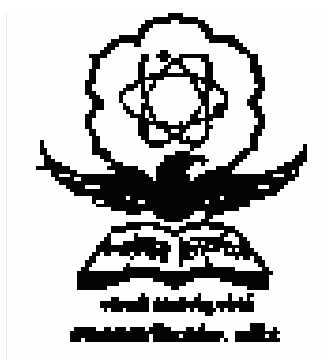


SWAMI RAMANAND TEERTH MARATHWADA
UNIVERSITY, VISHNUPURI,
NANDED



SYLLABUS OF
FOURTH YEAR B. PHARM (REVISED)
w.e.f.– 2004-2005

Swami Ramanand Teerth Marathwada University, Nanded
Teaching and Examination Scheme
Final Year B.Pharm. (Revised)

CLASS : B.PHARM IVTH YEAR

SR. NO.	SUBJECT	TOTAL TH HRS.	TH HRS./ WEEK	TOTAL PRAC. HRS.	PRAC. HRS./W /BATCH	THEORY EXAMINATION			PRACTICAL EXAMINATION		
						TH HRS.	MARKS	INT. MARKS	PR HRS.	MARKS	INT. MARKS
01	MODERN PHARMACEUTICS & COSMETICOLOGY	75	03	75	03	03	80	20	04	80	20
02	BIO-PHARMACEUTICS & PHARMACOKINETICS	50	02	75	03	03	80	20	04	80	20
03	MEDICINAL CHEMISTRY-II	50	02	75	03	03	80	20	04	80	20
04	PHARMACOGNOSY AND PHYTOCHEMISTRY (CHEMISTRY OF NATURAL PRODUCTS)	50	02	75	03	03	80	20	04	80	20
05	TECHNICS IN PHARMACEUTICAL ANALYSIS-III	50	02	75	03	03	80	20	04	80	20
06	PHARMACOLOGY-III (CLINICAL PHARMACY)	50	02	--	--	03	80	20	--	--	--
07	TOTAL QUALITY MANAGEMENT	50	02	--	--	03	80	20	--	--	--
08	ENTERPRENERSHIP SKILL- IV (PHARMACEUTICAL MANAGEMENT)	50	02	--	--	03	80	20	--	--	--
09	RESEARCH METHODOLOGY* (LIBRARY ASSIGNMENT)	25	01**	--	02***	--	--	--	--	--	--
	TOTAL	450	18	375	17	--	--	--	--	--	--

* Internal assessment

** The students are expected to have 1 hr / week contact with the mentor to discuss about the progress of the assignment.

*** Students are expected to spend at least 2 hrs / week, in library referring or for experimentation under supervision of the mentor, as the case may be.

4.1 MODERN PHARMACEUTICS & COSMETICOLOGY

THEORY

(75 Hours)

(03 Hours / week)

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 & liposomes, micro-encapsulation, resealed erythrocyte, etc.

The second part is dealing 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. Allergy in various cosmetics, art of making up cosmetic are also emphasized.

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.
5. To develop a cosmetic formulation.
6. To get acquainted with Industrial processes included in cosmetic formulation.

SCOPE:

MODERN PHARMACEUTICS

1. **Introduction:** (04 hrs)
Basic concepts (bioavailability, drug absorption, physico-chemical properties of drug influencing absorption), commercial importance, classification, mechanism, advantages and disadvantages.
2. **Sustained release dosage forms –** (05 hrs)
Theory, zero order release, 1st order release, design, formulation, product evaluation and testing encapsulated slow release granules, tableted slow release, granules, matrix tablet, controlled release technology.

3. **Aerosols -** (08 hrs)
Definition, propellants, general formulation, containers, selection of components, manufacturing and packaging methods, pharmaceutical applications, evaluation.
4. **Implants and inserts.** (05 hrs)
Introduction, 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 glycolide polymers, poly anhydride, poly caprolactones, poly-orthoesters, poly phosphasenes , pseudo poly amino acids, natural polymers.
5. **Trans-dermal drug delivery system -** (08 hrs)
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 and production: Membrane permeation, Adhesive dispersion, Matrix diffusion-controlled system,
6. **Ocular drug delivery system -** (05 hrs)
Introduction, role of polymers in drug delivery, muco-adhesives, ophthalmic inserts, nanoparticles, liposomes, prodrugs, penetration enhancer, iontophoresis.
7. **Carrier mediated drug delivery systems.**
 - a. Liposomes: (03 hrs)
Introduction, components, preparations, purification, characterization, chemical properties, stability, application.
 - b. Neosomes: (03 hrs)
Introduction, method of preparation, evaluation, characterization & application.
 - c. Resealed erythrocytes: (04 hrs)
Introduction, erythrocyte carrier, advantages and limitation, encapsulation, entrapment methods, Lysis, characterization, route of administration, stability, storage, transport in erythrocyte, release characteristic of loaded drugs, application.
 - d. Micro encapsulation – (05 hrs)
Introduction, Techniques of micro encapsulation, characterization and application.

COSMETICOLOGY:

1. Scope of cosmetics, historical development, status & structure of cosmetic industry (02 hrs)
2. Physiological consideration: physiology of skin & appendages, physiological & pharmaceutical aspects of sweating. (03 hrs)
3. Raw materials used in cosmetic: surfactants, oils, waxes, gums, hydrophilic colloids, dyes, powders, colors, flavors, propellants, solvents humectants, protective agents, bleaching agents, stabilizers antioxidants, preservatives and other ancillary materials. (03 hrs)

4. Study of cosmetics, (formulation and manufacturing). (09 hrs)
 Skin cream—Cleansing, cold cream, vanishing cream, formulation, all purpose hand cream & nutritive cream.
 Deodorants and antiperspirants.
 Shampoos, anti dandruff preparations, hair colorants, hair settings, lotion, depilators.
 Colored make up preparations: lipsticks, mascara, eye shadows eye liner.
 Nail polishes and cuticle remover.
 Shaving preparations.
5. Standards of cosmetic ingredients & quality control of finished products mentioned above. (03 hrs)
6. Microbiological contamination in cosmetics and its stability. (03 hrs)
7. Regulatory control - brief account. (02 hrs)

BOOKS RECOMMENDED

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.

