenting the quality system–documentation control, the quality manual, writing quality procedures developing flow charts for production, packaging.

6. Quality Control In Pharmaceutical Industry (15 hrs)

a) Good manufacturing practices for premises and materials - General requirements as per schedule- M of drug and cosmetics rules, 1945.

b) Good Laboratory Practices

c) Brief study of specific requirements for manufacture of sterile products, SVP & LVP and Ophthalmic preparations.

d) Brief study regarding specific requirement for manufacture of oral solid dosage forms, oral liquids, topical products, metered dose inhalers (MDI).

e) Requirement of plant and equipments for manufacture of external preparations, oral liquids tablets, powders, capsules, surgical dressings, ophthalmic preparations peccaries and suppositories, inhalers, in repacking operations, parenterals.

f) General requirement of factory premises for manufacture of cosmetics, medical devices

g) GMP for ayurvedic, siddha and Unani medicines a general study.

h) In- process quality control on various dosage forms

7. Quality Audit (02 Hrs)

Aims and objectives of an audit, the audit process, corrective action and follow up, check list personnel. Importance of quality audit in loan license industries.

8. Quality Systems (02 Hrs)

ISO Quality System. FDA functions and responsibilities, Introduction to ICH guidelines.

Recommended Books:

1. J.M.Juran, Juran's Quality Control Hand Book, 4th Edition, McGraw Hill International Edition
2. M.L.Mehra, GMP, Good Manufacturing practice quality controls, guidelines basic standards in the manufacture of drug and pharmaceuticals, the University Book Agency, Allahabad.
3. Quality assurance of pharmaceuticals, volume 1, Universal publishing corporation, mumbai, WHO, Geneva.
4. P.P.Pharma, How to practice GMPs, 3rd edition, Vandana publications, Delhi.
5. Armand V, Feigenbaun, Total quality control, 3rd edition revised, McGraw – Hill International edition.
6. Sidney H. Willig and James R. Stoker, Good manufacturing practices for Pharmaceuticals, A Plan for Total quality control forth edition, Marcel Dekker, Inc New York.
7. Elizabeth Prichard, quality in the analytical chemistry laboratory, John Wiley and sons.
8. P.P.Sharma, How to practice GLP, good laboratory practice, Vandana publications.
9. Jurg P. Seiler, Good Laboratory pracitce, springer, Berlin.

10. J.M. Juran, and Frank M. Gryna, Quality planning and analyusis, third edition, tata Mcgraw – Hill edition.
11. Vijay Mallik, Drugs & cosmetic Act,1940 together with Rules, 1945 Eastern Book Company, 6th Edition.
12. Drugs & Cosmetics Act 1940 and rules there under.
13. Quality assurance and quality management in pharmaceutical industry by Y.Anjaneyulu and Marayya.
14. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 6th Edition, South-Western (Thomson Learning), 2005.
15. Oakland, J.S., "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, 3rd Edition, 200UNIT III.
16. Suganthi,L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd.,2006.
17. Janakiraman, B and Gopal, R.K, "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.
18. Dale H.Besterfiled, et at., "Total Quality Management", Pearson Education Asia, 3rd Edition, Indian Reprint (2006).

Swami Ramanand Teerth Marathwada University, Nanded

Fourth Year B. Pharmacy, VIIIth Semester

Subject : Clinical Pharmacy & Drug Interaction
Subject Code/Paper No : BPH87
Credits : 03 (03T)

The Course & Objective

The Course is designed to incorporate areas of Clinical Pharmacology and Clinical Pharmacy. The therapeutics and rational use of medicine is now a day a part of multidisciplinary process involving pharmacists, clinicians and nurses. The course is also aimed at introduction of functions necessary to discharge a set of social responsibility related to therapeutic drug use. The concept of 'Patient Oriented' in addition to 'Product Oriented' approach is envisaged. The course content is designed to achieve learning goals as-

- To understand and develop rational and critical attitude to drug therapy.
- To understand history of patient, this is important in deciding dosage regime.
- To know concept of essential drug and rational use of drug.
- To understand individualization and optimization of drug dosing regimens.
- To seek a place in health care team as a Clinical Pharmacists.
- To probe possibilities of clinical pharmacist as a professional.
- To understand importance of drug information system and services.

