B. Pharmacy Scheme and Syllabus

First Semester

Course Code	Course Name	L+T	P	Total Marks		Credits
				Internal Marks	External Marks	
BTHU101	Communicative English	2+1	**-**	20	80	3
BPHM101	Pharmacognosy-I	2+1	-	20	80	3
BPHM 102	Pharmaceutical Chemistry-I (Inorganic Pharmaceutical Chemistry)	3+1	-	20	80	4
BPHM 103	Pharmaceutical Analysis-I	3+1	-	20	80	4
BPHM 104	Computer Science & Application	2+1	-	20	80	3
BPHM 105	Introduction to Dosage Form	2+1	-	20	80	3
BPHM 106	Lab Pharmacognosy-I	-	3	20	80	2
BPHM 107	Lab Pharmaceutical Chemistry-I (Inorganic Pharmaceutical Chemistry)	-	3	20	80	2
BPHM 108	Lab Pharmaceutical Analysis-I	-	3	20	80	2
BPHM109	Lab Computer Science & Application	-	3	20	80	2
	Total	20	12	200	800	28
	Grand Total	**32H/Week**		**1000**		**28**

Second Semester

Course Code	Course Name	L+T	P	Total Marks		Credits
				Internal Marks	External Marks	
HVPE101	Human Values and Professional Ethics	2+1	**-**	20	80	3
BPHM 201	Pharmaceutics-I (Dispensing & Community Pharmacy)	2+1	-	20	80	3
BPHM 202	Pharmaceutical Chemistry-II (Physical Chemistry)	3+1	-	20	80	4
BPHM 203	Pharmaceutical Chemistry-III (Organic Chemistry)	3+1	-	20	80	4
BPHM 204	Anatomy, Physiology & Health Education-I	2+1	-	20	80	3
BPHM205	Pharmaceutics-II (Hospital Pharmacy)	2+1	-	20	80	3
BPHM206	Lab Pharmaceutics-I (Dispensing & Community Pharmacy)	-	3	20	80	2
BPHM 207	Lab Pharmaceutical Chemistry-II (Physical Chemistry)	-	3	20	80	2
BPHM 208	Lab Pharmaceutical Chemistry-III (Organic Chemistry)	-	3	20	80	2
BPHM 209	Lab Pharmaceutics-II (Hospital Pharmacy)	-	3	20	80	2
	Total	20	12	200	800	28
	Grand Total	**32H/Week**		**1000**		**28**

Third Semester

Course Code	Course Name	L+T	P	Total Marks		Credits
				Internal Marks	External Marks	
BPHM301	Pharmaceutical Mathematics	3+1	-	20	80	4
BPHM 302	Pharmacognosy-II	2+1	-	20	80	3
BPHM 303	Pharmaceutics-III (Unit Operation-I)	2+1	-	20	80	3
BPHM 304	Anatomy, Physiology & Health Education-II	2+1	-	20	80	3
BPHM305	Pharmaceutical Industrial Management	2+1	-	20	80	3
BPHM306	Pharmaceutical Chemistry-IV (Organic Chemistry-II)	3+1	-	20	80	4
BPHM 307	Lab Pharmacognosy-II	-	3	20	80	2
BPHM 308	Lab Pharmaceutics-III (Unit Operation-I)	-	3	20	80	2
BPHM 309	Lab Anatomy, Physiology & Health Education-II	-	3	20	80	2
BPHM 310	Lab Pharmaceutical Chemistry-IV (Organic Chemistry-II)	-	3	20	80	2
	Total	**20**	**12**	**200**	**800**	**28**
	Grand Total	**32H/Week**		**1000**		**28**

Fourth Semester

Course Code	Course Name	L+T	P	Total Marks		Credits
				Internal Marks	External Marks	
BPHM401	Pharmaceutics-IV (Unit Operation-II)	2+1	-	20	80	3
BPHM 402	Pharmaceutical Analysis-II	3+1	-	20	80	4
BPHM 403	Pharmacognosy-III	2+1	-	20	80	3
BPHM 404	Pathophysiology of Common Diseases	2+1	-	20	80	3
BPHM405	Pharmaceutics-V (Physical Pharmacy)	3+1	-	20	80	4
BPHM406	Intellectual Property Rights	2+1	-	20	80	3
BPHM 407	Lab Pharmaceutics-IV (Unit Operation-II)	-	3	20	80	2
BPHM 408	Lab Pharmaceutical Analysis-II	-	3	20	80	2
BPHM 409	Lab Pharmacognosy-III	-	3	20	80	2
BPHM 410	Lab Pharmaceutics-V (Physical Pharmacy)	-	3	20	80	2
	Total	**20**	**12**	**200**	**800**	**28**
	Grand Total	**32H/Week**		**1000**		**28**

Fifth Semester

Course Code	Course Name	L+T	P	Total Marks		Credits
				Internal Marks	External Marks	
BPHM501	Pharmaceutical Chemistry-V (Biochemistry)	2+1	-	20	80	3
BPHM 502	Pharmaceutics-VI (Pharmaceutical Technology-I)	2+1	-	20	80	3
BPHM 503	Pharmacology-I	3+1	-	20	80	4
BPHM 504	Pharmacognosy-IV	2+1	-	20	80	3
BPHM505	Pharmaceutics- VII (Biopharmaceutics & Pharmacokinetics)	3+1	-	20	80	4
BPHM506	Lab Pharmaceutical Chemistry-V (Biochemistry)	-	3	20	80	3
BPHM 507	Lab Pharmaceutics-VI (Pharmaceutical Technology-I)	-	3	20	80	2
BPHM 508	Lab Pharmacology-I	-	3	20	80	2
BPHM 509	Lab Pharmacognosy-IV	-	3	20	80	2
BPHM 510	Lab Pharmaceutics- VII Biopharmaceutics & Pharmacokinetics)	-	3	20	80	2
	Total	**17**	**15**	**200**	**800**	**28**
	Grand Total	**32H/Week**		**1000**		**28**

Sixth Semester

Course Code	Course Name	L+T	P	Total Marks		Credits
				Internal Marks	External Marks	
EVSC 101	Environmental Science	2+1	-	20	80	3
BPHM 601	Pharmaceutical Chemistry-VI (Medicinal Chemistry-I)	3+1	-	20	80	4
BPHM 602	Pharmaceutical Jurisprudence & Ethics	2+1	-	20	80	3
BPHM 603	Pharmacology-II	3+1	-	20	80	4
BPHM604	Pharmacognosy-V	2+1	-	20	80	3
BPHM605	Pharmaceutical Microbiology	2+1	-	20	80	3
BPHM 606	Lab Pharmaceutical Chemistry-VI (Medicinal Chemistry-I)	-	3	20	80	2
BPHM 607	Lab Pharmacology-II	-	3	20	80	2
BPHM 608	Lab Pharmacognosy-V	-	3	20	80	2
BPHM 609	Lab Pharmaceutical Microbiology	-	3	20	80	2
	Total	**20**	**12**	**200**	**800**	**28**
	Grand Total	**32H/Week**		**1000**		**28**

Seventh Semester

Course Code	Course Name	L+T	P	Total Marks		Credits
				Internal Marks	External Marks	
BPHM 701	Pharmaceutical Biotechnology	2+1	-	20	80	3
BPHM 702	Pharmaceutics-VIII (Pharmaceutical Technology-II)	2+1	-	20	80	3
BPHM 703	Pharmacology-III	2+1	-	20	80	3
BPHM 704	Pharmaceutical Chemistry-VII (Medicinal Chemistry-II)	3+1	-	20	80	4
BPHM705	Lab Pharmaceutical Biotechnology	-	3	20	80	2
BPHM706	Lab Pharmaceutics-VIII (Pharmaceutical Technology-II)	-	3	20	80	2
BPHM 707	Lab Pharmacology-III	-	3	20	80	2
BPHM 708	Lab Pharmaceutical Chemistry-VII (Medicinal Chemistry-II)	-	3	20	80	2
BPHM 709	Project Work	-	6	20	80	3
BPHM710*	Industrial Training	-	8	20	80	4
	Total	**13**	**26**	**200**	**800**	**28**
	Grand Total	**39H/Week**		**1000**		**28**

