

# COURSE CURRICULUM

## BACHELOR OF MANAGEMENT STUDIES (PHARMACEUTICAL MANAGEMENT)

### COURSE STRUCTURE

Sl.No.	Paper Code	First Semester	Credits*			Marks		
		Subjects	(T + P)			Intl. Asst.	End Term	Total
		<b>Theory Papers</b>						
			T	P	Total			
1	ENG101	English	3	0	3	40	60	100
2	ENS102	Environmental Studies	4	0	4	40	60	100
3	PPM103	Principles & Practices of Management	4	0	4	40	60	100
4	QTM104	Quantitative Techniques for Management – I	4	0	4	40	60	100
5	PAQ105	Pharmaceutical Analysis & Quality Control	3	0	3	40	60	100
		<b>Practical Papers</b>						
6	PAL106	Pharmaceutical Analysis Lab	0	2	2	40	60	100
7	CAM107	Computer Application in Management	0	2	2	40	60	100

**All subjects are compulsory**

Sl. No	Paper Code	Second Semester	Credits*			Marks		
		Subjects	(T + P)			Intl. Asst.	End Term	Total
		<b>Theory Papers</b>						
			T	P	Total			
1	ANP201	Anatomy & Physiology	4	0	4	40	60	100
2	PHC202	Pharmaceutical Chemistry I	3	0	3	40	60	100
3	PHR203	Pharmaceutics I	3	0	3	40	60	100
4	ORB204	Organizational Behaviour	4	0	4	40	60	100
5	MGE205	Managerial Economics	4	0	4	40	60	100
		<b>Practical Papers</b>						
6	PHL206	Pharmaceutics Lab-I	0	2	2	40	60	100
7	PCL207	Pharmaceutical Chemistry Lab-I	0	2	2	40	60	100

**All subjects are compulsory**

Sl.No.	Paper Code	Third Semester	Credits*			Marks		
		Subjects	(T + P)			Intl. Asst.	End Term	Total
		<b>Theory Papers</b>						
			T	P	Total			
1	PHR301	Pharmaceutics II(MFG)	3	0	3	40	60	100
2	FPE302	Forensic Pharmacy & Ethics	4	0	4	40	60	100
3	PHC303	Pharmaceutical Chemistry II(Medicinal Biochemistry)	3	0	3	40	60	100
4	PHE304	Pharmaceutical Engineering	4	0	4	40	60	100
5	MNM305	Manufacturing Management	4	0	4	40	60	100
		<b>Practical Papers</b>						
6	PHL306	Pharmaceutics Lab-II	0	2	2	40	60	100
7	PCL307	Pharmaceutical Chemistry Lab –II	0	2	2	40	60	100

**All subjects are compulsory**

		Fourth Semester	Credits*			Marks		
Sl.No.	Paper Code	Subjects	( T + P )			Intl. Asst.	End Term	Total
		<b>Theory Papers</b>						
			T	P	Total			
1	MEC401	Medicinal Chemistry-I	3	0	3	40	60	100
2	BIS402	Bio-Statistics	4	0	4	40	60	100
3	OPR403	Operations Research	4	0	4	40	60	100
4	FRA404	Financial Reporting and Analysis	4	0	4	40	60	100
5	CSA405	Cost Accounting	3	0	3	40	60	100
		<b>Practical Papers</b>						
6	MCL406	Medicinal Chemistry Lab	0	2	2	40	60	100
7	HRM407	Human Resource Management Project	0	2	2	40	60	100

**All subjects are compulsory**

		Fifth Semester	Credits*			Marks		
Sl.No.	Paper Code	Subjects	( T + P )			Intl. Asst.	End Term	Total
		<b>Theory Papers</b>						
			T	P	Total			
1	PHA501	Pharmacology	4	0	4	40	60	100
2	PSM502	Pharmaceutical Sales & Marketing Practices	4	0	4	40	60	100
3	PHR503	Pharmaceutics-III(Industrial & Pharma Microbiology)	3	0	3	40	60	100
4	PHP504	Pharmacognosy & Phytochemistry	3	0	3	40	60	100
5	PAS505	Pharmaceutical Advertising & Service Management	4	0	4	40	60	100
		<b>Practical Papers</b>						
6	PHL506	Pharmaceutical Lab-III(Pharma Microbiology)	0	2	2	40	60	100
7	PAL507	Pharmacognosy Lab	0	2	2	40	60	100

**All subjects are compulsory**

		Sixth Semester	Credits*			Marks		
Sl.No	Paper Code	Subjects	( T + P )			Intl. Asst.	End Term	Total
		<b>Scheme-I</b>						
		<b>Theory Papers</b>						
			T	P	Total			
1	MEC601	Medicinal Chemistry-II	4	0	4	40	60	100
2	PRS602	Pharmaceutical Marketing Research & Supply Chain Management	4	0	4	40	60	100
		<b>Practical Paper</b>						
3	PHL603	Pharmacology Lab	0	2	2	40	60	100
		<b>Scheme-II</b>						
4	PSI604	Project & Seminar/Industrial Training & Seminar	0	12	12			400

**All subjects are compulsory**

### Eligibility -Science any stream

CREDIT PER SEMESTER-22

TOTAL CREDIT-132

TOTAL MARKS-4200(700 PER SEMESTER)

## 1.1 ENGLISH

### UNIT I

**Vocabulary Enhancement** – Synonyms, Antonyms, Prefixes and suffixes. Understanding the proper way of letter writing. Comprehension, Passage reading and question answer handling. Noun, Verb, Adjective. Construction of sentences and passages with proper grammar.

### UNIT II

**Spelling and Punctuation/ Spelling Pitfalls, Grammar Revisited** - Review of parts of speech. Proper pronunciation from language lab. Hearing fluent English and identifying and answering questions. Understanding the proper way to utilize punctuation and spelling Pitfalls.

### UNIT III

**Functional English** - Language functions: descriptive, expressive and social, Types of language functions: to inform, enquire, attract, influence, regulate and entertain. Understanding the importance of communication. Communication in an organization. Types of communication

### UNIT IV

**Reading Skills** - Strategies for developing reading skills, Skimming and scanning, Predicting, Inferring, Reading critically. Reading passages, comprehension and letters. Reading with proper pronunciation. Book reading, Shakespearean Literature reading. Reading silently, sub-vocalization, Reading at speeds of at least 250 words per minute, Inferring meaning or content after reading the heading, Guessing meaning of unfamiliar words from context, Identifying the central idea as well as supporting ideas, Spelling pitfalls, Preparing notes in diagrammatic form after reading a text, showing the central idea and supporting ideas and the relationships between them.