4.1 MODERN PHARMACEUTICS & COSMETICOLOGY

PRACTICAL

(75 Hours)

(03 Hours / week)

1. Preparation of micro capsule by co- acervation phase separation method. (02 prs)
2. Preparation of micro capsule by Spray congealing method. (01pr)
3. Preparation and evaluation of transdermal patch. (02 prs)
4. Design, development and evaluation of controlled release formulation. (02 prs)
5. Design, development and evaluation of sustained release formulation (02 prs)
6. Preparation and evaluation of implants. (02 prs)
7. Formulation and evaluation of various types of cosmetics for Skin
Calamine lotion, cold cream, vanishing cream, Sunscreen lotion. (04 prs)
8. Formulation and evaluation of various types of cosmetics for Hair,
Shampoo, shaving cream, (02 prs)
9. Formulation and evaluation of various types of cosmetics for Nails
Nail paint, Nail paint remover. (02 prs)
10. Formulation & evaluation of various types of cosmetics for personal hygiene.
Deodorants and antiperspirants (02 prs)
11. Formulation and evaluation of various types of cosmetics for colored makeup
Preparation.
Lipsticks, mascara, eye shadows, eye liner. (04 prs)

4.2 BIOPHARMACEUTICS AND PHARMACOKINETICS

THEORY

(50 Hours)

(02 Hours / week)

OBJECTIVE

The course is aimed at unfolding fundamental concepts involved in the study of relationship between nature and intensity of biological effects observed due to simple chemical modification of drug, modified factors influencing drug availability, presence or absence of adjuvants, the type of DDS administered and the processes of manufacture. Further it also helps prospective clinical pharmacist to begin learning pharmacokinetic techniques for further applications in clinical situations.

LEARNING GOALS:

1. To strengthen fundamentals of graphing techniques and linear correlation and kinetics.
2. Concepts involved in ADME.
3. Mechanism of drug absorption and factors influencing it.
4. The term bioavailability and its determination and application, bioequivalence.
5. Compartment modeling to simulate rate processes of ADME.
6. Applications of principles of pharmacokinetics.
7. Practice problem solved.

SCOPE:

1. Introduction to Biopharmaceutics and pharmacokinetics & their role in formulation development and clinical setting. (02 hrs)
2. Absorption of drug : G.I. Absorption of drugs, cell membrane-structure and physiology, mechanism of drug absorption, factors influencing drug absorption and bioavailability- physico chemical factors, dosage form related factors, patient related factors, absorption of drugs from non per os extra vascular routes. (05 hrs)
3. Distribution of drugs: tissue permeability of drugs, factors affecting drug distribution, volume of distribution. (03 hrs)
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 P.D.binding. (04 hrs)
5. Biotransformation of drugs: drug metabolizing organs and enzymes, chemical pathways of drug metabolism, factors affecting biotransformation. (03 hrs)
6. Pro-drugs: applications of pro-drug design, limitation of pro-drug design. (03 hrs)
7. Excretion of drugs: renal excretion, non-renal routes of drug excretion, factors affecting renal excretion of drug. (04 hrs)

8. Pharmacokinetics drug interactions: mechanism. (02 hrs)
9. Pharmacokinetics: basic considerations, plasma drug concentration time profile, rates, rate constants and orders of reaction, pharmacokinetics models. (03 hrs)
10. Compartment modeling: one compartment open model I.V. Bolus administration, I.V. Infusion, extra vascular administration, multi compartment models, urinary excretion data. (08 hrs)
11. Non-linear pharmacokinetics : causes of nonlinearity, michaelis menten equation, estimation of k_m and v_{max} . (04 hrs)
12. Bioavailability and bioequivalence : objectives and measurement of bioavailability, invitro drug dissolution, invitro-in vivo correlation, bioequivalence studies, methods for enhancement of bioavailability. (06 hrs)
13. Applications of pharmacokinetics principles : design of dosage regimens, individualization, monitoring drug therapy. (03 hrs)

TEXT BOOK:

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

REFERENCE BOOKS :

1. Introduction to Biopharmaceutics - by Milo Gibaldi (Lea & Febiger, Philadelphia, 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 dekker inc. 2nd edition.
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.

4.2 BIOPHARMACEUTICS AND PHARMACOKINETICS

PRACTICAL

(75 Hours)

(03 Hours / week)

1. To compare invitro acid neutralization capacity of different marketed antacid preparations.
2. To study drug-drug interactions. - (02 prs)
3. To study drug food interactions. - (02 prs)
4. To study different methods of enhancing bioavailability.- (03 prs)
5. To study the effect of pharmaceutical factors on invitro drug release. (04 prs)
6. To study invitro drug release from marketed tablet dosage form. – (02 prs)
7. To study the effect of protein drug binding on drug availability invitro.
8. Influence of vehicle on drug release from topical dosage form invitro.
9. Bioavailability of aspirin from different dosage form in man.
10. Bioequivalence study of aspirin.
11. Urinary excretion study of Paracetamol.
12. Salivary excretion study of Paracetamol.
13. Bioequivalence study of Paracetamol.
14. Experiments designed for the estimation of various pharmacokinetic parameters with given data. (software base exercises wherever possible) (Practice problems –05)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
Fourth Year B.Pharm. (Revised)
4.3 MEDICINAL CHEMISTRY II
THEORY
(50 Hours)
(02HRS/Week)

“Medicinal chemistry is a branch of chemistry also involving aspects of biological, medical and pharmaceutical sciences. It is concerned with the invention, discovery, design, identification and preparation of biologically active compounds, the interpretation of their mode of interaction at the molecular level, the construction of their structure-activity relationships, and study of their metabolism.”

Objective:

The course in medicinal chemistry – II at final year is aimed at study of select class of therapeutic agents not covered at third year level including SAR's and synthesis.

Learning goals:

For each therapeutics class described in the course, student will have knowledge of –

1. General structural features of agents belonging to the therapeutic class.
2. Relevant physico-chemical properties.
3. Relevant chemical reactions.
4. Structural and chemical influences on mechanism of action and activity.
5. Biodisposition (Metabolism) of therapeutic agents.
6. Approaches to synthesize therapeutic agents.

Scope:

Definition, classification, generic names, IUPAC names, mechanism of action (up to the level of resulting therapeutic action), structure activity relationship including physicochemical properties, uses, synthetic procedures of mentioned drugs of the following classes.