Eighth Semester

Course Code	Course Name	L+T	P	Total Marks		Credits
				Internal Marks	External Marks	
BPHM 801	Pharmaceutics-IX (Dosage Form Design)	3+1	-	20	80	4
BPHM 802	Pharmaceutical Analysis-III	2+1	-	20	80	3
BPHM 803	Pharmacognosy-VI	2+1	-	20	80	3
BPHM 804	Pharmacology-IV (Clinical Pharmacy & Drug Interaction)	3+1	-	20	80	4
BPHM805	Pharmaceutical Chemistry-VIII (Medicinal Chemistry-III)	3+1	-	20	80	3
BPHM806	Lab Pharmaceutics-IX (Dosage Form Design)	-	3	20	80	2
BPHM 807	Lab Pharmaceutical Analysis-III	-	3	20	80	2
BPHM 808	Lab Pharmacognosy-VI	-	3	20	80	2
BPHM 809	Lab Pharmaceutical Chemistry-VIII (Medicinal Chemistry-III)	-	3	20	80	2
BPHM810	Dissertation on Project Work	-	6	20	80	3
	Total	**18**	**18**	**200**	**800**	**28**
	Grand Total	**36H/Week**		**1000**		**28**

Note: At least two sessional exams to be conducted, the best of two will be considered in final exam

*Industrial Training of four weeks in summer vacations after 6th Semester & evaluation in 7th Semester

SEMESTER-I

BTHU 101 Communicative English

Objective/s and Expected outcome:

The objective is to help the students to become independent users of english language. Students should be able to understand spoken and written english language of varied complexity on most including some abstract topics; particularly the language of their chosen technical field. They must show awareness of appropriate format and a capacity for explaining their views in a rational manner. The students should be able to converse fluently, without strain with international speakers of english in an accent and lexis that is widely understood across the globe. They will be able to produce on their own texts which are clear and coherent.

1. **Reading:** Reading texts of varied complexity; speed reading for global and detailed meaning; processing factual and implied meanings
2. **Vocabulary:** Building up and expansion of vocabulary; active use of the prescribed expressions in the appropriate context
3. **Grammar:** Revising and practicing a prescribed set of grammar items; using grammar actively while processing or producing language
4. **Writing:** The qualities of good writing; Learning the prescribed written expressions of conventional use; writing business letters, emails; reports, summaries and various forms of descriptive and argumentative essays

Learning and Teaching Activities:

PART A (Reading)

The prescribed reading textbook for students will be S. P. Dhanavel English and Communication Skills for Students of Science and Engineering (with audio CD), Orient Blackswan. They will go through the reading texts themselves with the help of a dictionary or word power as given at the end. As they progress from one reading to another they should learn to read fast with greater degree of understanding of both concrete and abstract topics. While taking up the textbook lessons in the classroom, the teacher shall ensure that students can do the following:

a) Identify the significant points and conclusions as given in the text.
b) Handle large texts (even outside the prescribed book) with overall comprehension of the links between arguments and the finer distinction between stated and implied meanings.
c) Generally read the stance or the point of view of the writer and present it in the form of a summary
d) Use the vocabulary learnt in the lessons (especially given in „word power‟) productively in various writing tasks as suggested at the end of each lesson.

e) Profitably use the grammatical items as discussed at the end of each lesson while producing language for communication.

Besides the textbook, the teacher must insist that students extend their reading by taking up additional texts of their own choice.

PART B (Writing)

In addition to the various exercises given at the end of each lesson of Dhanavel‟s book, the teacher shall use Anne Laws Writing Skills, Orient Blackswan to teach the language and conventions of writing. The students must learn the language that expresses various cognitive functions that are frequently used in writing. With the help of the teacher who will give them adequate practice, the students should be able to:

a) Convey information on concrete or abstract topics with clarity and precision.
b) Write about objects or events with appropriate detail in both descriptive and narrative form.
c) Explain ideas and build up arguments with adequate support in a convincing manner.
d) Use language with some degree of flexibility in consideration to the reader.
e) Produce effectively such forms of professional writing as business letter, emails, notes, memos, reports summaries etc.

While teaching, the teacher must inculcate in students the habit of revising their writing. The teacher can also use and recommend the relevant sections of the following books for developing writing skills in students.

Suggested Readings/ Books

1. Vandana R Singh, The Written Word, Oxford University Press, New Delhi
2. KK Ramchandran, et al Business Communication, Macmillan, New Delhi
3. Swati Samantaray, Busines Commnication and Commnicative English, Sultan Chand, New Delhi.
4. S.P. DhanavelEnglish and Communication Skills for Students of Science and Engineering (with audio CD).

BPHM 101Pharmacognosy-I

Module- 01: Definition, history, scope and development of Pharmacognosy; Sources of drugs: Biological, marine, mineral and plant tissue culture.

Module- 02: Plant Cell, Histology and Morphology: Structure of plant cell and its nonliving inclusions, different types of plant tissues and their functions. Morphology and histology of root, stem, bark, wood, leaf, flower, fruit and seed. Modifications of root and stem.

Module- 03: Classification of drugs: Alphabetical, morphological, taxonomical, chemical and pharmacological; Plant taxonomy: Study of the following families with special reference to medicinally important plants-Apocynacae, Solanaceae and Rutaceae.

Module- 04: Plant taxonomy: Study of the following families Umbelliferae, Leguminosae, Rubiaceae, Liliaceae, Graminae, Labiatae, Cruciferae and Papaveraceae with special reference to medicinally important plants.

Module- 05: Cultivation, collection, processing and storage of crude drugs: Factors influencing cultivation of medicinal plants. Polyploidy, mutation and hybridization with reference to medicinal plants.

Module- 06: Quality control of crude drugs: Adulteration of crude drugs. Brief introduction to evaluation of crude drugs by organoleptic, microscopic, physical, chemical and biological methods.

Module- 07: Introduction to crude drug monograph and its importance in registration of herbal products. Introduction to Chromatographic Techniques: Column, Paper, Thin Layer (TLC).

Module- 08: Introduction to Phytoconstituents of drugs: Definition, classification, properties and identification tests of alkaloids, glycosides, terpenoids, steroids and flavonoids.

Suggested Readings/ Books:

1. Trease, G. E. and Evans, W.C. Pharmacognosy, Published by Elsevier, a Division of Reed Elsevier India Pvt. Ltd., New Delhi.
2. Kokate, C.K., Purohit, A.P. and Gokhale, S.B Pharmacognosy, Nirali Prakashan, Pune.
3. Handa, S.S and Kapoor, V.K. Textbook of Pharmacognosy, Vallabh Prashan, New Delhi.
4. Wallis, T.E. Textbook of Pharmacognosy, Fifth Edition, CBS Publishers and Distributors, New Delhi.
5. Tyler, V.C., Brady, L.R. and Robers, J.E. Pharmacognosy. Lea & Febiger, Philadelphia.
6. Tyler, V.E. Jr. and Schwarting, A.E. Experimental Pharmacognosy. Burgess Pub. Co, Hinneapois, Minnesotta
7. Brain, K.R. and Turner, T.D. The Practical Evaluation of Phytopharmaceuticals. Wright-Scientechnica, Bristol.