**N.B.: Training Will Be Provided In Techniques Of Efficient Reading: (Practice)**

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#### BOOK REFERENCES:

1. Scot Ober, Contemporary business communication, fifth edition, biztantra.
2. Lesiler & Flat lay, Basic Business communication. Tata McGraw Hill.
3. Kulbhushan Kumar, Effective Communication Skills, Khanna Publishing House

## 1.2 ENVIRONMENTAL STUDIES

### UNIT I

Introduction: Nature and type of environmental management - Overview of the course, economy and environment, basics of natural resource management, Ecology, different ecosystems, biodiversity- sustainable utilization and conservation, Intellectual Property Rights, TRIPS, Role of WTO

### UNIT II

Natural resource management - Natural Resource Management, Sustainable development, Externalities, Market failure, Green crisis management - Climate changes, global warming, natural disasters and disaster management

### UNIT III

Air pollution, noise pollution, Environmental law, Soil pollution, water pollution, Water treatment technology, Waste management, waste water treatment technology, solid waste treatment technology, Biomedical Waste Management

### UNIT IV

Energy costing and pricing, energy audits, energy management, Environmental management system, Environmental standards, EIA/EIS, Cost benefit analysis. Pharmaceutical waste management and control. Biodiversity of flora and fauna, etc. Green Marketing, green costing, green accounting, green audits, green supply chain management, ISO 14001, Occupational safety and health, ISO 18000 and safety inspection, Business ethics and business dynamics. Laws related to pollution and violation of government rules and regulation.

#### BOOK REFERENCES:

1. Environmental Studies - S.C. Sharma & M.P. Poonia, Khanna Publishing House
2. Environmental Management - N.K. Uberoi. 2nd ed. Excel Books.
3. Environmental Management - Swapan C Deb. Jaico Books.
4. Environmental Science and Engineering - J.G. Henry & G.W. Heinke. PHI, 2nd ed.
5. Elements of Environmental Pollution Control, O.P. Gupta, Khanna Publishing House

## 1.3 PRINCIPLES AND PRACTICES OF MANAGEMENT

### UNIT I

Management : Science, Theory and Practice - The Evolution of Management thought process and the Patterns of Management Analysis - Management and Society : The External Environment, Social Responsibility and Ethics - Global and Comparative Management - The Basis of Global Management.

### UNIT II

The Nature and Purpose of Planning - Objectives - Strategies, Policies and Planning  
Premises - Decision Making - Global Planning. Team building process. Group development. Vision, mission, goal, etc.

### UNIT III

The Nature of Organizing and Entrepreneurship - Organizational Structure:  
Departmentation - Line/Staff Authority and Decentralization - Effective Organizing and Organizational Culture - Global Organizing.

### UNIT IV

Co-ordination functions in organisations - Human Factors and Motivation - Leadership - Committees and group Decision Making - Communication - Global Leading. Types of communication. Barriers to communication. Importance of Communication. The System and Process of Controlling - Control Techniques and Information Technology - Productivity and Operations Management - Overall Control and progress towards the future through Preventive Control - Global Controlling and Global Challenges.

### REFERENCE BOOKS:

1. L.M.Prasad, Principles of management, 7<sup>th</sup> edition, Sultan Chand & Sons, 2008
2. P.N. Reddy, Principles of Business organisation and Management, S Chand & Co Ltd, 2010
3. Premvir Kapoor, Principles of Management, Khsnna Publishing House, 2018.

## 1.4 QUANTITATIVE TECHNIQUES FOR MANAGEMENT

### UNIT I

Notion of constants, variables and functions; linear and non-linear functions: Simplify and Evaluate Algebraic expressions, Create Mathematical business models for real world situations, Translate word expressions to algebraic expressions, Calculate simple and compound interest, determine monthly payments, interest and principal portions in future values.

### UNIT II

Linear equations, Systems of linear equations, Formulating Business problems, Solving systems of linear equations using Cramer's Rule. Addition in matrices, Determinants, rules of determinants, types of matrices( square, diagonal, etc.)

### UNIT III

Functions in economics and commerce, Demand function - Supply function - Cost function – Revenue, function - profit functions; Break-even analysis; slope and its relevance for marginal analysis. Maximum and minimum of non-linear functions using graphs.

### UNIT IV

Limits and continuity of functions, derivatives of functions as a rate of change. Rate of change of a quantity - Related rates of change. Derivative as a measure of slope. Techniques and rules of differentiation, Applications in computing marginal costs and revenue. Increasing and decreasing functions - Sign of the derivative -Maximum and minimum values using differentiation- Local and global maxima and minima. Applications in revenue and profit maximizations. Area under a curve. Analysis of various aspects of system integration.

### REFERENCE BOOKS

1. Sundaresan and Jayaseelan - An Introduction to Business Mathematics, S.Chand & Company Ltd.,2011
2. P.R.Vittal - Business Mathematics, Third Edition, Margham Publications, 2009
3. Qazi Zameeruddin, Vijay K Khanna and SK Bhambri – Business Mathematics, Second Edition, 2010
4. Manish Sharma & Amit Gupta - The Practice of Business Statistics, Khanna Publishing House, 2018

## 1.5 PHARMACEUTICAL ANALYSIS & QUALITY CONTROL

### UNIT I

Significance of quantitative analysis in quality control, Different techniques of analysis, Preliminaries and definitions, Significant figures, Rules for retaining significant digits, Types of errors, Mean deviation, Standard deviation, Statistical treatment of small data sets, Selection of sample, Precision and accuracy, Fundamentals of volumetric analysis, methods of expressing concentration, primary and secondary standards.

### UNIT II

Acid Base Titrations : Acid base concept, Selection of solvents, strengths of acids and bases, Ionization, Law of mass action, Common Ion effect, Ionic product of water, pH, Hydrolysis of salts, Henderson-Hasselbach equation, Buffer solutions, Neutralization curves, Acid-base indicators. Theory of indicators, Choice of indicators, Mixed indicators, Polyprotic system, Polyamine and amino acid systems, Amino acid titration, applications in assay of H<sub>3</sub>PO<sub>4</sub>, NaOH, CaCO<sub>3</sub>, etc.

### UNIT III

Precipitation Titrations : Precipitation reactions, Solubility products, Effect of acids, temperature and solvent upon the solubility of a precipitate, Argentometric titrations and titrations involving ammonium or potassium thiocyanate, mercuric nitrate, and barium sulphate, Indicators, Gay-Lussac method, Mohr's method, Volhard's method and Fajan's method.

### UNIT IV

Oxidation Reduction Titration: Concepts of oxidation and reduction, Redox reactions, Strengths and equivalent weights of oxidising and reducing agents. Theory of redox titration, Redox indicators, Cell representations, Measurement of electrode potential, oxidation-reduction curves, Iodimetry and Iodimetric Titrations involving ceric sulphate, potassium iodate, potassium bromate, potassium permanganate; titanous chloride and Sodium 2, 6-dichlorophenol indophenol. Gravimetric analysis: Precipitation techniques, Solubility products, The colloidal state, supersaturation co-precipitation, Post-precipitation, Washing of the precipitate, Filtration, Filter papers and crucibles, Ignition, Thermogravimetric curves, Specific examples like barium sulphate, aluminium as aluminium oxide, calcium as calcium oxalate and magnesium as magnesium sulphate.

### REFERENCE BOOKS:

1. Mendham J, Denny R.C., Barnes J.D., Thomas M, Jeffery G.H., "Vogel's Textbook of Quantitative Chemical Analysis", Pearson Education Asia.
2. Connors K.A., "A Text book of Pharmaceutical Analysis", Wiley Inter-science.
3. Beckett, A.H., and Stenlake, J.B., Practical Pharmaceutical Chemistry, Vol. I&II. The Atherden Press of the University of London.
4. British Pharmacopocia, Her Majesty's Stationary Office, University Press, Cambridge.