- 1) Drugs acting on CNS (10-12 hrs)
 - a) CNS stimulants: Amphetamine, Nikethamide, Caffiene.
 - b) CNS depressant.
 - i) Anaesthetics: General and local
Ketamine, Lignocaine, Dibucaine, Procaine, Benzocaine
 - ii) Sedative Hypnotics: Propafol, Ethionamide, Phenobarbitone, Pentobarbitone, Thiopental, Diazepam
 - iii) Anticonvulsants: Phenytoin, Carbamazepine, Sodium valproate
 - iv) Antipsychotic, Antidepressants, Anxiolytics: Chlorpromazine, Haloperidol, Chlordiazepoxide, Meprobamate, Imipramine

- 2) Drugs acting on cardiovascular system (10-12 hrs)**
- i) Cardiotonic: cardiac glycosides
 - ii) Antianginal and vasodilators : Organic nitrates, ISDN, Nifedipine
 - iii) Antiarrhythmic agents Quindine, Mexilitene, Verapamil.
 - iv) Antihypertensive agents Propranolol, Minoxidel, Hydralazine.
 - v) Coagulants and anticoagulants: Heparin, Dicoumarol.
- 3) Drugs acting on Hormones and their receptors (10-12 hrs)**
- i) Insulin and synthetic hypoglycemic agents: Chlorpropamide, Phenformin, Tolbutamide
 - ii) Steroids:
 Adrenocorticoids: Prednisolone, Triamcinolone, Betamethasone, Dexamethasone
 Sex Hormones: Testosterone, Progesterone, Methyl testosterone
 Oral contraceptives: Estradiol, Mestranol, Lynestrenol
 - iii) Prostaglandins, Thromboxanes, Eicosanoids and non-steroidal anti-inflammatory agents: Aspirin, Paracetamol, Ibuprofen, Piroxicam, Diclofenac
- 4) Drugs acting on neurotransmitters and their receptors (08 hrs)**
- i) Cholinergic and anticholinergic agents: Introduction to neurotransmitters, cholinergic receptors and their structural features, Biosynthesis and metabolism of Ach, Atropine
 - ii) Adrenergic and anti adrenergic agents: Introduction to receptors and their structural features, Biosynthesis, release and metabolism of NA, Methyldopa, Propranolol
 - iii) Histamine and Antihistamines (H1 and H2 antagonists): Structural features of histamine and receptors, H1, H2 and proton pump blockers, Chlorpheniramine, Diphenhydramine, Prolodine, Omeprazole
- 5) Narcotic analgesics: Morphine, Meperidine, Methadone, Pentazocine (03-05 hrs)**
- 6) Diuretics: Acetazolamide, Furosemide, Hydrochlorthiazide (03- 05 hrs)**

RECOMMENDED BOOKS TEXT BOOK

W C Foye, Principles of Medicinal Chemistry, Lea and Febiger

REFERENCE BOOKS

1. Wilson & Gisvold's Text book of Organic, Medicinal & P'Ceutical Chemistry, Lippincott
2. M E Wolff, Burgers Medicinal Chemistry Vol I to V, John Wiley and 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 Approach)
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.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
 Fourth Year B.Pharm. (Revised)
4.3 MEDICINAL CHEMISTRY II
PRACTICAL
 (75 Hours)
 (03HRS/Week)

1. Synthesis of phenytoin (02 Prs)
 - i. Synthesis of benzil from benzoin.
 - ii. Synthesis of Phenytoin from benzil.
2. Synthesis of benzocaine (03 Prs)
 - i. Synthesis of p-nitrobenzoic acid (P.NBA) from P-nitro toluene (P.NT)
 - ii. Synthesis of P-amino benzoic acid (P-ABA) from P-nitrobenzoic acid (P-NBA)
 - iii. Synthesis of Benzocaine from P-Aminobenzoic acid (P-ABA)
3. Synthesis of phenacetin (02 Prs)
 - i. Synthesis of P-acetyl amino phenol from P-amino phenol
 - ii. Synthesis of phenacetin from P-acetyl aminophenol.
4. Synthesis of Antipyrine (02 Prs)
 - i. Synthesis of 3-methyl-1-phenyl 3-pyrazolone
 - ii. Synthesis of 2,3-dimethyl-1-phenyl pyrazolone (antipyrine or phenazone) from 3-methyl-1-phenyl-5-pyrazolone.
5. Synthesis of Eosin (02 Prs)
 - i. Synthesis of fluorescein from phthalic anhydride.
 - ii. Synthesis of Eosin from fluorescein
6. Synthesis of Aspirin from salicylic acid. (01 Pr)
7. Synthesis of methyl red from anthranilic acid. (01 Pr)
8. Synthesis of B-dimethyl amino propiophenone HCL from dimethyl amine hydrochloride. (01 Pr)
9. Synthesis of O-chlorobenzoic acid from anthranilic acid (Sand mayer reaction) (01 Pr)
10. Synthesis of Benzanilide from Benzophenone. (02 Prs)
 - i. Synthesis of benzophenone oxime from Benzophenone.
 - ii. Synthesis of Benzophenone oxime.
11. Synthesis of 1, 2, 3, 4 – tetrahydrocarbazole. (01 Pr)

12. Practicals based on public domain and licensed software (07 Prs)
(Students shall be exposed to handling and practice of various chemistry related softwares, utility and limitations of softwares used, knowledge of some currently available and used softwares in market.)
- i Sketching the molecule
 - ii Beautifying the molecule.
 - iii Energy minimization of the molecule.
 - iv. Calculating the different physicochemical parameters of the molecule.

REFERENCE:

- 1. Vogel A.I. , Text Book of Practical Organic Chemistry , ELBS.
- 2. Raj K. Bansal , Manual of Organic Chemistry, John & Wiley.
- 3. Vogel, Elementary practical organic chemistry, small scale preparation part I, CBS.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
Fourth Year B. PHARM. (REVISED)
4.4 PHARMACOGNOSY AND PHYTOCHEMISTRY
(CHEMISTRY OF NATURAL PRODUCTS)
THEORY
(50 HOURS)
(02 HOURS / WEEK)

OBJECTIVE:-

“The Objective of the course is to study medicinally important plants & marine drugs scientifically along with chemistry & biosynthesis of different phytoconstituents obtained from crude drugs. The course also envisages the biotechnological techniques for obtaining and improving the quality of natural products.”

LEARNING GOALS:

After completion of the course the candidate shall be able to –

1. Isolate various phytoconstituents from herbs.
2. Formulate and standardize various herbal products.
3. Use the latest techniques for search of new compounds from natural sources.
4. Know the industrial requirements for quality control of herbs.
5. Know the techniques for improving the quality of medicinal plants.

SCOPE

1. ALKALOIDS

(18 hrs)

A) Study Of Crude Drugs Containing Alkaloids

Systematic study of source, cultivation, collection, processing, commercial varieties, chemical constituents, substitutes, adulterants, uses, diagnostic macroscopic and microscopic features and specific chemical tests for following categories alkaloids containing drugs.

- a) Pyridine – Piperidine – Tobacco, Areca and Lobelia.
- b) Tropane – Belladonna, Hyoscyamus, Datura Duboisia, Coca and Withania.
- c) Quinoline and isoquinoline: Cinchona, Ipecac, Opium.
- d) Indole: Ergot, Rauwolfia, Catharanthus, Nux-vomica and Physostigma.
- e) Imidazole – Pilocarpus.
- f) Steroidal : Veratrum and Kurchi.
- g) Alkaloidal amine – Ephedra and colchicum.
- h) Glycoalkaloid – Solanum
- i) Purines – Coffee, tea and cola.