BPHM 102 Pharmaceutical Chemistry-I

Module 01: Impurities in Pharmaceutical Substances & their control sources and types of impurities, their limits, limit test for chlorides, sulphates, iron, lead, arsenic & heavy metals.

Module 02: Pharmaceutical Aids & Necessities (Antioxidants: Theory, the selection of Antioxidants, Official antioxidants (Hypophosphorous Acid, Sodium bisulphite, Sodium thiosulphate, Sodium nitrite); **(Water:** Official water (Water, Purified water, Water for injection, Bacteriostatic water for injection, Sterile water for injection)

Module 03: Major Intra & Extracellular Electrolytes {Major Physiological ions (Chloride, Phosphate, Bicarbonate, Sodium, Potassium, Calcium, Magnesium); Electrolytes used in replacement therapy(Sodium chloride), Potassium replacement (potassium chloride), Calcium replacement (Calcium chloride, Calcium gluconate) Parenteral magnesium administration (Magnesium sulphate), Physiological acid base balance, Electorlytes used in acid base therapy (Sodium acetate, Potassium acetate, Sodium bicarbonate, Sodium citrate, Potassium citrate, Sodium lactate, Ammonium chloride), Electrolyte combination therapy.}; **Essential and Trace Elements** {Iron, Copper, Zinc, Chromium, Manganese, Molybdenum, Selenium, Sulphur and Iodine. Official Iodine Products (Iodine, Potassium iodide, Sodium iodide}.

Module 04: Gastrointestinal Agents {Acidifying agents, **Antacids:** (Sodium bicarbonate, Aluminium hydroxide, Aluminium phosphate, Dihydroxy Aluminium, Sodium carbonate, Calcium carbonate, Tribasic Calcium phosphate, Magnesium carbonate, Magnesium hydroxide, Magnesium oxide, Magnesium phosphate, Magnesium trisilicate) Combination antacid preparations.; **Protectives and Adsorbents:** Introduction. Bismuth containing products, Bismuth subnitrate, Bismuth subcarbonate, Kaolin, Activated charcoal.**}**; **{Saline Cathartics:** Introduction, Sodium phosphate, Potassium sodium tartrate, Magnesium hydroxide, Magnesium citrate, Magnesium sulphate, Potassium phosphate, Potassium bitartrate, Calomel.**}**

Module 05: Protective: Definition, Protective products, Talc, Insoluble Zinc compounds (Zinc oxide, Calamine, Zinc stearate), Titanium dioxide, Aluminium as a protective agent, Silicone polymer; **Antimicrobials and Astringents:** Antimicrobial terminology, mechanism of action, control of antimicrobial/ astringent action; **Oxidative Antimicrobial Agents:** Hydrogen peroxide, Zinc peroxide, Sodium carbonate, Potassium permanganate, Iodine preparation and compounds**.**

Module 06 Protein Precipitant Antimicrobial Agents: Silver nitrate, Mild Silver Protein Mercury compounds (Yellow Mercuric oxide, Mercuric chloride), Sulphur and Sulphur compounds(Sublimed sulphur and Precipitated sulphur) Boric acid and Sodium borate, Antimony potassium tartrate, Official compounds of Aluminium and Zinc; **Dental Products:** Anticaries agents: Fluorides, official products (Sodium fluoride, Stannous fluoride), Phosphates, Dentifrices: Dentifrices containing Fluorides, Official products (Pumice).

Dentifrices containing desensitizing agents, Official products (Zinc chloride and Zinc-Eugenol cement).

Module 07: Co-ordination Compounds and Complexation {Theoretical considerations and official products (Calcium disodium edetate, Disodium edetate, Dimercaprol & Penicillamine**}**; **Miscellaneous Inorganic Pharmaceutical Agents {**Inhalants, respiratory stimulants, expectorants and emetics, antidotes,tableting aids and suspending agents.**}**

Suggested Readings/ Books:

1. J.H. Block, E. Roche, T.O. Soine and C.O. Wilson, "Inorganic Medicinal and Pharmaceutical Chemistry", Lea & Febiger, Philadelphia, P.A.
2. L.M. Artherden, Bentley and Drivers, "Textbook of Pharmaceutical Chemistry", S& Ed., Oxford University Press, Delhi.
3. Pharmacopoeia of India, Govt. of India, Ministry of Health.
4. Block, Roche, Soine & Wilson. Inorganic Medicinal & Pharmaceutical Chemistry. 1st edition, 1986. Varghese publishing house, Mumbai.
5. Chatwal. Pharmaceutical Chemistry Inorganic. 3rd edition, 2007. Himalaya publishing house, Mumbai.
6. Singh & Kapoor. Practical Pharmaceutical chemistry. 4th edition, 1998. Vallabh prakashan, Delhi.

BPHM103 Pharmaceutical Analysis-I

Module 01: Quantitative Analysis and Data Handling {Introduction to concept of Quality Control and Assurance in Pharmaceutical Industry and role of Statistics in pharmaceutical analysis. Significance of quantitative analysis in quality control, different techniques of analysis, preliminaries and definitions, significant figures. Rules for retaining significant figures, Types of errors (Determinate and Indeterminate). Minimization of errors, Propagation of errors in addition and subtraction, multiplication and division, exponents, logarithms, precision and accuracy, selection of sample.

Module 02: Acid Base Titrations {Acid base concept, role of the solvent, Relative strengths of acids and bases; Law of mass action; common ion effect, ionic product of water, pH, Hydrolysis of salts, Handerson – Hasselbach equation; Buffer and buffer capacity: Acid base indicators, Theory of indicators, Choice of indicators; Neutralization curves (Strong acid and strong base, strong acid weak base, weak acid strong base and weak acid weak base).

Module 03: Acid Base Titrations {Polyprotic system, dissociation calculations for polyprotic acids, fractions and equilibrium concentrations of dissociating species at a given pH, salts of polyprotic acids, (Amphoteric salts and unprotonated salts), Buffer calculations for polyprotic acids, titrations of polyprotic acid, amino acid system and its titrations. Application in assay of H3B03, HCl, NaOH and Na_2CO_3.

Module 04: Oxidation-Reduction Titrations {Concepts of oxidation and reduction, redox reactions, equivalent weights of oxidizing and reducing agents, electrochemical cells, reduction potential, standard reduction potential, Nernst equation, cell representations, measurement of electrode potential and its application in determining the equilibrium constant of a reaction.

Module 05: Oxidation-Reduction Titrations {Concept of formal potential, oxidation reduction curves, redox indicators, potassium pemanganate titrations, iodimetry andiodometry, ceric sulphate titrations, potassium iodate titrations, sodium 2, 6- dichlorophenol - indophenol titrations, pharmaceutical applications.

Module 06: Precipitation Titrations {Precipitation reactions, solubility product, effects of common ion, acids, temperature and solvent upon the solubility of a precipitate, conditional solubility product, fractional precipitation.

Module 07: Precipitation Titrations {Argentometric titrations, ammonium or potassium thiocyanate titrations, mercuric nitrate titrations, indicators, Gay-Lussac method, Mohr's method, Volhard's method, Fajan's method, Pharmaceutical applications.

Module 08: Gravimetric Analysis Precipitation techniques, the colloidal state, gravimetric factor, supersaturation, co-precipitation and its types, Post precipitation, digestion, washing of the precipitate, filtration, filter papers and crucibles, ignition, thermogravimetric curves of copper sulphate, specific examples like barium as barium sulphate, aluminium as aluminium

oxide, calcium as calcium oxalate and magnesium as magnesium pyrophosphate, organic precipitants.