## 1.6 PHARMACEUTICAL ANALYSIS LAB

### Unit 1

Standardization of analytical weights and calibration of volumetric apparatus. Acid base Titration: Preparation and standardization of acids and bases, some exercises related with determination of acids and bases separately or in mixture form , some official assay procedures e.g. boric acid should also be covered.

### Unit 2

Oxidation Reduction Titrations: Preparation and standardization of some redox titrants e.g. potassium permanganate, potassium dichromate, iodine, sodium thiosulphate, etc. some exercises related to determination of oxidizing and reducing agents in the sample shall be covered. Exercises involving potassium iodate, potassium bromate, iodine solution, stanous chloride, sodium 2, 6- dichlorophenol indophenol, and ceric ammonium sulphate.

### Unit 3

Precipitation titrations: Preparation and standardization of titrants like silver nitrate and ammonium thiocyanate, Titrations according to Mohr's, Volhard's and Fajan's methods.

### Unit 4

Gravimetric analysis: Some exercises related to gravimetric analysis are to be covered (at least 3 experiments).

## 1.7 COMPUTER APPLICATIONS IN MANAGEMENT

**Aim:** To introduce the concepts of information technology and their application in management decision making.  
**Components of a Computer** - Hardware and Software – Operations Systems – Directories and File properties.

### Unit-I

**WORD** – Creating a new document with templates & Wizard – Creating own document – Opening/modifying a saved document – converting files to and from other document formats – Using keyboard short-cuts & mouse – Adding symbols & pictures to documents – header and footers – Finding and replacing text – spell check and Grammar check – Formatting text - paragraph formats - adjusting margins, line space – character space – Changing font type, size – Bullets and numbering – Tables – Adding, editing, deleting tables – Working within tables – Adding, deleting, modifying rows and columns – merging & splitting cells.

### Unit-II

**EXCEL** – Working with worksheets – cells – Entering, editing, moving, copying, cutting, pasting, transforming data – Inserting and deleting of cells, rows & columns – Working with multiple worksheets – switching between worksheets – moving, copying, inserting & deleting worksheets – Using formulas for quick Calculations – Working & entering a Formula – Formatting a worksheet – Creating and editing charts– elements of an Excel Chart – Selecting data to a chart – Types of chart – chart wizard – Formatting chart elements – Editing a chart – Printing charts.

### Unit-III

**POWERPOINT** – Creating new presentations – Auto content wizard – Using template – Blank presentation – Opening existing presentations – Adding, editing, deleting, copying , hiding slides – Presentations – Applying new design – Adding graphics – Using headers and footers – Animations text – Special effects to create transition slides – Controlling the transition speed – Adding sounds to slides – Using action buttons.

### References:

Computer Fundamentals - R.S. Salaria, Khanna Publishing House  
Handbook of Computer Fundamentals - N.S. Gill, Khanna Publishing House  
PC Software Made Easy - Ramesh Bangia - Khanna Publishing House  
OFFICE 2000 Complete – BPB  
Windows 98 Complete – BPB  
Windows 98 6 in one by Jane Calabria and Dorothy Burke – PHI

## 2.1 ANATOMY & PHYSIOOLOGY

### UNIT I

**The Skeleton** – Skull, Mandible, Hyoid bone, Cervical vertebrae, Clavicle, Sternum, Costal arch cartilages, Ribs, Scapula, Humerus, Radius, Ulna, Carpal bones, Metacarpal bones, Phalanges of thumb and fingers, Thoracic vertebrae, Lumbar vertebrae, Sacrum, Hip bone, Femur, Patella, Tibia, Fibula, Tarsal bones, Metatarsal bones, Phalanges of toes, coccyx, **The Muscular System** - Abductor muscles, Adductor muscles, Brachialis, Sternocleidomastoid muscle, Pectoral muscles, Hamstring muscle, Femur, Fibula, Thigh muscle, Humerus, Tibia, Ulna, Radius

### UNIT II

**The Nervous System** – Brain, Spinal nerves, The ear, The eye, Facial nerves, Femoral nerves, Hair follicles, Nasal passage, Skin, Tongue, Ulnar nerves, **The Lymphatic System** - Lymph nodes, Lymph trunk, Lymphatic system

### UNIT III

**The Digestive System** – Glands, Mouth, Tooth, Esophagus, Stomach, Spleen, Liver, Gallbladder, Pancreas, Appendix, Small intestine, Large intestine, Rectum, **The Endocrine System** - Adrenal glands, Ovaries, Pancreas, Pituitary glands, Testicles, Thymus, Thyroid and parathyroid glands

### UNIT IV

**The Cardiovascular System** - The heart, Lungs, Veins, Arteries, Capillaries, Aorta, Superior vena cava, Inferior vena cava, Pulmonary artery, Pulmonary vein, Right atrium, Left atrium, Right ventricle, Left ventricle, Mitral valve, Tricuspid valve, Pulmonary valve, Aortic valve, Carotid artery, Renal artery, Iliac artery, Mesenteric artery, Jugular vein, Hepatic vein, Hepatic portal vein, Renal vein, Iliac vein. The Male Reproductive System - Cowper's glands, Penis, Prostate gland, Testicles, The Female Reproductive System - The mammary glands, Cervix, Fallopian tubes, Labia minor, Ovary ligaments, Ovaries, Uterus, Vagina vulva, The Urinary System – Urethra, Renal pelvis, Kidneys, The medial umbilical ligament, Bowman's capsule, Renal medulla, Ureter

### Reference:

1. Ross & Wilson-Anatomy & Physiology
2. Vijaya D. Joshy & Ashelete-Anatomy & Physiology for Nursing and Health

## 2.2 PHARMACEUTICAL CHEMISTRY-I

### UNIT I

Mechanistic aspects of organic reactions of different categories of aliphatic and aromatic compounds:6 Hydro carbons, alcohols, alkyl and aryl halides, esters, carbonyl compounds, carboxylic acids and their derivatives, sulfonic acids, nitro compounds, amino compounds, diazonium salts, phenols.

### UNIT II

Alicyclic compounds

Polynuclear aromatic hydrocarbons

### UNIT III

Orientation and reactivity in electrophilic aromatic substitutions

Introduction to heterocyclic chemistry nomenclature with special reference to fused ring system and drugs.

Five membered ring containing one and two hetero atoms and related drugs.

Six membered ring containing one and two hetero atoms and related drugs.

### UNIT IV

Fused ring system:

Indole, benzofuran, benzimidazole, quinoline, isoquinoline, pteridine, quinazolone, purine, 1,4-benzodiazepine, lactam ring, coumarins, thioxanthanes and their related compounds.

### RECOMMENDED BOOKS

3. Harper's Biochemistry by Robbert K. Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwell, Latest Ed.
4. Lippincott's Illustrated Review of Biochemistry by Pamela C. Champe and Richard A. Harvey, Latest Ed.
5. Practical Clinical Biochemistry by Varley.
6. Textbook of Biochemistry by Devlin, 5th Ed

## 2.3 PHARMACEUTICS-I

### UNIT I

**Liquid dosage forms** – Introduction, Types of additives used in formulation, vehicles, stabilization, preservatives, suspending agents, emulsifying agents, solubilisers, colours, flavours and others, Manufacturing, packaging, Physicochemical and biopharmaceutical aspects of drug release and efficacy are to be dealt with individual dosage form and evaluation of clear liquids, suspensions and emulsions

### UNIT II

**Semisolid dosage forms** - Definition, types, mechanism of drug penetration, Factors influencing penetration, Semi-solid bases and their selection, General formulation of semi-solids, Clear gels manufacturing procedure, Evaluation and packaging

### UNIT III

**Suppositories** - Definition, size, shape and doses, Ideal requirements, Factors affecting drug absorption, Type of bases, Manufacturing procedure, Storage, Packaging, Stability of suppositories, **Blood products and plasma substitutes** - Collection, processing and storage of Whole human blood and all fractions individually, Plasma substitutes – ideal requirements, PVP, Dextran etc. for control of blood pressure as per I.P.