B) Chemistry:

Biogenesis and pharmacogological ativity of atropine and related compounds. quinine, morphine, papaverine, ephedrine, ergot and vinca alkaloids.

- 2) **Marine pharmacognosy,** (02 hrs)
Definition, Advantages, Source & Pharmacological Activity of newer medicinal agents from marine sources.
- 3) **TERPENOIDS:** (08 hrs)
Definition, classification, chemistry, biogenesis and pharmacological activity of medicinally important
a) Monoterpenes: Citral, Carvone.
b) Sesquiterpenes: Zinziberane, Farnesol.
c) Diterpenes: Abietic acid
d) Triterpenoids: Squalene
- 4) **GLYCOSIDES:** (03 hrs)
Chemistry and biosynthesis of digitoxin, digoxin, sennosides, and diosgenin
- 5) **Carotenoids :** (03 hrs)
Definition, Isolation, functions and chemistry of important carotenoids.
Alpha carotenoids, Beta Carotenes, vitamin- A, Xanthophylls of medicinal importance.
- 6) **PLANT TISSUE CULTURE TECHNIQUE:** (05 hrs)
Historical development of plant tissue culture, types of cultures, nutritional requirement, growth and their maintenance. Application of plant tissue culture in pharmacognosy.
- 7) A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India Utilization and production of phytoconstituents such as quinine, calcium sennosides, podophyllotoxin, diosgenin, solasodine, and tropane alkaloids. (02 hrs)
- 8) Utilization of aromatic plants and derived products with special reference to sandalwood oil, mentha oil, lemon grass oil, vetiver oil, geranium oil, and eucalyptus oil. (02 hrs)
- 9) **Herbal cosmetics.** (02 hrs)
- 10) **Spices:** (05 hrs)
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,

TEXT BOOK

Trease and Evans: Pharmacognosy: ELBS,London;

REFERENCE BOOKS:-

1. Text book of Pharmacognosy by T.E. Wails
2. Pharmacognosy by V.E.Tylor, L.R.Brady and J.E.Robbers
3. Cultivation and Utilization of Aromatic Plants by Atal & Kapoor
4. Cultivation and Utilization of Medicinal Plants by Atal & Kapoor
5. Powdered Vegetable Drugs by B.P. Jackson & D.W. Snewden
6. V.D. Rangari; Pharmacognosy & Phytochemistry; Part I&II; First edition; Career publication; Nashik.
7. C.K. Kokate; S.B.Gokhale; A.P. Purohit, pharmacognosy; Nirali Prakashan, 22nd edition, Pune.
8. Spice India Monthly Journal, Spices Board of India Cochin.

4.4 PHARMACOGNOSY AND PHYTOCHEMISTRY

(Chemistry Of Natural Products)

PRACTICAL

(75 HOURS)

(03 HOURS / WEEK)

1. Isolation of some selected phytoconstituents studied in theory. (10 prs)
2. Study of Histological characteristics of drugs in entire & powder form mentioned in theory. (10 prs)
3. Extraction of volatile oil from crude drugs. (03 prs)
4. Bioproduction of phytoconstituents using tissue culture technique including callus formation. (02 prs)

TEXT BOOK:-

1.C.K.Kokate; Practical pharmacognosy; Vallabh prakashan;Delhi.

Reference Book:-

- 1.K.R. Khendelwal; practical pharmacognosy; Nirali prakashan, Pune.
2. V.D. Rangari; Pharmacognosy & Phytochemistry; Part II; First edition; Career publication; Nashik.
- 3.M.A.. Iyenger; Pharmacognosy of powdered crude drugs; Manipal.

4.5 TECHNIQUES IN PHARMACEUTICAL ANALYSIS –III

THEORY

(50 Hours)

(02 Hours / week)

OBJECTIVE

The objective of the course is to further skills of pharmaceutical analysis by studying various principles involved in instrumental methods of chemical analysis, interpreting the data of spectroscopic analysis including atomic absorption & emission spectroscopy, X-Ray diffraction, mass spectrometry and chromatography & their applications. After completion of this course student will be able to do validation of instruments, trouble shooting in operations related to analytical instruments, interpretation of results obtained from data or spectra, designing of appropriate analytical method for newer or known drug or drug material.

LEARNING GOALS

- To understand the principle underlying techniques of instrumentation.
- To practice the operation of instrument.
- To know how interpretation of data is made.
- To know how results are analyzed.
- To know how designing of analytical method is made.
- Importance of precision and accuracy in instrumentation.
- To follow good laboratory practice.

SCOPE

1. UV-VISIBLE SPECTROSCOPY: -

(06 hrs)

- I. Brief review of electromagnetic spectrum.
- II. UV-visual range.
- III. Wavelength and colour relationship.
- IV. Beer and Lambert's law, application and reasons for deviation from Beer's law.
- v. Theory of UV Spectroscopy.
- VI. Effect of solvent on absorption spectra.
- VII. Instrumentation of single beam and double beam spectrophotometer.
- VIII. Application of UV Spectroscopy.

2. INFRARED SPECTROSCOPY: -

(05 hrs)

- i. Theory
- ii. Factors influencing vibrational frequency.
- iii. Qualitative interpretation of IR.
- iv. Introduction to FT-IR.
- v. Instrumentation.
- vi. Sampling of solids, liquids and gases.
- vii. Applications.

- 3. ATOMIC ABSOROTION SPECTROSCOPY: -** (02 hrs)
- i. Principle
 - ii. Instrumentation
 - iii. Applications.
- 4. EMISSION SPECTROSCOPY: -** (02 hrs)
- i. Theory.
 - ii. Instrumentation.
 - iii. Applications.
- 5. X-RAY DIFFRACTION: -** (02 hrs)
- i. Generation of X-rays.
 - ii. X-ray diffraction.
 - iii. Bragg's law.
 - iv. Instrumentation.
 - v. Applications.
- 6. NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY: -** (07 hrs)
- i. Magnetic and Non magnetic nuclei.
 - ii. Rules to find out nuclear spin.
 - iii. Effect of external magnetic field.
 - iv. ProceSSIONal motion and precessional frequency.
 - v. Energy transition
 - vi. Fundamental Principle of NMR.
 - vii. Chemical shift and factor affecting chemical shift.
 - viii. Shift Reagents.
 - ix. Reference Standards.
 - x. PMR Spectra, their characteristic, presentation terms used in describing spectra .
 - xi. Shielding and Deshielding effects.
 - xii. Spin-Spin coupling.
 - xiii. Instrumentation in brief.
 - xiv. Applications.
- 7. MASS SPECTROMETRY: -** (06 hrs)
- i. Basic principle of Mass Spectrometry.
 - ii. Instrumentation.
 - a. Sample handling system.
 - b. Ionization methods in Mass Spectrometry.
 - c. Mass Analyzers.
 - d. Ion collection system.
 - e. Vacuum system
 - iii. Resolution
 - iv. Type of Ions produced.
 - v. Fragmentation Patterns.
 - vi. Mc-Lafferty rearrangement.
 - vii. Application of Mass Spectrometry.