Suggested Readings/ Books

1. Becket & Stenlake. Practical Pharmaceutical Chemistry. Vol. 1& 2. 4th edition, 2005. CBS Publishers, New Delhi.
2. Jeffery, Bassett & Mendham. Vogel‟s text book of Quantitative chemical analysis. 5th edition, 1996. Addison Wesley Longman Ltd England.
3. Danzer K, Analytical Chemistry, 2007, Springer.
4. R.M. Verma. Analytical Chemistry. IIIrd edition, 2007. CBS Publishers, New Delhi.
5. Alexeyev. Qualitative Analysis. 2nd edition, 2005. CBS Publishers, New Delhi.
6. L. M. Atherden, Bentley and Driver's Textbook of Pharmaceutical Chemistry, Oxford University Press, Delhi (Latest Edition)

BPHM 104 Computer Science and Applications

Scope of the Subject: Subject deals with computer fundamentals and operating system. Computer applications are expected to offer various pharmaceutical services as drug information services, drug design and pharmacokinetic analysis.

Objectives of the Subject: Upon completion of the subject student shall be able

- To understand the basic MS-Word, MS- Excel and MS- Power point
- To know computer programming, data analysis, calculation and graphing using formulae and function.

Module- 01: Computer Fundamentals Introduction to Computers: Characteristics of computers, Historical perspectives of computers, Computer generations, types of computers and uses, Software, Hardware, Basic architecture and functions of CPU and its parts, Important I/O devices like Keyboard, Mouse, Printers, Video Monitors; **Number System:** Decimal, Binary, Basic Binary arithmetic (Conversion to and from decimal numbers, Binary addition and subtraction; **Memory Storage:** Memory Cells, Semiconductor and Magnetic core memory, ROM (its types), RAM, Cache and Virtual memory, Secondary storage devices and their organization (Hard disk, Floppy disk, CD, DVD).

Module- 02: Operating Systems Definitions, Need, Organization, Functions, Types of Operating Systems, DOS, Windows, Handling Drives, Directories and files, Commands (Internal & External), Icons, Clipboard, Folders, Major differences between DOS & Windows.

Module- 03: Communication Networks Hardware and software components, Seven layers of OSI architecture, Network Topologies (Ring, Star, Fully Connected and Bus), LAN and WAN, Bounded and unbounded communication media, Internet, World Wide Web and I.T., Browsers, Important terminology regarding Internet applications, Electronic Mail, Potential uses and abuses of Internet.

Module- 04: Computer Programming Programming languages, Classifications, Low level and high level languages, merits and demerits of languages, object oriented languages, Syntax and semantics, Basic steps involved in software development, Flow charts, Compilers and Interpreters.

Module- 05: Simple programming using C Data types, Constants, Variables, Arithmetic and relational expressions, Symbolic constants, Input and output assignment statements, If-else, Switch statements, Loops (While, do-while and for), Transfer statements, Problem solving using "C" taking simple algorithms.

Module- 06: Computer Applications Word Processing: Techniques, File manipulation, Formatting, Printing setups Table handling, Mail merge, etc. using MS-Word; **Spreadsheet Package:** Worksheets, Formatting sheets, Calculations and graphing using formulae and functions, Import and export of data using MS-Excel.

Module- 07:Computer Applications Graphics: Objectives and types of graphics , Presentation packages, Slides designing, Diagrams and graphs, Import & Export data using MS-Power Point**; Data Security against Viruses:** Definition of computer viruses, Detection, prevention and cure against viruses using anti-virus software packages.

Module- 08: **Pharmaceutical Applications** Basics of computer use in various pharmaceutical and clinical applications like drug information services, hospital and community pharmacy, drug design, pharmacokinetics and data analysis.

Suggested Readings/ Books

1. Fundamentals of Computers by Rajaraman, Prentice Hall of India.
2. Tiwari, NK, Computer Fundamental with Pharmacy Applications, Ist edition, 2008, Pharm Med Press.
3. Learn MS-Office 2000 by Stultz, BPB Publications. 4. Using Microsoft Windows 1998 by Ivens, Prentice Hall of India.
4. Learn DOS in a day by Stultz, BPB Publications.

BPHM 105 Introduction to Dosage Form

Scope and objectives: Subject deals with the basic knowledge of Pharmacopoeias, monographs, history of pharmacy and basic knowledge of different dosage forms. It prepares the students for most basics of the applied field of pharmacy.

Objectives of the Subject: Upon the completion of the course the student should be able to –

- Know about the pharmacopoeias and the role of pharmacist.
- Understand about pharmacy and brief about the dosage forms
- Know various additives and technical terms commonly used in the field of pharmacy.
- Know the method of preparation of extracts and principle of infusion, decoction etc.

Module- 01: Pharmacy Profession {History of Pharmacy, Pharmacy as a career, Pharmaceutical education in India and abroad, Pharmacopoeia of India and other Pharmacopoeias, Other official books.

Module- 02 & Module- 03: Introduction to different dosage forms, their classification with examples (Official formulation), their relative application; Definitions, general formulation, manufacturing procedures and official products of solutions, aromatic waters, syrups, spirits, elixirs, glycerides, lotions, liniments, gargles, mouth washes, suspension, emulsion, douches, draught preparation.

Module- 04 & Module- 05: Additive of dosage forms Introduction, classification and uses of following additives in formulation of different dosage forms: preservatives, antioxidants, surfactants, hydrocolloids, emulsify agent, suspending agent, Diluents, binders, lubricants, organoleptic additives.

Module- 06: Crude Extracts Infusion, decoction, tincture, and extracts, methods of preparation of dry, soft and liquid extracts of IP.

Module- 07: Allergenic extracts Types of allergens, preparation of extracts testing and standardization of extracts.

Module- 08: Important terms of Pharmaceutics Definition and examples of expectorant, pharmaceutical aid, additives.

Suggested Readings/ Books

1. Remington‟s Pharmaceutical Sciences.
2. Pharmacopoeia of India, Govt. of India, Ministry of Health
3. Ansel : Introduction to Pharmaceutical Dosage Forms

BPHM 106 Lab Pharmacognosy-I

1. To study different features of a dicot stem (Sunflower)
2. To study different feature of a dicot root
3. To study various pharmacognostic characteristics of a monocot stem
4. To study various pharmacognostic characteristics of a monocot root (Maize)
5. To study various pharmacognostic characteristics of a monocot leaf
6. To study various pharmacognostic characteristics of a dicot leaf
7. To determine the veinislet and veinlet termination number.
8. To study diagnostic features of *Vinca rosea* (Apocynaceae)
9. To study diagnostic features of *Datura stramonium/metel* (Solanaceae)
10. To study diagnostic features of *Ocimum bassilicum* (Labiatae)
11. To study diagnostic features of *Brassica compestris* (Cruciferae)
12. To study diagnostic features of *Fennel* (Umbelliferae)
13. To study diagnostic features of *Cassia fistula* (Leguminosae)
14. To identify accacia gum by performing various tests
15. To identify tragacanth by performing various tests
16. To identify honey by performing various tests
17. To perform tests for identification of castor oil
18. To perform tests for identification of sesame oil
19. To determine the stomatal number and stomatal index of senna leaf
20. To determine the palisade ratio of Indian senna
21. To determine the average diameter of starch grains (Cinnamon powder)
22. To measure the average width of fiber in Cinnamon powder
23. Preparations of minimum of 50 herbarium sheets(one each for every student) of selected medicinal plants

Suggested Reading/ Books:

1. Trease, G.E. and Evans, W.C. *Pharmacognosy*. Published by Elsevier, a Division of reed Elsevier India Pvt. Ltd., New Delhi.
2. Tyler, V.E. Jr. and Schwarting, A.E. *Experimental Pharmacognosy*. Burgess Pub. Co, Hinneapois,Minnesotta.
3. Brain, K.R. and Turner, T.D. The *Practical Evaluation of Phytopharmaceuticals*. Wright- Scientechnica, Bristol.
4. Wallis, T.E. *Practical Pharmacognosy*, 4th Edn, 2011. Published by PharmaMed Press, Hyderabad, India.
5. Kokate, C.K. *Practical Pharmacognosy*, 4th Edn, 1994. Published by M.K Jain for Vallabh Prakashan , Delhi, India