### UNIT IV

**Pharmaceutical Aerosol** - Mode of operation, Definition, Propellants, Manufacturing and packaging methods, Container with all parts, Pharmaceutical application and testing. Ophthalmic preparation – Requirements, Eye drops, Eye lotions, Eye ointments, Formulation, Additives, Preparation, sterilization, packaging, evaluation, Contact lens solution

### REFERENCE BOOKS

1. Remingtons "Pharmaceutical Sciences"
3. Bentley's Pharmaceutics.

## 2.4 ORGANISATIONAL BEHAVIOUR

### UNIT I

Group dynamics and teamwork - how groups work, groups in organizations, stages of group, foundations of group performance, decision making in groups. Teams and teamwork, team building, improving team processes, teams in the high performance workplace; power and politics: power and influence, power. Formal authority and obedience empowerment, organizational politics – political behaviour in organization

### UNIT II

Organizational structure and design: strategy and goals of organizations; basic attributes of organizations, organizing and co-coordinating work, - different types of organizational design based on nature of business

### UNIT III

Conflict and negotiation conflict in organizations, conflict management, negotiation: negotiation strategies, how to be an effective negotiator, manager as a negotiator. change in organizations planned change strategies resistance to change, overcoming resistance to change,

### UNIT IV

Organisational culture, understanding organisational cultures, managing organisational culture, organisational development: nature scope objectives and intervention strategies. Different types of organizational culture and dealing with grievance handling.

### REFERENCE BOOKS :

1. Stephen P. Robbins, Timorthy A. Judge, Neharika Vohra - Organisational Behaviour 14th Edition; Pearson 2011
2. Kavita Singh - Organisational Behaviour : text and cases, Pearson, 2010

## 2.5 MANAGERIAL ECONOMICS

### UNIT – I

Nature and scope of Managerial Economics. Demand Theory and analysis. Theory of consumer choice.

### UNIT – II

Production Theory and estimation. Cost Theory and estimation. Market Structure and degree of competition.

### UNIT - III

Macro Economics and Micro Economics. Theory and Practices

### UNIT – IV

Monopoly theories and practices. Oligopoly Theories and Practices

### REFERENCES:

1. Introduction to Psychology-7<sup>th</sup> Edition, Clifford .T.Morgan, John R Weisz, Tata McGraw Hill(2001)
2. Developmental Psychology-5<sup>th</sup> Edition, Elizabeth B.Hurlock, McGraw Hill(2001)

## 2.6 PHARMACEUTICS LAB-I

### UNIT I

Preparation of the following : Solution, Powder, Galenical, Suspension, mouth wash, gargle, lotion, and emulsion.

### UNIT II

Study on the effect of complexing agents on the solubility of sparingly water soluble drug. Study on the effect of co-solvent on the solubility of sparingly water soluble drugs. Study on the effect of surfactant on the solubility of sparingly water soluble drugs. Determine the bulk density and void porosity of powdered drugs.

### UNIT III

Study the effect of lubricants on angle of repose of granules / powdered drugs. Quantitative analysis of Salicylic acid using Spectrophotometer. Study particle size distribution of granules by sieve method. Determination of critical micelle concentration of surfactants.

### UNIT IV

Determination of HLB value of a surfactant. Evaluation of physical stability of suspension. Study the effect of pH on the solubility of a slightly soluble weak acid. Determination of dissolution of tablets. Determination of rate constant and half life of pseudo first order reaction

## 2.7 PHARMACEUTICAL CHEMISTRY LAB-I

### UNIT I

Identification of organic compounds based on detection of elements, determination of physical constants, group solubility, functional groups and preparation of derivatives.

### UNIT II

Preparation of simple organic compounds based on different types of reactions such as nitration, sulfonation, oxidation, reduction, diazotization, hydrolysis, acylation etc. Examples: Aspirin, Acetanilide, Nitrobenzene, m-Dinitrobenzene, Benzamide etc.

### UNIT III

Estimation of functional groups like carboxyl, hydroxyl, amino, acetyl, carbonyl, unsaturation, ester group and amino nitrogen.

### 3.1 PHARMACEUTICS-II

#### UNIT - I

**Tablets** - Formulation of different types of tablets, granulation technology on large scale by various techniques, physics of tablets making, different types of tablet compression machinery and equipment employed, evaluation of tablet, Manufacturing area design and layout flow diagram of tablet manufacturing.

#### UNIT - II

**Tablets** -Coating of tablets: Types of coating, sugar coating, film coating, film forming materials, formulation of coating solution, equipment for coating, coating process, evaluation of coated tablets, Physiological availability and tablet coating, Stability Kinetics and quality assurance

#### UNIT - III

**Capsules** - Advantages and disadvantages of capsule dosage form, Material for production of hard gelatin capsules, Size of capsules, Method of capsule filling. Capsule disintegration in the digestive system. Half life of capsules.

#### UNIT - IV

**Capsules** - Sealing and packaging, Soft gelatin capsules shell and its content, Quality control, Stability testing and storage. Form Fill and Seal method. Machines used in FFS method. Understanding quality analysis of the above method. Cosmetology and Cosmetic preparation - Fundamentals of cosmetic science, Structure and function of skin and hair, Formulation, Preparation, Packaging and Evaluation of cosmetic products for skin, hair, eye, denitrifies, Preparations like nail polish, lipstick, baby care products, shaving cream, after-shave lotions, etc

#### REFERENCE BOOKS

1. Remingtons "Pharmaceutical Sciences"
2. Bentley's Pharmaceutics.

### 3.2 FORENSIC PHARMACY & ETHICS

#### UNIT I

Introduction and Principles of Forensic Science, Forensic Medicine and Toxicology, Medicinal Chemistry of Drugs of Abuse, and Other allied areas.

#### UNIT II

Pharmaceutical Legislations – A brief review. Drugs & Pharmaceutical Industry – A brief review. Pharmaceutical Education – A brief review. Pharmaceutical Ethics:

#### UNIT III

An elaborate study of the following: (A) Pharmacy Act 1948 (B) Drugs and Cosmetics Act 1940 and Rules 1945 [14] Unit-III : (C) Medicinal & Toilet preparations (Excise duties Act 1955) (D) Narcotic Drugs & Psychotropic Substances Act 1985 & Rules. (E) Drugs Price Control Order 1995.