8. CHROMATOGRAPHIC TECHNIQUE: -

(20 hrs)

- i. Theory of Chromatography.
- ii. Classification.
- iii. Separation Technique.
- iv. Choice of method.
- v. Column Chromatography: Adsorption Column Chromatography, Operational Technique, Elution Procedure, Factors Affecting Column Efficiency and Applications.
- vi. Thin Layer Chromatography: Principle, Technique, R_f values.
- vii. Paper Chromatography: Types of paper Chromatography, Operational Technique, Quantitative Analysis and development Techniques.
- viii. Ion-exchange Chromatography: Ion Exchange materials, Synthetic ion exchange resins, Physical properties of ion exchange resins, mechanism of ion exchange process, Operational Technique & Applications.
- ix. Gel Chromatography: Introduction, Mechanism, and Technique.
- x. High Performance Liquid Chromatography: Introduction, Instrumentation, & Applications.
- xi. High Performance Thin Layer Chromatography: Introduction, Instrumentation, & Applications.
- xii. Gas Chromatography: Introduction, Technique of Gas Chromatography, Instrumentation & applications.
- xiii. Programmed Temperature Gas Chromatography: Introduction, Instrumentation, & Applications.

RECOMMENDED BOOKS: -

TEXT BOOK:

Chatwal & Anand, Instrumental methods of chemical analysis, Himalaya publishing house. 5th Enlarged edition.

REFERENCE BOOKS:

- 1) Vogel's, Text Book of Quantitative Chemical Analysis, 5th edition, By J. Mendham, R.C. Denney.
- 2) A.H.Beckett and J.B. Stenlake, Practical Pharmaceutical Chemistry, Vol. I & II.
- 3) Willard and Meritt, Instrumental methods of analysis, CBS Publication.
- 4) J.W.Munson, Pharmaceutical Analysis, Modern Methods, Part A & B.
- 5) G.W.Ewing, Instrumental methods of chemical analysis, McGraw Hill International edition.
- 6) Skoog, Principles of Instrumental Analysis, Saunders college publishing.
- 7) D.C.Harris, Exploring Chemical Analysis, W.H. Freeman and Company.
- 8) Gary D. Christian, Analytical Chemistry, John Wiley and sons. Inc.
- 9) P. Parimoo, Pharmaceutical Analysis, CBS Publication.
- 10) Robert de Levie, Principle of qualitative chemical analysis, McGraw Hill International series.
- 11) William Kemp, Organic Spectroscopy, 3rd edition Makwillan Pren Ltd., London.
- 12) Roger E. Schirmer, Modern method of Analysis Vol. I & II, published by CRCP pren Inc. Boca Raton, Florida.
- 13) Silverstein- Spectroscopic Identification of organic compounds 5th edition.
- 14) Higuchi & Hanseen E.B., Text Book. of Pharmaceutical Analysis (Inter science).
- 15) Indian Pharmacopoeia 1996 Ministry of Health Government of India.
- 16) Dr.A.V.Kasture & Dr.S.G.Wadodokar.-Pharmaceutical Analysis – Vol.-II By- Nirali Prakashan Pune.

4.5 TECHNIQUES IN PHARMACEUTICAL ANALYSIS –III
PRACTICALS

(75 Hours)

(03 Hours / week)

1. Validation of single pan electrical balance and pH meter.
2. Validation of spectrophotometer.
3. Determination of absorption maxima for a given sample solution.
4. Verification of Beer's law by Colorimetric Measurements.
5. Determination of the dissociation constant of indicator using UV-visible spectrophotometer.
6. Determine stability constant of Ferric salicylate complex by colorimetric measurement.
7. Assay of dextrose injections by colorimeter.
8. Simultaneous determination of dichromate & permanganate ions in the given solution by colorimetric measurement.
9. Determination of λ_{\max} , preparation of standard curve, determination of working range for Ibuprofen or any other drug.
10. To study effect of pH and solvent on UV spectrum of certain drugs.
11. Determination of isosbestic point of Phenol red.
12. Spectrophotometric estimation of Ibuprofen bulk drug & its tablet formulation
13. Simultaneous estimation of Paracetamol & Ibuprofen.
14. Simultaneous estimation of Rifampicin & Isoniazid.
15. Separation of a mixture of Methylene blue and Fluorescein on an alumina column.
16. Separation of mixture of ortho and para-nitro aniline on an alumina column
17. Separation and identification of sugar by TLC
18. Separation and identification of Amino acid by paper chromatography.
19. To determine the conc. of salt solution by ion-exchange chromatography.
20. Preparation of free acid or base from the salt of an organic acid or base by ion-exchange chromatography.
21. Determination of Saponification value of Fixed oil.
22. Determination of Ester value of volatile oil.
23. Determination of Acid value of fixed oil.
24. Determination of Iodine value of fixed oil.
25. Workshop to interpret the structure of simple organic compound using UV, IR, NMR, and Mass spectra.

REFERENCES:

1. S. W. Rajbhoj., Dr. T. K. Chondhekar., Systematic Experimental Physical Chemistry, Anjali Publication.
2. Indian Pharmacopoeia 1996 Ministry of Health Government of India.
3. British Pharmacopoeia.
4. A.H.Beckett and J.B. Stenlake, Practical Pharmaceutical Chemistry, Vol. I & II.
5. Dyer J R, Application of Absorption Spectroscopy of organic compounds.
6. Nagavi B.G., Laboratory hand book of Instrumental Drug Analysis.
7. Clarke's, Isolation and identification of drug.
8. Journals related to pharmaceutical analysis.

4.6 PHARMACOLOGY-III

(Clinical Pharmacy)

THEORY

(50 Hours)

(02 Hours / week)

OBJECTIVE:

The Course is designed to incorporate areas of Clinical Pharmacology, Clinical Pharmacy, and Clinical Pharmacokinetics including therapeutic drug monitoring. The therapeutics and rational use of medicine is now a days 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.