BPHM 107 Lab Pharmaceutical Chemistry-I

1. To analyze the presence of acid radicals (anions) in the given mixture.
2. To analyze the presence of six radicals (three anions and three cations) in the given mixture by semi-micro method.
3. To perform detection of group I and group II radicals.
4. To perform determination of melting point and boiling points.
5. To perform identification tests for Magnesium Sulphate
6. To perform identification tests for Calcium chloride.
7. To perform identification tests for barium sulphate.
8. To perform identification tests for Hydrochloric acid and qualitatively analyze the chloride ions.
9. To perform identification tests for ferrous sulphate.
10. To perform identification tests for hydrogen peroxide.
11. To perform identification tests for Boric acid .
12. To perform identification tests for Potassium permanganate and qualitatively analyze for potassium ions.
13. To perform identification tests for ammonium chloride and qualitatively analyze for ammonium as cation and chloride as anion.
14. To perform limit tests for chloride in Magnesium sulphate.
15. To perform limit tests for sulphate .
16. To perform limit tests for iron.
17. To perform limit tests for heavy metals.
18. To perform limit tests for Arsenic.

Suggested Readings/ Books:

1. Dr. Nirmal Sharma, Dr. Yogeshwar sharma, K.K. Thakur, Pratibha nand, Dr. G.C. Sharma, " Practical Inorganic Pharmaceuticalchemistry and Viva- voce", first edition (2007), Birla Publications Pvt. Ltd.
2. Singh & Kapoor. Practical Pharmaceutical chemistry. 4th edition, 1998. Vallabh prakashan, Delhi.
3. Dr. G. Devala Rao," Practical Pharmaceutical Inorganic Chemistry" 3rd edition (20101-2011), Birla Pub.
4. Anees Ahmed Siddiqui, Mohammed Ali," Practical Pharmaceutical Chemistry" first editin, (1997) CBS Publishers

BPHM 108 Lab Pharmaceutical Analysis-I

1. To study the typical analytical balance, the requirements of a good balance, weights, care and use of balance, methods of weighing and errors in weighing.
2. To perform calibration of volumetric apparatus and weights including fractional weight using digital weighing balance of sensitivity 01 mg.
3. To carry out the standardization of 0.1 N HCl using standard solution of sodium carbonate.
4. To carry out the standardization of 0.1 N H2SO4 using standard solution of sodium carbonate.
5. To standardise the given of 0.1 N NaOH using standard solution of oxalic acid.
6. To perform the assay of given sample of sodium bicarbonate.
7. To perform the assay of given sample of boric acid.
8. To perform the assay of given sample borax using standard solution of HCl.
9. To standardise the given solution of 0.1N KmnO4 using standard solution of oxalic acid.
10. To perform the assay of given sample of ferrous sulphate using standard solution of KmnO4.
11. To perform the assay of the given sample of coper sulphate.
12. To perform the assay of the given sample of sodium chloride.
13. To perform the assay of the given sample of KCl.
14. To prepare and standardize 0.1 N iodine solution.
15. To prepare and standardise 0.1 N sodium thiosulphate solution.
16. To estimate the amount of barium present in the given solution

Suggested Readings/ Books:

1. Jeffery, Bassett & Mendham. Vogel text book of quantitative chemical analysis. 5th edition, 1996. Addison Wesley Longman ltd England.
2. R.M.Verma. Analytical chemistry .3rd edition, 2007. CBS Publishers, New Delhi. Becket & stenlake. Practical pharmaceutical chemistry. Vol.1 & 2. 4th edition, 2005. CBS publishers, New Delhi.
3. Alexeyev. Quantative analysis. 2nd edition.2005. CBS publishers, New Delhi.
4. L.M.Atherden, Bentley and Driver's textbook of pharmaceutical chemistry, Oxford University Press, Delhi (Latest Edition).

BPHM109 Lab Computer Science & Applications

1. Give the various components, their functions and identification of various parts of a computer and peripherals. Perform installation of a computer and loading system software and application software.
2. Installation of DOS and simple exercises on TYPE, REN, DEL, CD, MD, COPY, TREE, BACKUP commands.
3. Exercises on entering text and data (Typing Practice) Features of Windows as an operating system.
4. File Management using Ms Word, Page set up using Ms Word Editing a document using Ms Word.
5. Formatting a document using Ms Word Tables and Borders using Ms Word Working with more than one window in MS Word
6. Perform application of MS Excel
7. Application of Menu commands, Work books and Creating a chart
8. Customize MS-Excel
9. Introduction to MS-Power Point and use of Wizards and Templates Preparing Presentations.
10. Prepare and submit a scientific power point presentation using various effects and application of power point
11. Prepare a program in C language to find sum of any two numbers.
12. Prepare a program in C language to find gross salary
13. Prepare a program in C language to find table (mathematical) of any number.
14. Prepare a program in C language to find greatest in 3 numbers
15. Prepare a program in C language to show the use of conditional operator
16. Program to find that entered year is leap year or not
17. Prepare a program in C language to find whether given no is even or odd
18. Display the kind of output on screen (in the left of the screen)
    a. 1
    b. 22
    c. 333
    d. 4444
19. Write a C program to find the sum of first 100 natural number.
20. Prepare a program in C language to find the sum of first 100 odd or even numbers.
21. Write a C program to display first 25 Fibonacci number.
22. Write a C program to display first 100 prime numbers
23. Write a C program to find factorial numbers and to print the accepted no and its reverse number

SEMESTER-II

HVPE 101 Human Values & Professional Ethics

Objective and Expected Outcome: The subject will help the students to discriminate between the valuable and superficial in the life. To help develop the critical ability to distinguish between essence and form, or between what is of value and what is superficial, in life - this ability is to be developed not for a narrow area or field of study, but for everyday situations in life, covering the widest possible canvas. To help students develop sensitivity and awareness; leading to commitment and courage to act on their own belief. It is not sufficient to develop the discrimination ability, it is important to act on such discrimination in a given situation. Knowingly or unknowingly, our education system has focused on the skill aspects (learning and doing) - it concentrates on providing to its students the skills to do things. In other words, it concentrates on providing "How to do" things. The aspects of understanding "What to do" or "Why something should be done" is assumed. No significant cogent material on understanding is included as a part of the curriculum. A result of this is the production of graduates who tend to join into a blind race for wealth, position and jobs. Often it leads to misuse of the skills; and confusion and wealth that breeds chaos in family, problems in society, and imbalance in nature. This course is an effort to fulfill our responsibility to provide our students this significant input about understanding. This course encourages students to discover what they consider valuable. Accordingly, they should be able to discriminate between valuable and the superficial in real situations in their life. It has been experimented at IIITH, IITK and UPTU on a large scale with significant results.

PART A

1. Course Introduction - Need, Basic Guidelines, Content and Process for Value Education (6)

- Understanding the need, basic guidelines, content and process for Value Education.
- Self Exploration–what is it?- its content and process; „Natural Acceptance‟ and Experiential Validation- as the mechanism for self exploration.
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

2. Understanding Harmony in the Human Being - Harmony in Myself! (6) Understanding human being as a co-existence of the sentient „I‟ and the material Body‟ Understanding the needs of Self ("I") and "Body" - *Sukh* and *Suvidha*

- Understanding the Body as an instrument of "I" (I being the doer, seer and enjoyer) Understanding the characteristics and activities of "I" and harmony in "I" Understanding the harmony of "I" with the Body: *Sanyam* and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure *Sanyam* and *Swasthya*

3. Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship (6)

Understanding harmony in the Family- the basic unit of human interaction

- Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*; Trust (*Vishwas)* and Respect (*Samman)* as the foundational values of relationship
- Understanding the meaning of *Vishwas*; Difference between intention and competence
- Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): *Samadhan, Samridhi, Abhay, Sah-astitva* as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society (*Akhand Samaj),* Universal Order (*Sarvabhaum Vyawastha)*- from family to world family.