#### UNIT IV

A brief study of the following with special reference to the main provisions. (A) Poisons Act 1919 (B) Drugs and Magic remedies (Objectionable Advertisements) Act 1954. (C) Medical termination of Pregnancy Act 1970 & Rules 1975. (D) Prevention of Cruelty to Animals Act 1961. (E) States Shops & Establishments Act & Rules. (F) A.I.C.T.E. Act 1987 (G) Patents Act 1970 (H) Weight and Measures Act (I) Package and Commodity Act (J) U.S Food and Federal D&C Act

#### BOOKS RECOMMENDED :

1. B.M., Mittal, Textbook of Forensic Pharmacy, National Book Centre, Dr. Sundari Mohan Avenue, Calcutta.
2. Relevant Acts & Rules Published by the Govt. of India.

### 3.3 PHARMACEUTICAL CHEMISTRY-II

#### UNIT I

**Quality Control-** Significance of qualitative analysis in quality control, Different techniques of analysis, Preliminaries and definitions, Significance of figures, Rules for retaining significant digits, Types of errors, minimization of error, Selection of sample, precision and accuracy, Fundamentals of volumetric analysis, Methods of expressing concentration, Primary and secondary standards

#### UNIT II

**Acid Base Titration-** Acid base concepts role of solvers, Relative strength of acids and bases, Ionization, Law of mass action, Common ion effect, Ionic product of water, pH, Hydrolysis of salts, Henderson-Hasselbalch equation, Buffers solutions, Neutralization curves, Acid-base indicators, Theory of indicators, Choice of indicators, Mixed indicators, Polyamine and amino acid systems Amino acid titration, Applications in assay

#### UNIT III

**Precipitation Titrations-** Precipitation reactions, solubility product, effect of acids, , Temperature and solvent upon the solubility of a precipitate, Argentometric titration and titrations involving ammonium or potassium thiocyanate, mercuric nitrate and barium sulphate, Indicators, Gay-Lussac method, Mohr's method, Volhard's method, Fajan's method.

#### UNIT IV

**Non-aqueous titrations-** Acidimetry & Alkalimetry, Basic principles, solvents involved indicators, Typical examples of Acidic & Basic drug molecules, **Complexometric titration-** Types of complexometric titrations, Metal ion indicator, Complexometric titrations involving EDT, Typical examples of complexometric titration. Oxidation Reduction Titrations- Concepts of oxidation and reduction, Redox reactions strengths and equivalent weights of oxidizing and reducing agents, Theory of redox titrations, Redox indicators cell representations, Measurement of electrode potential, Oxidation-reduction curves, Iodimetry and Iodometry

#### Recommended Books

1. Textbook of Biochemistry by Devlin, 5th Ed.
2. Textbook of Medical Biochemistry Vol-I and II by M.A. Hashmi.
3. Biochemistry by Stryer, Lubert, Latest Ed.

### 3.4 INTRODUCTION TO PHARMACEUTICAL ENGINEERING

#### UNIT I

Different unit systems, dimensional analysis, different types of plotting methods. Problems related to stoichiometry. Concept of material balance. Definitions related to humidity, use of psychometric chart. Problems on humidity.

#### UNIT II

Theory and problems related to vapour pressure and thermodynamics. Concept of heat balance.

#### UNIT III

Fluid statics, Measurement of pressure drop-- Simple, differential, inclined etc. , Fluid Dynamics in Newtonian system: Types of flow, Reynolds number, Bernoulli's theorem, Fluid friction, pipe roughness, sudden contraction and enlargement in pipes and pipe fittings, Flow measuring devices— Orificemeter, venturimeter, rotameter, pitot tube, weirs; pumps—centrifugal , gear, reciprocating, gear peristaltic etc.

#### UNIT IV

Non- Newtonian Fluid flow – Theory of various types of Non- Newtonian Fluid flow, modified Reynolds number etc.

### 3.5 MANUFACTURING MANAGEMENT

#### UNIT I

Elements of operations management; introduction to various production and operational functions such as planning, design, production, maintenance, purchase and inventory, logistics, operations strategy – Importance of P&OM in the value chain.

#### UNIT II

Various types of production systems; location of the plant – influencing factors; plant layout – influencing factors and types; process layouts, product layouts, assembly line; lean manufacturing techniques – principles, characteristics and benefits

#### UNIT III

Production planning and control; sequencing and scheduling principles; inventory control; materials management; purchase and inventory control– influencing factors, inventory carrying costs

#### UNIT IV

Productivity – work measurement, time study, method study and ergonomics; outsourcing; supply chain management; just-in-time – concepts, advantages and implementation; logistics. Total quality management – quality in various aspects of business; various tools and analysis used in current business environments; maintenance management – breakdown, preventive, total productive maintenance (TPM), planning, maintenance engineering and reporting; Future directions of production and operations management;

#### REFERENCE BOOKS

1. B Mahadevan - Operations Management – Theory and Practice, Pearson Education, 2010.
2. J P Saxena - Production and Operations Management; 2<sup>nd</sup> Edition, Tata Mcgraw Hill, 2009.
3. S N Chary - Production and Operations Management; 4<sup>th</sup> Edition, Tata Mcgraw Hill, 2010.

### 3.6 PHARMACEUTICS LAB-II

#### UNIT I

Non systemic liquid antacid preparation, Application and related emulgents, Non staining iodine preparation, Syrup IP, Syrup based liquid preparation, Effervescent preparation, Tooth Powder, Liquid Disinfectant, and Ointment

#### UNIT II

Preparation of the following preparation:

Tablet, coating, Capsule, Parenterals, ophthalmic products, suppository

### 3.7 PHARMACEUTICAL CHEMISTRY LAB-II

#### UNIT I

Assay of inorganic pharmaceuticals by aciditrimetry, alkalimetry, permanganometry, iodometry, dichromatometry (internal and external indicators), and argentometry using Mohr's method and adsorption indicator, gravimetry, and complexometry. Limit tests.

#### UNIT II

Determination of viscosity of a liquid using Ostwald Viscometer

Determination of Surface tension of a pure liquid using different methods.

Determination of Interfacial tension between two liquids by the drop count method.

Determination of transition temperature of sodium carbonate by solubility method.

Determination of mutual solubility curve of phenol and water.

Determination of variation of refractive index with the composition of liquid mixtures.

Determination of end point in a typical titration by Conductometric method.

Determination of the specific and molecular rotation of a compound using polarimeter.

Determination of velocity constant of a first order reaction.

Determination of coefficient of an organic compound between two solvents.

Determination of equilibrium constant of the equilibrium

Study on the absorption of acetic acid on charcoal----- verification of Freundlich's adsorption isotherm.

Potentiometric titration.

## 4.1 MEDICINAL CHEMISTRY-I

### UNIT I

**Basic Principles of Medicinal Chemistry: Physicochemical aspects (Optical, geometric and bioisosterism) of drug molecules and biological action.** Drug-receptor interaction including transduction mechanism, concept of prodrug. [08] Mode of action, uses, structure activity relationship of the following classes of drugs (Synthetic procedures of individually mentioned drugs only)

### UNIT II

Drugs acting at Synaptic and neuro-effector junction sites: Cholinergic, Anticholinergic & Anticholinesterases-Neostigmine, Physostigmine, Methacholine, Pilocarpine, Atropine. Adrenergic Drugs- Ephedrine, Amphetamine, Salbutamol, Adrenaline.