LEARNING GOALS:

1. To understand and develop rational and critical attitude to drug therapy.
2. To understand history of patient which is important in deciding dosage regime.
3. To know concept of essential drug and rational use of drug.
4. To understand individualization and optimization of drug dosing regimens.
5. To practice application of pharmacokinetic principles in clinical situation.
6. To understand significance and drug interference in diagnostic tests.
7. To seek a place in health care team as a Clinical Pharmacists.
8. To probe possibilities of clinical pharmacist as a professional.
9. To understand importance of drug information system and services.

SCOPE

1. Introduction to clinical pharmacy practice:

Objectives, goals, functions of clinical pharmacy. Role and responsibilities of Clinical Pharmacists. (01 hr)

2. Clinical pharmacy, National and International perspective. (01 hr)

3. Clinical Pharmacist in health care (patient) services – A Discussion (02 hrs)

4. Patient compliances and counseling: (05 hrs)

- Methods of assessments of compliances, strategies for improving compliances.
- Precautions and directions for medications and administration instructions.
- Monitoring of drugs, patients, medication efficacy and safety, adverse effects.

- 5 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.
- 6. Adverse drug reactions:** (03 hrs)
- Types of adverse drug reactions (ADR), predisposing factors of ADR, high risk patients for ADR, prevention & management of ADR, Role of pharmacist in management of ADR.
- 7. Drug interaction:** (04 hrs)
- Types and mechanism of drug interaction.
 - Understanding and identification of drug interaction.
 - Potential drug interactions with clinical significance.
 - Role of pharmacists in management of drug interaction.
- 8. Drug Poisoning, over dose and antidotes.** (03 hrs)
(General principle of clinical toxicology)
- 9. Dosage regimens and intravenous admixtures:** (05 hrs)
- Dosage adjustment according to age and weight.
 - Optimization of drug therapy, concept of Missed dose and multiple dosage regimens.
 - Optimization of drug therapy in disease state like renal and hepatic dysfunctioning and cardiovascular disorder.
 - Management of intravenous drug administration.
- 10. Drug therapy during pregnancy, lactation and labour.** (02 hrs)
- 11. Clinical Pharmacokinetics:** (05 hrs)
- Review of basic of pharmacokinetic process (drug ADME), clinical significance and application of each pharmacokinetic parameter, loading and maintenance dose, therapeutics drug monitoring.
(Problem solving skills of students is expected).
- 12. Management of some disorders like:** (07 hrs)
- Hypertension, Congestive heart failure, Epilepsy, Diabetes mellitus, Asthma, Malaria, UTI. STDs, Rheumatoid Arthritis and Cancer.
- 13. Investigational drugs, clinical research and clinical trial:** (03 hrs)
- Design and monitoring of clinical trial, phases of clinical trial, role of pharmacists in development of new drug and in preclinical and clinical studies.
- 14. Pharmacoeconomics and Pharmacoepidemiology:** (02 hrs)

15. **Medication errors.** (01 hr)
16. **Drug information systems and services:** (02 hrs)

Introduction need and scope of drug information system, functions and sources of drug information, drug information centre.

RECOMMENDED BOOKS

1. Tipnis, H.P., Bajaj Amrita: Clinical Pharmacy; 1st edition, Career publications, 2003.
2. Nand Pratibha, Khar, R.K.: Hospital & Clinical Pharmacy, Reprint 1st edition, Birla Publications, 2003.
3. Francke, D.E., Whitney, H.A.K.: Perspective in Clinical Pharmacy, Drug intelligence publications, Hamilton, 1972.
4. McCarron, M.M.: Principle of Clinical Pharmacy – Illustrated by clinical case studies, 3rd printing, Drug intelligence publications, Hamilton, 1978.
5. Sourcebook on Clinical Pharmacy, 2nd edition, PSG publishing company, Inc, Littleton, 1980.
6. Katzung, B.G.: Basic and Clinical Pharmacology, 8th edition, International edition, Lange Medical Books, McGraw Hill, 2000.
7. Laurence, D.R., Bennett, P.N., Brown, M.J.: Clinical Pharmacology, 8th edition, Churchill Livingstone, 1997.
8. Walker, R., Edwards, C.: Clinical Pharmacy and Therapeutics, 2nd edition, Churchill Livingstone, 1999.
9. Gibaldi, M.: Biopharmaceutics and Clinical Pharmacokinetics, 4th edition, Lea and Febiger, London, 1991.
10. Rowland, M., Tozer T.N.: Clinical Pharmacokinetics – Concept and Application, 3rd edition, Lea and Febiger, B.I. Waverly Pvt., Ltd., London, 1996.

4.7 TOTAL QUALITY MANAGEMENT

THEORY

(50 Hours)

(02 Hours / week)

OBJECTIVES

A course on total quality management is aimed at application of managerial tools to plan for quality, attain and control quality, follow up and improve quality, as well as organize for quality and to develop a work force.

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 an evidence needed to establish confidence among all concerned.

LEARNING GOALS

1. To understand importance of quality and quality function.
2. To know quality systems terminology.
3. To adhere to the system rules and regulations for ensuring drugs of standard quality are made available to the community.
4. To be a part of quality function team of an organization.

SCOPE -

1. INTRODUCTION TO BUSINESS OF QUALITY MANAGEMENT (04 hrs)

The concept of quality of products and services and total quality control (management), the purpose of TQM meaning of quality, quality orientation to customer satisfaction, meaning of control in industry, total quality control's organization wide impact, quality as a measure business strategy, four management fundamentals of total quality.

2. THE TOTAL QUALITY SYSTEM. (04 hrs)

A Brief study of system approach to quality, establishing the quality system, quality cost (foundation of quality system economics).

3. QUALITY SYSTEMS TERMINOLOGY AND ACRONYMS (04 hrs)

Accuracy, calibration, control charts, random error, systematic error, external audit, internal audit, limit of detection, limit of quantitation, measurant, precision, proficiency testing, quality assurance, quality control, reference material, certified reference material, repeatability, reproducibility, selectivity, sensitivity, traceability, uncertainty of measurement, validation, quality trilogy GMP, GLC, ISO, TGM, VAN, ISI etc.

4. QUALITY AND SOCIETY - (03 hrs)

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

5. QUALITY AND NATIONAL CULTURE - (03 hrs)

Quality in capitalistic economics, cultural differences multinational collaborations. quality in developing countries and in developed countries (US,UK Germany, Japan and France)

6. THE QUALITY FUNCTION - (02 hrs)

Quality policy and its objectives, company wide planning for quality, organizing for quality, training for quality, quality team concept in TQM. Quality improvement, quality assurance, quality audit and certification.