PART-B

4. Understanding Harmony in the Nature and Existence - Whole existence as Co-existence (4)

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulation in nature
- Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space
- Holistic perception of harmony at all levels of existence
-

5. Implications of the above Holistic Understanding of Harmony on Professional Ethics (6)

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics:
    - Ability to utilize the professional competence for augmenting universal human order
    - Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems

    - Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order:
    - At the level of individual: as socially and ecologically responsible engineers, technologists and managers
    - At the level of society: as mutually enriching institutions and organizations

Text Book:

1. R R Gaur, R Sangal, G P Bagaria, 2009, *A Foundation Course in Value Education*.

Suggested Readings / Books:

1. Ivan Illich, 1974, *Energy & Equity,* The Trinity Press, Worcester, and HarperCollins, USA
2. E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if people mattered*, Blond & Briggs, Britain.
3. A Nagraj, 1998, *Jeevan Vidya ek Parichay,* Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, *How the Other Half Dies,* Penguin Press. Reprinted 1986, 1991
5. PL Dhar, RR Gaur, 1990, *Science and Humanism*, Commonwealth Purblishers.
6. A.N. Tripathy, 2003, *Human Values*, New Age International Publishers
7. Subhas Palekar, 2000, *How to practice Natural Farming,* Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, *Limits to Growth – Club of Rome's report*, Universe Books.
9. E G Seebauer & Robert L. Berry, 2000, *Fundamentals of Ethics for Scientists & Engineers ,* Oxford University Press
10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, *Engineering Ethics (including Human Values)*, Eastern Economy Edition, Prentice Hall of India Ltd
11. B P Banerjee, 2005, *Foundations of Ethics and Management,* Excel Books.
12. B L Bajpai, 2004, *Indian Ethos and Modern Management*, New Royal Book Co., Lucknow. Reprinted 2008.

BPHM 201 Pharmaceutics –I (Dispensing and Community Pharmacy)

Module- 01: Introduction: Definition, Scope and future trends in Dispensing. **Posology:** Factor affecting dose and action of drugs, dosage route of administration, application of some common drugs and calculation of doses for infants, adults and elderly patients.

Module- 02: Prescription: Definition, various part of prescription, Handling of prescription, source of errors in prescription, General dispensing procedures including labelling of dispensing products.

Module- 03: Pharmaceutical Calculations: Weight & measures, house hold measures and use of equivalents imperial system to metric system, Enlarging and reducing recipes percentage solutions, allegation, proof spirit, isotonic solutions and displacement value.

Module- 04: Principle involved and procedures adopted in dispensing (I): Typical prescriptions like mixtures, solutions, emulsions, creams, ointments, powders, capsules, pastes, jellies,

Module- 05: Principle involved and procedures adopted in dispensing (II) : suppositories, ophthalmic, pastilles, lozenges, pills, lotions, liniments, inhalations, paints, sprays, tablet triturates etc.

Module- 06: Incompatibilities (I): Physical, therapeutic and chemical incompatibilities, inorganic incompatibilities including incompatibilities of metals and their salts, non-metals, acids, alkalis, organic incompatibilities.

Module- 07: Incompatibilities (II): Purine bases, alkaloids, pyrazolone derivatives, amino acids, quaternary ammonium compounds, carbohydrates, glycosides, anaesthetics, dyes, surface active agents, correction of incompatibilities. Therapeutic incompatibilities.

Module- 08: Community Pharmacy: Organization and structure of retail and wholesale drug store types of drug store and design, legal requirements for establishment, maintenance and drug store, dispensing of proprietary products, maintenance of records of retail and wholesale, patient counseling, role of pharmacist in community healthcare & education.

Suggested Readings/ Books:

1. Carter SJ. "Cooper & Gunn‟s Tutorial Pharmacy", 6th edition, CBS Publishers & Distributors, New Delhi.
2. Indian Pharmacopoeia 2007, Vol I-III**,** 2008, Indian Pharmacopoeia Commission, Ghaziabad.
3. British Pharmacopoeia 2009, British Pharmacopoeia Commission, UK.
4. Remington‟s The Science & Practice of Pharmacy Mack Publishing Co. Easton, PA

5. Jain NK & Gupta GD. Modern Dispensing Pharmacy, II edition, 2009, Pharma Book Syndicate, Hyderabad Gaud RS

BPHM 202 Pharmaceutical Chemistry –II (Physical Chemistry)

Module 01: Behaviour of Gases: Kinetic theory of gases, Deviation from ideal behaviors and explanation.

Module 02: The Liquid State: Physical Properties (surface tension, parachor, viscosity, refractive index, optical rotation, dipole moments and chemical constituents).

Module 03: Solutions: Ideal and real solutions, solutions of gases in liquids, colligative properties, partition coefficient, conductance and its measurement, Debye Huckel Theory.

Module 04: Thermodynamics: First, Second and Third laws, Zeroth law, Absolute Temperature Scale, Thermochemical Equations, Phase-equilibria and Phase rule.

Module 05: Photochemistry: Consequences of light absorption, Jablenski diagram, Lambert-Beer Law, Quantum efficiency.

Module 06: Chemical Kinetics: Zero, first and second order reactions, complex reactions, theories of reaction kinetics.

Module 07: Chemical Kinetics: Characteristics of homogeneous and heterogeneous catalysis, acid base and enzyme catalysis.

Module 08: Adsorption: Freudlich and Gibbs adsorption, isotherms, Langmuir theory of adsorption. Quantum Mechanics: Postulates of quantum mechanics, operators in quantum mechanics, the Schrodinger wave equation.

Suggested Readings / Books

1. Laidler, K.J. Physical Chemistry with Biological Applications. Benjamin. 1980
2. Shoemaker, D.P. and Garland, C.W. Experiments in Physical Chemistry. McGraw Hill Book Co. New York.
3. Puri, B.R., Sharma, L.R. and Pathania, M.S. Principles of Physical Chemistry. Shoban Lal Nagin Chand & Co. 1993
4. Bahl, Bahl & Tuli. Essentials of Physical Chemistry. 14th edition, 2006. S. Chand & company, New Delhi.
5. Khosla, Garg & Gulati. Senior practical physical chemistry. 12th edition, 2006. R. Chand & company, New Delhi.
6. Mahadik & Bhosale. Hand book of practical chemistry. 9th edition, 2006. Nirali prakashan, Pune

BPHM 203 Pharmaceutical Chemistry –III (Organic Chemistry)

Module 01: Structure and Properties of Matter: The structural theory, the chemical bond, quantum mechanics, atomic orbitals, electronic configuration, molecular orbitals, intramolecular forces, bond dissociation energy, polarity of bonds, polarity of molecules, structure and physical properties including melting point, boiling point and solubility, acids and bases, isomerism. Role of Solvent: Secondary bonding, solubility of non-ionic and ionic solutes, protic and aprotic solvents, ion pairs, role of solvent in substitution reactions, phase-transfer catalysis.

Module 02: Stereochemistry: Introduction, stereoisomerism, enantiomerism, diastereoisomerism, optical activity, chiral center, racemic modification, meso-structures, configuration, reactions involving stereoisomers, stereoselective and stereospecific reactions.
[Note: Structure, Nomenclature, Preparation & Reactions of the following: Reactive Intermediate carbocation; carbanions; carbenes, nitrene and nitrenium ions are to be discussed whichever involved.]