### UNIT III

Drugs acting on the Central Nervous System . General Anaesthetics-Thiopental, Ketamine, Methohexital. 4 Local Anaesthetics-Lignocaine, Benzocaine. Sedatives and Hypnotics-Phenobarbitone, Alprazolam. Opioid Analgesics-Pethidine, Methadone, Pentazocine. Antitussives-Cramiphen, Dextromethorphen. [08] Anticonvulsants-Phenytoin, Carbamazepine, Ethosuximide, Valproic Acid. Antiparkinsonism drugs- Carbidopa, Levodopa. CNS Stimulants-Caffeine, Nikethamide.

### UNIT IV

Psychopharmacological Agents : [08] Antianxiety drugs- Diazepam, chlordiaze Poxide. Antidepressants – Imipramine, Amitriptyline Fluoxetine. Antispasmodic and Antiulcer drugs-Dicyclomine, Ranitidine, Omeprazole. Skeletal muscle Relaxants– Gallamine Mephenesin, Antipsychotic- Chlorpromazine, Haloperidol. **Digestive system** – Absorption, Stomach, Pancreatic secretion, Types of jaundice. Digestive System: Gross anatomy of the gastro-intestinal tract, functions of its different parts including those of liver, pancreas and gall bladder, various gastrointestinal secretions and their role in the absorption and digestion of food. Disorders of digestive system.

### Reference :

1. Pharmacopoeia of India, Ministry of Health, Govt. of India.
2. Wolff ME. Ed. Burger's Medicinal Chemistry, John Wiley & Sons, New York.
3. Degado J.N. and Remers W A R, 10th eds., Wilson and Giswold's Text book of Organic Medicinal and Pharmaceutical Chemistry, Lippincott, William & Wilkins.
4. Foye W C. Principles of Medicinal Chemistry, Lea & Febiger, Philadelphia.

## 4.2 BIO-STATISTICS

### UNIT I

**Summary Measures - Measures of Central tendency – Relevance of Arithmetic Mean,** Median, Mode, Geometric and Harmonic Mean in different situations. Measures of Dispersion; Range; standard deviation; coefficient of variation; Applications to business.

### UNIT II

Introduction to probability and statistics – Definitions, types of variables, Organising data. Basic definitions and rules of probability, conditional probability, Baye's theorem, and random variables, Normal distribution.

### UNIT III

Probability Distributions: Binomial, Poisson, Uniform and Normal, Expected Values, Payoff Table. Hypothesis testing – one sample and two sample tests for means and proportions of large samples, Design of Experiments.

### UNIT IV

Sampling Distribution and Estimation – central limit theorem, sampling techniques, Point and Interval, estimation of population parameters of large samples. Correlation and Regression – Correlation analysis, estimation of regression line. Time Series Analysis – Variations in time series, trend analysis, cyclic variations, seasonal variations and irregular variations. Index numbers.

## REFERENCE BOOKS

1. K. Subramani, A.Santha – Statistics for Management, Second Edition, Scitech Publications, 2011.
2. T.N. Srivatsava, Shailaja Rego – Statistics for Management, The McGraw-Hill Companies, 2011.
3. Manish Sharma & Amit Gupta - The Practice of Business Statistics, Khanna Publishing House

## 4.3 OPERATIONS RESEARCH

### UNIT I

Decision Theory – Objectives, Strategies and Decision Pay-off. Decision Models. Rules/Techniques for decision making. Use of Marginal Analysis, Comparative Decision Model, Limitations.

### UNIT II

Introduction to Operations Research - Meaning - Scope – Models - Limitation. Linear Programming – Problem Formulation – Application in Management decision making, Problems in management decision making.

### UNIT III

Linear Programming Tools. Transportation and Assignment Problems Integer Programming , 0-1 Programming. (Simple Problems Only) Introduction to non-linear programming /simulations.

### UNIT IV

Queuing Theory – Simple Queuing models and problems, Limitations of Queuing Theory. Exposure to use of simulations. Network Analysis CPM: Meaning and Objectives, Significance, Limitations, Activity Floats, Slack. Resource Allocation and Levelling. Time-Cost Trade-offs. PERT: Calculating probability of Completions, PERT as a control device. Similarities and Dissimilarities between CPM and PERT. Awareness of software for Network Analysis.

## REFERENCE BOOKS

1. Kanti Swarup, Gupta P.K, Operations Research, 15<sup>th</sup> Edition, Sultan Chand & Sons, 2010.
2. C.R. Kothari, An Introduction to Operational Research, Third Edition, Vikas Publishing House, 2010.
- 3.

## 4.4 FINANCIAL REPORTING AND ANALYSIS

### UNIT I

Basic Accounting Concepts – Trial balance – reconciliation – Income and expenditure statements – Depreciation - Cash flow statement - purpose - uses - structure - format of cash flow statement - preparing cash flow statement - reporting cash flows - interpreting the cash flow statement

### UNIT II

Objective and users of financial statements – the reporting entity – elements of financial statements – financial analysis – articulation of financial statements – elements from which financial statements are constructed

### UNIT III

Standards of comparison - earnings quality -techniques of financial statement analysis - using financial ratios - corporate disclosure policy - efficient market hypothesis and financial statement analysis - earnings management - interpreting financial reports - scanning the annual report

### UNIT IV

Effect of changes in accounting principles – sustainable earnings – recurring vs nonrecurring – operating vs non- operating – continuing vs discontinued Effect of discontinuing operations – comprehensive income – revenue recognition – various forms of sales growth – internally-generated growth, growth from acquisitions. Ratio Analysis – Financial statements forecasting – accounting policies, changes in accounting estimates and errors – events after the balance sheet date

## REFERENCE BOOKS:

1. R Narayanaswamy - "Financial Accounting" - A managerial Perspective", Prentice Hall of India 2011.
2. SN Maheshwari - Principles of Management Accounting, sultan chand and sons 2006.
3. Gerald I White, Ashipaul C. Sondhi, Dov Fried - "The analysis and use of financial statements, wiley student edition, third edition, 2004

## 4.5 COST ACCOUNTING

### Unit I

#### Introduction

- Development of Cost and Management Accounting to satisfy the internal needs of management for information for decision making
- Functions of various branches of Accounting and their relationship
- Accounting as an information system
- Relevant data for decision making
- **Cost Concepts, Cost Accumulation and Profit Measurement**
- Analysis and Classification of Costs
- Material, Labor and Overhead
- Costing Methods
- Job Costing
- Process Costing
- Service Costing

### Unit II

#### Cost Allocation

- Volume Based Cost Allocation
- Activity Based Cost Allocation
- Use of ABC system for cost management and profitability improvement
- **Management Control Systems**
- Budgetary Control
- Standard Costing
- Responsibility Accounting

### Unit III

#### Capital Expenditure Decisions

#### Marginal Costing and Managerial Decisions

- Concept
- It's application in Cost – Volume – Profit ( CVP ) analysis and decision making Unit
- Relevant Cost Analysis and Management Decisions.
- Contemporary Topics
- Strategic Cost Management
- Life Cycle Costing
- Target Costing
- Transfer Pricing

### REFERENCE BOOKS

1. P.C.Tulsian – Cost Accounting, First Edition, S.Chad Publisher, 2009.
2. M.Hanif– Modern Cost and Management Accounting, The McGraw-Hill Companies

## 4.6 MEDICINAL CHEMISTRY LAB-I

### UNIT I

Synthesis of selected drugs from the course content involving two or more steps. Establishing the pharmacopoeial standards of the drugs synthesized.