7. QUALITY CONTROL IN PHARMACEUTICAL INDUSTRY - (20 hrs)

- a) Good manufacturing practices for premises and materials -
General requirements as per schedule- M of drug and cosmetics rules, 1945.
- b) Brief study of specific requirements for manufacture of sterile products, SVP & LVP and Ophthalmic preparations.
- c) Brief study regarding specific requirement for manufacture of oral solid dosage forms, oral liquids, topical products, metered dose inhalers (MDI).
- d) 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.
- e) General requirement of factory premises for manufacture of cosmetics, medical devices,
- f) GMP for ayurvedic, siddha and Unani medicines a general study.
- g) Biomedical waste management and handling.
- h) FDA functions and responsibilities.
- i) International certification schemes (ISO 9000 series, WHO) and US FDA regulations, a brief account.
- j) GLP – Introduction definition responsibilities quality assurance program, computerized systems, test systems etc.

8. QUALITY ASSURANCE AND QUALITY AUDIT - (10 hrs)

Documenting the quality system – documentation control, the quality manual, writing quality procedures developing flow charts for production, packaging.

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

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.

**4.8 ENTREPRENEURSHIP SKILLS – IV
(PHARMACEUTICAL MANAGEMENT)**

THEORY

(50 Hours)

(02 Hours / week)

COURSE OBJECTIVE

Graduates of pharmaceutical sciences often join organizations (profit making or non profit making) as managers of business. An effective manager must be proactive in responding to change and is always juggling with resources like money, time and personnel. An effective manager are responsible for translation of goals and objectives of the business into their own departments in accordance with the mission statement of organization. The success of an organization is the result of adoption of a system view and team work.

A course in pharmaceutical management is aimed at developing certain skills among undergraduate students to prepare them for sharing the stated responsibility. The study of management is vast, however in this course of study an overview of personnel management operations management, product, marketing, sales promotion and advertising management, financial and project management is expected to be studied, at introductory level. A topic on macro economics and environmental management is also included for rational approach in nation building.

LEARNING GOALS

1. To understand strategies for managing time and stress.
2. To understand strategies for supporting organization success.
3. To get acquainted with major approaches to planning and change management.
4. To sort out methods and tools for making decisions.
5. To understand approaches for determining priorities and developing budgets.

SCOPE

1. Production and Operations Management (15 hrs)

Nature and scope of production and operations management, strategic operations management, forecasting, production process, manufacturing and services operations, product and process design, process planning, plant utilities, production technology, plant location, plant lay out, materials handling, factory building, shop floor planning.

Materials management, purchasing, purchasing policies, materials storing and inventory management.

2. Product, Marketing, Sales promotion and advertising management (15 hrs)

Marketing – objective and 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, compensation of sales force, field sales planning control and risk, sales forecasting, sales budget and budgetary control, sales literature, catalogue and price list.

Concepts and nature of advertising, advertising and marketing, effects of advertising, social effects of advertising, ethics, advertising process, media selection, messages, planning and budget.

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, ex post and ex ante, equilibrium.

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, creeping and galloping, open and suppressed inflation, effects of inflation, control of inflation.

4) Financial management and project management - (10 hrs)

a) An overview, scope of financial management, evolution of corporate finance, goals for financial management, basic considerations (fundamental valuation concepts) – Time value of money, risk and return, valuation of securities.

b) Introduction to project management, concept of projects, role of project manager – advantages of project management.

c) Projects in contemporary organization, concept of project, capital expenditure decisions, project development, project appraisal.

d) Environment of projects – industrial policy, IDRA, MRTP, FERA, incentives for various business.

e) Cost of capital – Cost of debentures, equity, term loans, retained earnings, weighted average cost of capital, capital structure, factors affecting capital structure.

f) Project feasibility – market feasibility, technical feasibility, financial projections, financial appraisal.

g) Project report – Preparation model.

5) 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

- i. K.Aswathappa and K. Sridhara Bhat, Production and Operations Management, Himalaya Publishing House, New Delhi.
- ii. M. N. Mishra, Sales promotion and advertising management, Himalaya Publishing House, New Delhi.
- iii. Kotler and Armstrong, Principles of marketing, Prentice-Hall of India Pvt Ltd, New Delhi.
- iv. Prassanna Chandra, Financial Management, Theory and practice Tata mcGraw-hill publishing company limited, New Delhi fourth edition.
- v. H.P.S. Palwa, Bhart's Project financing (Policies, Procedure and Practice), Bharat law house, 4th edition.
- vi. T.M. Joseph, Enviornmental Management, Himalaya Publishing House, New Delhi.
- vii. K.Aswathappa, Essentials of production management, Himalaya Publishing House, New Delhi.
- viii. S.A. Chunawala, Sales Management, Himalaya Publishing House, New Delhi.
- ix. S.A. Chunawala, Product Management, Himalaya Publishing House, New Delhi.
- x. SVR Subbarao, Hand book of pharmaceutical marketing in India, Universal book corporation, Mumbai.
- xi. Peter F. Drucker, Management tasks, responsibilities, practices, Allied publishers limited, New Delhi.
- xii. Heinz Weihrich and Harold Koontz, Management, A global Perspective, McGraw-hill International edition.
- xiii. Prasanna Chandra, Financial Management: Projects, Planning, analysis, selection, implementation & Review, Tata mcGraw-hill publishing company limited, New Delhi fourth edition.
- xiv. Nikhilesh Dholkia, Rakesh Khurana, Labdhi Bhandari & Ashinandan K. Jain, Marketing Management cases and Concepts, Macmillan India Limited.
- xv. S.A. Sherlekar, K. Nirmala Prasad and S. J. Salvadore victor, Principples of Marketing, Himalaya Publishing House, New Delhi.
- xvi. S.A.Chunawalla and K.C., Sethia, Foundation of advertising, Theory and practice, Himalaya Publishing House, New Delhi.
- xvii. R.B.Smarta, Revitalizing the pharmaceutical business, innovative marketing approaches, Universal book corporation, Mumbai.
- xviii. S.K. Bhattacharjee, Fundamentals of PERT / CPM and project management, Khanna Publisher.
- xix. D.Gopalkrishana, A study of managerial economics, Himalaya Publishing House, New Delhi.
- xx. Dr. M.M. Varma and R.K. Agarwal, managerial economics, King Books, Delhi.
- xxi. A Nag, Macroeconomics for management studies, Universal Book corporation, Mumbai.

4.9 RESEARCH METHODOLOGY

(LIBRARY ASSIGNMENT)

CONTACT HRS 1 / W

LIBRARY 2 HRS / W

OBJECTIVE

A course in research methodology (library assignment) is aimed at introduction of how research work is being done. The research is aimed as an organized enquiry, essentially an investigation designed and carried out to provide information for solving a problem or gaining knowledge. It also includes discovering newer information or relationship and to expend and to verify existing knowledge. Different categories of research are classified. Here, it is mainly confined to library research of technological kind involving evolution of theories, study involving cause and effect relationship and seeking out significant facts and interpretation of the past data which are found in journals reports, directories, books and using internet sources.