Module 03: Alkanes: Introduction, Shapes, Nomenclature, Preparation, Halogenatation(Chain Reaction), Analysis**,** Alkenes & Alkynes: Introduction, Properties, Preparation(Elimination reaction), Electrophillic Reaction, Ozonolysis, Markornikovas rule, peroxide effect, Analysis; Cyclic Analogs: Baeyer strain theory, cyclopropane & cyclobutane, Angle Strain, cyclic ethers, crown ethers, epoxides, their analysis.

Module 04: Alkyl Halides: Structure, Nomenclature, Properties, preparation, Reactions SN1 and SN2, Saytzeffs rule. Alcohols & Ethers: Introduction, Structure, Nomenclature, Properties, Preparation, Williamsons Synthesis, their analysis

Module 05: Benzene and Arenes: Aromaticity, properties, Nomenclature, Naphthalene, Anthracene, Electrophillic Aromatic substitution, Freidal Craft alkylation, Analysis

Module 06: Aldehydes and Ketones: Introduction, Nomenclature, Preparation, Nucleophillic Addition reactions, analysis.

Module 07: Carboxylic Acids & their Functional Derivatives: Introduction, Nomenclature, Preparation, Acidity constant, conversions, Nucleophillic Acyl substitution, Acid Chlorides, Acid Anhydrides, Amides, Esters.

Module 08 Amines and Diazonium Salts: Introduction, Nomenclature, Preparation, Properties, Basicity, Hoffman degradation of amides and Analysis.; Phenol: Introduction, Nomenclature, Preparation, Properties,Acidity, Kolbes Reaction, Riemer tiemer reaction.

Suggested Readings / Books

1. Roberts, J.D. and Caserio, M.C. Basic Principles of Organic Chemistry. W.A. Benjamin, Inc., New York.

2. Vogel, A.I. A Textbook of Practical Organic Chemistry. ELBS/ Longman, London
3. Morrison & Boyd. Organic chemistry. 6th Edition, 2007. Dorling Kindersley India, Delhi.
4. Finar. Organic chemistry. Vol. 1& 2. 6th Edition, 2007. Dorling Kindersley India, Delhi.
5. Bentley & Drive. Text book of Pharmaceutical Chemistry. 8th Edition, 2005. Oxford University, New Delhi.
6. Mann & Saunders. Practical Organic Chemistry. 4th Edition, 2004. Orient Longman Ltd, New Delhi.
7. Ferguson, Textbook of Organic Chemistry, 2nd Edition, EWP
8. Gallego, Organic Reaction Mechanisms, Springer

BPHM 204 Anatomy, Physiology and Health Education –I (APHE –I)

Module 1: Scope of Anatomy and Physiology: Scope, basic medical terminology used in these subjects. Structure of cell, its components and their functions. Elementary Tissues of the Human Body: Epithelial, connective, muscular and nervous tissues, their sub-types and their characteristics.

Module 2 Osseous System: Structure, composition and functions of skeleton, Classification of joints, types of movements of joints, Disorders of joints.

Module 3 Skeletal Muscles: Gross anatomy; physiology of muscle contraction, physiological properties of skeletal muscles and their disorders.
Smooth Muscles: Morphology, Electrical and Mechanical Activity, molecular basis of contraction, relation of length to tension and plasticity.

Module 4 Haemopoietic System: Composition and functions of blood and its elements, their disorders, blood groups and their significance, mechanism of coagulation, disorders of platelets and coagulation. Lymph and Lymphatic System: Composition, formulation and circulation of lymph; disorders of lymph and lymphatic system. Basic physiology and functions of spleen.

Module 5 Cardiovascular System: Morphology, Electrical Properties, Pacemaker tissue Basic anatomy of the heart, Physiology of heart, blood vessels and circulation.

Module 6 Cardiovascular System Basic understanding of Cardiac cycle, heart sounds and understanding of Cardiac cycle, heart sounds and electrocardiogram. Blood pressure and its regulation.

Module 7 Communicable diseases: Brief outline, their causative agents, modes of transmission and prevention (Chicken pox, measles, influenza, diphtheria, whooping cough, tuberculosis, poliomyelitis).

Module 8: **Communicable Diseases:** Brief outline, their causative agents, modes of transmission and prevention (Chicken pox, measles, influenza, diphtheria, whooping cough, tuberculosis, poliomyelitis, helminthiasis, malaria, filariasis, rabies, trachoma, tetanus, leprosy, syphilis, gonorrhoea, and AIDS).

Suggested Readings/ Books:

1. Owunwonne Handbook of Radio pharmaceuticals. Narosa Publishing House, New Delhi.
2. Hassan, William E. Hospital Pharmacy. Lea & Febiger, Philadelphia.
3. Remington‟s The Science & Practice of Pharmacy Mack Publishing Co. Easton, PA
4. Turco. S, and King, R.E. Sterile Dosage Forms. Lea & Febiger, Philadelphia.

BPHM 205 Pharmaceutics –II (Hospital Pharmacy)

Module- 01: Organization & Structure: Organization of a hospital and hospital Pharmacy, Responsibilities of hospital pharmacist, Pharmacy and therapeutic committee, Budget preparation and Implementation.

Module- 02: Hospital Formulary: Contents, preparation and revision of hospital formulary.

Module- 03: Drug Store Management and Inventory Control:

i. Organization of drug store, Types of materials stocked, storage conditions.
ii. Purchase and Inventory Control-principles, purchase procedures, Purchase order, Procurement and stocking.

Module- 04: Drug distribution System in Hospitals:

i. Outpatient dispensing, methods adopted
ii. Dispensing of drugs to in-patients. Types of drug distribution system/s. Charging policy, labeling.
iii. Dispensing of drugs to ambulatory patients.
iv. Dispensing of controlled drugs.

Module- 05: Central Sterile Supply Unit and their Management: Types of materials for sterilization, Packing of materials prior to sterilization, sterilization equipments, Supply of sterile materials. Manufacture of Sterile and Non-sterile Products: Policy making of manufacturable items, demand and costing, personnel requirements, manufacturing practice, Master formula Card, production control, manufacturing records.

Module- 06: Drug Information Services: Sources of Information on drugs, disease, treatment schedules, procurement of information, computerized services (e.g., MEDLINE), Retrieval of information, Medication error.

Module- 07: Records and Reports: Prescription filling, drug profile, patient medication profile, cases on drug interaction and adverse reactions, idiosyncratic cases etc.

Module- 08: Nuclear Pharmacy: Introduction to Radio pharmaceuticals, radio-active half life, Units of radio-activity Production of radio-pharmaceuticals, Permissible radiation dose level, Radiation hazards and their prevention, specifications for radio-active laboratory.

Suggested Readings/ Books

1. Owunwonne Handbook of Radio pharmaceuticals. Narosa Publishing House, New Delhi.
2. Hassan, William E. Hospital Pharmacy. Lea & Febiger, Philadelphia.
3. Remington‟s The Science & Practice of Pharmacy Mack Publishing Co. Easton, PA
4. Turco. S, and King, R.E. Sterile Dosage Forms. Lea & Febiger, Philadelphia.