### UNIT II

Synthesis of Methyl salicylate. To establish pharmacopoeial standards of Methyl salicylate.

### UNIT III

Synthesis of Paracetamol. To establish pharmacopoeial standards of Paracetamol. To synthesize Benzocaine.

### UNIT IV

To establish pharmacopoeial standards of Benzocaine. Synthesis of Phenytoin. To establish pharmacopoeial standards of Phenytoin.Synthesis of Barbituric acid desivatives. To establish pharmacopoeial standards.

## **4.7 HUMAN RESOURCE MANAGEMENT-PROJECT**

### **UNIT I**

**Instruction provided on field of HRM,Acquisition of HRM,Development of human resource ,Maintainance of Human Resource .**

### **UNIT II**

**Live Project on different aspect of HRM**

## 5.1 PHARMACOLOGY

### UNIT I

General Pharmacology: Introduction, Routes of Administration of Drugs, Mechanism of action of Drugs. Basic idea of mechanism of Drug action, Drug Toxicity. Pharmacology of ANS - Neurohumoral transmission, Drug acting on Sympathetic and Parasympathetic system. Principles of Toxicology- Poisons and Antidote

### UNIT II

Drugs acting on CNS - Sedative and Hypnotic agents, Psychotropic drugs including Psychomimetics, Drugs used for Epilepsy. Analgesics - Anti-inflammatory drugs, anti arthritic and anti gout drugs, Narcotic analgesics. .

Drugs acting on Endocrine system –

Drugs used in the treatment of thyroid disorders, Drugs acting on Pituitary and Adrenal Cortex, Hypoglycemic agents

### UNIT III

Drug Discovery – including concepts of Clinical Trials Working Capital concept – forecasting working capital needs – marginal working capital needs – adequacy of working capital – determinants of working capital – cash management models - Managing Working Capital – cash flow – key elements of working capital management – 4c's of working capital – collections, credit terms, credit facilities, cash (raising capital)

### UNIT IV

**Renal Pharmacology: Diuretics.**

**Anti allergic drugs.**

**Respiratory pharmacology: Drugs used in the treatment of various disorders of the respiratory tract.**

**Chemotherapy**

## 5.2 PHARMACEUTICAL SALES & MARKETING PRACTICES

### UNIT I

Sales management, sales organization, sales forecasting, sales force management, sales promotion objective.

### UNIT II

Marketing Concepts – approaches to marketing – core concepts of marketing – marketing process- functions of marketing - Marketing Mix – Four P's of marketing – Its significance in the competitive environment – product and product line – product mix – product life cycle – managing the product in product life cycle Market segmentation – bases for market segmentation of consumer goods, industrial goods and services – market targeting and position strategies . Difference between sales and marketing. Different types of marketing plans.

### UNIT III

Pricing – importance – methods – objectives – factors - Market evaluation and controls – types, processes, obstacles to marketing control – Different types of Pricing – with objectives

### UNIT IV

Physical Distribution – importance and role of distribution in marketing - introduction to various channels of distribution – promotion tools – sales promotion, advertising, personal selling, direct marketing and online marketing as promotion tools. New Product introduction – fundamentals of market intelligence – New Product decision process – types of new products – test marketing of a new product, packaging – purpose, types - marketing audit and marketing ethics

### REFERENCE BOOKS:

1. Philip Kotler - Marketing Management, 14<sup>th</sup> Edition 2011
2. VS Ramasamy & S. Namakumari - Marketing Management: Planning, Implementation and Control: Global Perspective Indian Context, Macmillan India, 2007

## 5.3 PHARMACEUTICS III

### UNIT I

**Cell Structure & Dynamics** - Origin of life on Earth, Basics of Cell Biology (structure & function), Biogenesis of Cellular organelles, Structure and function of Prokaryotic cell & its components, Membrane structure & transport, Cell cycle

### UNIT II

**Basic Microscopy & Instrumentation** - Microscopy: Light microscopy (principles, parts & function, Operation), Image analysis of different classes of Microbes, Preparation of Microbial media (bacteria, yeast, mold, algae, protozoa) , Sterilization: principles & operations – Autoclave, Hot Air Oven, Filtration, Laminar Air Flow Principles & operations of Incubators & Shakers, Principle & operation of Centrifuge Principle & operation of pH meter, Principle & operation of Colorimeter, Principle & operation of Spectrophotometer, Electrophoresis techniques

### UNIT III

**Organic Mechanisms in Biology**- Common Mechanisms in Biological Chemistry, Biomolecules, Lipid Metabolism, Carbohydrate Metabolism, Amino acid Metabolism, Nucleotide Metabolism, Chromosomal variation in Number & Structure, **Principles of Microbiology**- Overview of history of Microbiology, Classification of Microbes, Concept of Sterilization, Microbes in Extreme Environment, Pathogenic Microorganisms, Basic concepts of Virology

### UNIT IV

**Microbial Growth & Reproduction**- Basic concepts of Microbes, Kinetics of Bacterial growth, Microbial Reproduction, Sexuality and bacterial recombination, Practical, **Microbial Genetics**- Prokaryotic Genomes, Mechanism of genetic exchange, Bacteriophages, Bacteriophage Genetics. Principles of Immunology- Immune Response, Regulation of immunoglobulin gene expression, Major Histocompatibility complexes, Immunity to infection, Immuno-techniques, Vaccines & Vaccination, Auto-immune diseases.

### REFERENCES:

1. Microbiology for nurses
2. Microbiology
3. General microbiology
4. Hand book of microbiology
5. Stuck A Viven
6. Michall J Pelczar
7. Hans G Schlesal
8. Bisen P. S

## 5.4 PHARMACOGNOSY & PHYTOCHEMISTRY

### UNIT I

Definition, history, scope and development of Pharmacognosy

Classification of drugs: Alphabetical, Morphological, Taxonomical, Chemical and Pharmacological classification of Drugs.

Systematic pharmacognostic study of the following: Carbohydrates and derived products: Agar, guar gum, acacia, honey, Isapgul, pectin, Starch, Sterculia and Tragacanth.

Lipids, Beeswax, Castor oil, Cocoa butter, Cod liver oil, Hydnocarpus oil, kokum butter, Lard, Linseed oil, Rice Bran oil, Shark liver oil and Wool fat.

### UNIT II

Pharmaceutical Aids: Study of Pharmaceutical aids like talc, diatomite, kaolin, bentonite, gelatin and natural colors.

Resins: Study of Drugs Containing Resins and resin Combination like Colophony, podophyllum, Jalap, cannabis, capsicum, myrrh, asafoetida, balsam of tolu, balsam of Peru, benzoin, turmeric, ginger.

## **UNIT II**

Cultivation, collection, processing and storage of crude drugs: Factors influencing cultivation of medicinal plants. Types of soils and fertilizers of common use Pest management and natural pest control agents. Plant hormones and their applications. Polyploidy, mutation and hybridization with reference to medicinal plants.

## **UNIT II**

Fibres: Study of Fibres used in pharmacy such as cotton, silk, wool, nylon, glasswool, polyester and asbestos.

Volatile oils: General methods of obtaining volatile oils from plants, study of Volatile oils of Mentha, Coriander, Cinnamon, Cassia, Lemon peel, Orange peel, Lemon grass, Citronella, Caraway, Dill, Spearmint, Clove, Fennel, Nutmeg, Eucalyptus, Chenopodium, Cardamom, Valerian, Musk, Palmarosa, Gaultheria, Sandal wood.