LEARNING GOALS

The aim of library assignment is to achieve professional development of a student in the context of the overall goal of his / her programme. This subject will be conducted in terms of actual participation in professional activities such as audience handling, data preparation, data organization, designing, laboratory equipment and machinery handling etc. This subject will also deal with communication aspects such as presenting a paper in seminar, articulating ideas and concepts to professional audience etc.

PLAN OF STUDY

Each student shall be associated with a concerned teacher (mentor) under whose supervision he / she would choose a topic of his / her choice from a list prepared by the teacher. The teacher will guide the student regarding how to proceed with the preliminary details. This will consist of –

1. Objective
2. Scope and methodology
3. Plan of action.

The professional personality of a student, to the extent that it has a bearing on the development/ application of different skills in the work environment will also be assessed.

EVALUATION SCHEDULE

- a) **Seminar – I :**
A formal presentation on preliminary details, followed by questions posed to the student by his / her fellow mentor.
- b) **Interim Report**
A written and appropriately presented document, including the plan of work and methodology for the subject work and progress made till date.
- c) **Seminar – II**
The student is required to prepare a report on his topic and progress made till date, concerning his topic and submit the same containing a detailed version of the study.
- d) **Final Report**
A written and appropriately presented document along with synopsis.
- e) **Viva**
A question – answer and discussion session between the student and the concerned teacher along with panel of two judges on the final report.

Every assignment shall be evaluated for 100 marks. The evaluation structure with weightages, date of completion etc.

Sr. No.	Component	Weightage	Mode of evaluation	Date of completion
1	Seminar – I	15%	The teacher has to identify the chosen topic by the student, evaluate his ideas behind choosing the topic, his methodology to complete it, his performance etc.	Within 5 weeks from the date of commencement of college.
2	Interim Report	20%	The teacher will evaluate this document on the basis of its technical contents, plan of work, methodology, progress made till date etc.	Within next 5 weeks.
3	Seminar – II	15 %	The teacher will evaluate the knowledge acquired by the student on concerned topic, ability to communicate and represent the same.	Within next 5 weeks.
4	Final Report	30 %	The teacher will evaluate this document on basis of its technical contents, style, and reference work done by a student.	Within next 5 weeks.
5	Viva	20 %	The teacher assesses the students relevant personality traits in the professional work environment through a question answer and discussion session.	Within next 5 weeks.

Note: A student failing to cope up with the concerned date will loose marks in that respective schedule even after make up. It will entirely depend upon the teacher / mentor.

The detailed assignment must include following.

1. Title of the assignment work.
2. Consent of the proposed teacher.
3. Objectives, scope and methodology of the assignment work.
4. Plan of action, including proposed activity chart.
5. Some preliminary details of the project.
6. Tentative list of references.

The assignment has to be submitted as a separate booklet, typed and neatly bound.

FORMAT FOR THE FIRST PAGE OF THE ASSIGNMENT WORK

Title of the assignment: :
Work carried at :

Name of Student : -
Roll No. :

Library Assignment submitted for the partial fulfillment of Fourth Year B.Pharm degree under the supervision of (Name of the supervisor and his designation).

Name of Institute :
Year :

FINAL EVALUATION REPORT

Name of Student :

Roll No. :

Name of Teacher :

Title of Assignment :

Evaluation details –

Sr. No.	Component	Weightages	Date	Make up Date	Marks Obtained
1	Seminar – I	15%			
2	Interim Report	20%			
3	Seminar – II	15 %			
4	Final Report	30 %			
5	Viva	20 %			

Recommended final grade (specify) –

GRADE	EVALUATION	CORROSPONDING MARKS
O	EXCELLENT	86 and above
A	VERY GOOD	76 – 85
B	GOOD	66 – 75
C	FAIR	56 – 65
D	SATISFACTORY	45 – 55
E	POOR	Below 45

EVALUATION DETAILS

Sr. No	Component	Weightages
I	<u>Seminar – I</u>	
1	Ideology of topic	5 %
2	Material and methodology including plan of work	5 %
3	Presentation	5 %
II	<u>Interim Report</u>	
1	Sincerity (Actual time spent on assigned work and contact with concerned supervisor)	5 %
2	Quality of reference material collected	5 %
3	Style of presentation.	5 %
4	No. of references (books, National and International Journals)	5 %
III	<u>Seminar – II</u>	
1	Topic, material, methodology.	5 %
2	Presentation.	5 %
3	Reference work, depth of knowledge	5 %
IV	<u>Final Report</u>	
1	Justification of topic and introduction.	5%
2	Technicality of material referred	15%
3	Final conclusion (Synopsis) and presentation.	10%
V	<u>Viva</u>	
1	Style of speaking and topic ideology.	5 %
2	Material and methodology.	10%
3	Question answer.	5 %

Note: Adherence to schedule is a prerequisite, disobeying results in loss of weightages under each head and is entirely at the discretion of mentor.

LIBRARY ASSIGNMENT, 2004-05
FINAL EVALUATION REPORT

Name of Student :

Roll No. :

Exam. Seat No. :

Name of Teacher :

Title of Assignment :

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Evaluation details –

Sr. No.	Component	Weightages	Date	Make up Date	Marks Obtained
1	Seminar – I	15%			
2	Interim Report	20%			
3	Seminar – II	15 %			
4	Final Report	30 %			
5	Viva	20 %			
6	Total marks	100			
7	Grade Awarded				

Recommended final grade (specify) –

GRADE	EVALUATION	CORROSPONDING MARKS
O	EXCELLENT	86 and above
A	VERY GOOD	76 – 85
B	GOOD	66 – 75
C	FAIR	56 – 65
D	SATISFACTORY	45 – 55
E	POOR	Below 45

Name of Teacher : N.B.Ghiware

Signature :

LIBRARY ASSIGNMENT EVALUATING SHEET

Sr. No.	Component	Weightage	Mode of evaluation	Name of Students		
1	Seminar – I	15%	The teacher has to identify the chosen topic by the student, evaluate his ideas behind choosing the topic, his methodology to complete it, his performance etc.			
2	Interim Report	20%	The teacher will evaluate this document on the basis of its technical contents, plan of work, methodology, progress made till date etc.			
3	Seminar – II	15 %	The teacher will evaluate the knowledge acquired by the student on concerned topic, ability to communicate and represent the same.			
4	Final Report	30 %	The teacher will evaluate this document on basis of its technical contents, style, and reference work done by a student.			
5	Viva	20 %	The teacher assesses the students relevant personality traits in the professional work environment through a question answer and discussion session.			
Total						

Sig.....

Name of Mentor
(N B Ghiware)