Course Content (Theory)

1. **Introduction:** (**03 Hrs)**
   Clinical pharmacy, duties and activities of a clinical pharmacist in hospital, monitoring of pharmacotherapy (patient chart review, medication counselling, clinical output review), ward round participation, patient relevant history (diseases and medication), prescriptions, drug prescribing guidelines; Clinical pharmacy, National and International perspective
2. **Patient compliances and counselling: (05 Hrs)**
   a. Methods of assessments of compliances, strategies for improving compliances.
   b. Precautions and directions for medications and administration instructions.
   c. Monitoring of drugs, patients, medication efficacy and safety, adverse effects.
3. **Rational drug use and the essential drug concept: (04 Hrs)**
   Importance of rational drug use, problems associated with drug use in India, pharmacists' role in promoting rational drug use, general guidelines for rational prescribing of important medications.
4. **Adverse drug reactions: (03 Hrs)**
   Epidemiology, Classification, Risk factors, Monitoring and detecting adverse drug Reaction Assessing Causality using WHO scale and Reporting adverse drug reactions, Role of pharmacist in management of ADR.

5. **Drug Interactions: (04 Hrs)**
    a. Types and mechanism of drug interaction.
    b. Understanding and identification of drug interaction.
    c. Potential drug interactions with clinical significance.
    d. Role of pharmacists in management of drug interaction.

6. **Dosage regimens and intravenous admixtures: (04 Hrs)**
    a. Dosage adjustment according to age and weight.
    b. Optimization of drug therapy, concept of Missed dose and multiple dosage regimens.
    c. Optimization of drug therapy in disease state like renal and hepatic dysfunctioning and cardiovascular disorder.
    d. Management of intravenous drug administration.
7. **Drug therapy during pregnancy, lactation and labour. (02 Hrs)**
8. **Heavy Metal and Drug Poisoning, over dose and antidotes. (04 Hrs)**
    a. General methods for the treatment of poisoning
    b. Symptoms and management of heavy metal poisoning
    (Lead, mercury, copper, arsenic and iron) and
    Drugs (morphine and their derivatives, salicylate, barbiturates, benzodiazepines, organophosphates and alcohols)
9. **Investigational drugs, clinical research and clinical trial: (04 Hrs)**
    Designs of clinical trials, Good clinical practices (ICH & GCP guideline for safety and efficacy), Institutional Ethical Committee and its function; various phases of clinical trials, introduction to monitoring and auditing of clinical trials; Role of pharmacists in development of new drug and in preclinical and clinical studies
10. **Pharmacoeconomics & Pharmacoepidemiology: (02 Hrs)**
    Definition and scope, methods & systems of monitoring drug effects
11. **Drug Information System & services (01 Hrs)**

Recommended Books:

1. Text book of Clinical Pharmacy by Tipnis
2. Text Book of Clinical Pharmacy by Lassan.
3. Roger Walker & Clive Edwards: Clinical Pharmacy & Therapeutics by Clive Edwards.
4. Text Book of Pharmacotherapeutics by Joseph T Dipiro.
5. Text book of Pharmacotherapeutics by Herfindal.
6. Text book of Biopharmaceutics and Clinical Pharmacokinetics by Brahmankar.
7. Remington: The Sciences and Practices of Pharmacy
8. Text Book of Hospital Pharmacy by William E Hassan. Lea & Febiger, Philadelphia.
9. Text book of Hospital Pharmacy by S.H. Merchant & Dr. J S Quadry.
10. J.G. Wagner – Fundamentals of Clinical Pharmacokinetics, Drug Intelligence Publications, Hamilton, PA, USA.