Tannins: Study of tannins and tannin containing drugs like Gambier, black Catechi, gall and Myrobolan. The holistic concept of drug administration in traditional systems of medicine. Introduction to ayurvedic preparations like Arishtas, Asavas, Gutikas, Churnas, Lehyas, and Bhasmas.

Plant growth Regulators and Tissue culture and its application in Pharmacy

## **5.5 PHARMACEUTICAL ADVERTISING & SERVICES MANAGEMENT**

### **UNIT I**

Services Marketing - meaning - nature of services - Types and importance - Relationship marketing - Mission, strategy, elements of design, marketing plan market segmentation.

### **UNIT II**

Marketing mix decisions:- unique features of developing, pricing, promoting and distributing services - Positioning and differentiations strategies, quality of service industries - Achievement and maintenance, customer support service-

### **UNIT III**

Nature and scope of advertising, Copy design and development, Advertising control and Public Relationship..

### **UNIT IV**

Marketing of Pharmaceutical and Hospital services :- Understanding the services provided in hospitals and clinics. Understanding the after sale services for any medical and pharmaceutical instruments. Marketing of Non-Profit Organisations :- Services offered by charities - Educational service - miscellaneous services - Power and Telecommunication.

## **REFERENCES :**

Services Marketing - S.M.Jha - Himalaya Publishing Company 1998, Mumbai.

1. Services Marketing - Indian experiences - Ravishankar - South Asia Publication 1998, Delhi.
2. Services Marketing: Integrating Customer Focus across the Firm – Valarie A Zeitnamd and Mary Jo Bitmer, 3<sup>rd</sup> Edition, TMH, 2003.
3. Services Marketing - Text & Readings - P.K. Sinha & S.C.Sahoo - Himalaya, Mumbai.
4. Essence of Services Marketing - Adrian Pyne - Prentice Hall of India, New Delhi.
5. Services Marketing - Lovelock - Prentice Hall
6. Services Marketing - Jeithaml - I.S.E.
7. Services Marketing - Gousalves - Prentice Hall
8. Services Marketing - Principles & Practice - Palmer, Prentice Hall.
9. Services Marketing - Woodruffe - McMillan.
10. Ravi Shankar, Services Marketing, Excel, 2

## 5.6 PHARMACEUTICS LAB-III

### UNIT I

Different methods of sterilization : Moist heat , Dry heat, Filtration through Bacterial filter.

Sterility testing of injectables according to I.P.

Microscopic examination of microbes including bacteria, yeast and fungi. Gram staining of bacteria.

### UNIT II

Preparation of basic media for culture of microorganisms : Liquid and solid media. Growth on slants and Petridis. Cultivation and isolation of bacteria. Bacterial counts. Fermentation reactions.

Evaluation of antiseptic / disinfectants: Rideal-Walker Test (Phenol Co-efficient)

### UNIT II

Assay of antibiotics : Well diffusion and Disc diffusion method; MIC and MBC of antibiotics.

Assay of vitamins/ amino acids.

## 5.7 PHARMACOGNOSY LAB

### UNIT I

Identification of crude drugs mentioned in theory

Microscopic studies of the crude drugs mentioned in theory

Preparation of herbarium sheets

### UNIT II

Powder analysis of crude drugs mentioned in theory.

Extraction of crude drugs

Chemical group tests on the crude drugs.

### UNIT III

Thin layer chromatographic studies of the herbal drug constituents.

Isolation, separation, Purification of various phytoconstituents of pharmaceutical significance.

Microscopic measurement of cells and cell contents: Starch grains, calcium oxalate crystals and phloem fibres, trichomes etc.

Determination of leaf constants such as stomatal index, stomatal number, vein islet number, vein termination number and Palisade ratio.

## 6.1 MEDICINAL CHEMISTRY-II

### UNIT I

Basic concept of drug design, Introduction to Analogues based drug design, Structure based drug design, Introduction to QSAR & Computer aided drug design.

### UNIT II

Cordiac glycosides & drug used for CHF-Digitoxin Antiarrhythmic drugs-Propranolol, Procainamide  
Antianginal drugs- Isosorbide mononitrate Antihypertensive drugs-Captopril, methyl dopa, Nifedipine.  
Anticoagulants- Heparin, warfarin Antihyperlipidemics- Lovastatin, Clofibrate

### UNIT III

Anti cancer drugs Alkylating Agents- Chlorambucil, Carmustine Antimetabolites- Methotaxate 6.  
mercaptapurine 5. Fluorouracil .

### UNIT IV

Analgesics and Antipyretics – Aspirin, Mefenamic Acid, Ibuprofen, Diclofenac, Paracetamol. Antibacterials  
– Sulphamethoxazole, Sulphadiazine, Sulphacetamide, Nalidixic acid. Diuretics – Acetazolamide,  
Chlorthiazide; Furosemide, Spironolactone.

### REFERENCES:

1. Wolff ME, Ed. Burger's Medicinal Chemistry, John Wiley & Sons, New York.
2. Foye W C, Principles of Medicinal Chemistry, Lea & Febiger, Philadelphia.

## 6.2 PHARMACEUTICAL MARKETING RESEARCH& SUPPLY CHAIN MANAGEMENT

### UNIT I

#### Fundamentals of marketing research

- Thinking like a researcher
- The scientific research paradigm
- The language of research
- Typical applications of marketing research
- Types of marketing research

### UNIT II

#### The marketing research process

- Defining the research objective
- Research designs
- Designing the research methodology
- Sampling plan
- Data collection
- Analysis and interpretation
- Reporting the results

### UNIT III

#### Data analysis

- Data preparation and description
- Hypothesis testing
- Simple tabulation and cross-tabulation
- ANOVA and the design of experiments
- Multivariate analysis
- Correlation
- Regression
- Factor analysis (for data reduction & market segmentation)
- Cluster analysis (for market segmentation)
- Multi-dimensional scaling (MDS) for brand positioning

- Non-parametric tests

#### **UNIT IV**

##### **Supply Chain Management**

- Concept, drivers and obstacle
- Planning, Inventory Management, Transportation
- Co-ordination, Distribution and Logistics.

##### **Demand and Business Forecasting methods**

- Determinants of demand
- Estimation of demand and business
- Variable identification, time series and cross sectional data collection, estimation of parameters, interpretation of regression statistics
- Selecting a forecasting technique
- Qualitative forecasting techniques
- Regression methods
- Time Series analysis
- Trend analysis, cyclical variations, seasonal effects, random fluctuations
- N.B.: Sample case analysis and training on use of softwares
- Excel spreadsheet, SPSS, SAS/AMOS

##### **REFERENCE BOOKS:**

1. Philip Kotler - Marketing management, 2009
2. Ashok Ranchhod, - Marketing Strategies : A Contemporary Approach, Pearson 2011

### **6.3 PHARMACOLOGY LAB II**

#### **UNIT I**

Synthesis of selected drugs from the course content involving two or more steps.

#### **UNIT II**

Establishing the pharmacopoeial standards of the drugs synthesized.

#### **UNIT III**

Spectral analysis of the drugs synthesized.

### **6.4 PROJECT & SEMINAR/INDUSTRIAL TRAINING & SEMINAR**