BPHM 206 Lab Pharmaceutics–I (Dispensing and Community Pharmacy)

1. To prepare and dispense chloroform water.
2. To prepare and dispense double strength chloroform water.
3. To prepare and dispense camphor water
4. To prepare and dispense concentrated peppermint water.
5. To prepare and dispense 30 ml of potassium bromide mixture.
6. To prepare and dispense 30 ml magnesium sulphate and magnesium carbonate mixture. To prepare and dispense 30 ml light magnesium carbonate and kaolin mixture.
7. To prepare and dispense 30 ml of phenacetin and caffeine mixture.
8. To prepare and dispense 30 ml castor oil in emulsion.
9. To prepare and dispense 60 ml liquid paraffin castor oil emulsion.
10. To prepare and dispense 20 g cetrimide cream BPC.
11. To prepare and dispense 20g cold cream.
12. To prepare and dispense 20 g vanishing cream.
13. To prepare and dispense 10 g paraffin ointment.
14. To prepare and dispense emulsifying ointment.
15. To prepare and dispense emulsifying wax.
16. To prepare and dispense Whitfield ointment (compound benzoic acid ointment).
17. To prepare and dispense simple ointment.
18. To prepare and dispense 60 ml calamine lotion.
19. To prepare and dispense 30 ml salicylic acid lotion.
20. To prepare and dispense 30 ml turpentine liniments.
21. To prepare and dispense 30 ml white liniments.
22. To prepare and dispense 30 ml camphor liniments.
23. To prepare and dispense compound iodine throat paint (**Mandle'**s paint)
24. To prepare and dispense tannic acid glycerine throat paint.
25. To prepare and dispense 30 ml aqueous iodine solution (Lugol‟s solution.)
26. To prepare and dispense 30 ml weak iodine solution.
27. To prepare and dispense 60 ml calcium hydroxide topical solution.
28. To prepare and dispense magnesium hydroxide suspension.
29. To prepare and dispense aspirin powder.
30. To prepare and dispense compound Rhubarb powder.
31. To prepare and dispense compound sodium bicarbonate powder.
32. To prepare and dispense a mixture of magnesium carbonate, sodium bicarbonate and citric acid (physical incompatibility)
33. To prepare and dispense 30 ml of alkaloid salt with salicylate.
34. To prepare and dispense 10 glycerol gelatin suppositories

Suggested Reading/s/ Books

1. S.J. Carter, Cooper and Gunn‟s, Dispensing for pharmaceutical students, (2008) 12st edition, Published by CBS Publishers and distributors.

2. R.S. Gaud, A. Pawar, Modern dispensing pharmacy, (2009), 3rd edition, Career Publication, Nashik.
3. R.S. Gaud and G.D. Gupta, Practical Pharmaceutics, (2008), 1st edition, CBS Publisher and distributors, New Delhi.

BPHM 207 Lab Pharmaceutical Chemistry –II (Physical Chemistry)

1. To determine the heat of solution of given compound Potassium nitrate.
2. To determine the refractive index and specific refraction of given liquid sample.
3. To determine the specific rotation of given sample of sucrose by using polarimeter.
4. To determine the heat of hydration of CuSO4.
5. To determine the heat of ionization of acetic acid.
6. To determine the heat of neutralization of HCl and NaOH.
7. To determine the molar depression constant of camphor.
8. To determine the viscosity of given sample by using Ostwald viscometer.
9. To determine rate constant for First Order Reaction.
10. To determine the partition coefficient of benzoic acid by using benzene/water system. To study the general test for polysaccharides.
11. To determine the surface tension of given liquid at room temperature by means of stalagmometer.
12. To determine the molar depression constant of naphthalene by Rast‟s Method.
13. To determine the relative and absolute viscosity of benzene.
14. To determine the surface tension of given liquid at room temperature by drop number method.
15. To determine the surface tension of given liquid at room temperature by drop weight method.
16. To determine the partition coefficient of iodine between carbon tetrachloride and water.
17. To determine the partition coefficient of acetic acid by using cyclohexane/water system.
18. To carryout conductometric titrations of: strong acid v/s strong base, strong base v/s weak acid, strong acid v/s weak base and weak acid v/s weak base.
19. To determine the heat of neutralization CH3COOH and NH4OH using 1M solutions

Suggested Readings / Books:

1. Puri, B.R., Sharma, L.R., and Pathania, M.S., Principles of Physical Chemistry, (2008), 43th edition, Vishal Publishers, Delhi.
2. B.S. Bhal, Arun Bhal and G.D. Tuli, Essentials of Physical Chemistry, (2006), 14th edition, S. Chand and Company, New Delhi, India.
3. Peter Atkins and Julio De Paula, ATKINS‟ PHYSICAL CHEMISTRY, 8th edition (2006) Oxford University Press.
4. Khosla, B.D., Garg, V.C and Gulati, A. Senior Practical Physical Chemistry. (2006) 12th edition, R. Chand and Co. New Delhi.

BPHM 208 Lab Pharmaceutical Chemistry –III (Organic Chemistry)

1. To perform synthesis of aspirin.
2. To perform synthesis of paracetamol (Acetaminophen)
3. To prepare stereo-models of isomeric compounds.
4. To study nomenclature of the compounds by using stereo-models.
5. To make and study stereo-models of geometrical isomers.
6. To assign *R* and *S* configuration by making use of stereo-models.
7. To prepare iodoform from ethanol.
8. To prepare phthalimide from phthalic anhydride.
9. To study conformation of ethane and butane by using stereo-models.
10. To make and study conformation of cyclohexane by making use of stereo-models.
11. To perform detection of elements present in given organic compound and making their derivatives.
12. To perform synthesis of anthraquinone from anthracene.
13. To perform synthesis of p- Bromoacetanilide.
14. To perform reduction of nitrobenzene to aniline.
15. To carry out synthesis of phenyl benzoate.
16. To prepare acetanilide from aniline.

Suggested Readings / Books:

1. Ashutosh Kar, " Advanced Practical medicinal Chemistry" first edition (2004), Nmew age international publishers.
2. Arun Bahl, B.S. Bahl " A Text book of Organic Chemistry" first multicolor edition, 2006, published by S. Chand and Cmpany Ltd.
3. Robert Thornton Morrison, Robert neilson Boyd" Organic Chemistry" sixt edition, Dorling Kindersley (India) Pvt. Ltd.
4. FG MANN , BC SAUNDERS, " Practical Organic Chemistry" fourth edition, published by Orient Longman Private Limited.
5. O.P. Agarwal," Advanced Practical Organic Chemistry" first edition, Goel Publishing House.
6. Anees Ahmed Siddiqui, Mohammed Ali," Practical Pharmaceutical Chemistry" first editin, (1997) CBS Publishers.

BPHM 209 Lab Pharmaceutics –II (Hospital Pharmacy)

1. To visit the functional areas of hospital and nursing homes.
2. To study different type of syringes and method of sterilization.
3. To sterilize the surgical cotton using autoclave.
4. To perform sterilization of surgical materials used in hospital.
5. To prepare and submit ascorbic acid injection.
6. To prepare and submit 500mL of dextrose infusion IP.
7. To test the sterility of the product provided to you.
8. To prepare and submit 10mL water for injection IP
9. To prepare and submit eye lotion for first aid.
10. To prepare and submit paraffin gauge.
11. To sterilize the surgical rubber gloves.
12. To Preparations involving chemical and therapeutically incompatibility.
13. To examine the dressing material provided to you for different parameters.
14. To Submit 10 gm of sterilize powder.
15. To prepare and submit oily phenol injection.
16. To prepare and submit 10 ml of eye drop.

SEMESTER III

BPHM 301Pharmaceutical Mathematics

Module-01 Algebra: Determinants, properties of solution of simultaneous equations by Cramer‟s rule.

Module-02 Algebra: Matrices, definition of special kinds of matrices, arithmetic operations on matrices, inverse of a matrix.

Module-03 Trigonometry: Measurement of angle, T-ratios, addition, subtraction and transformation formulae, T-ratios of multiple, sub-multiple, and certain angles.

Module-04 Calculus (Differential): Limits and functions, definition of differential coefficients, differentiation of standard functions, Differentiation of implicit functions, logarithmic differentiation, parametric differentiation and successive differentiations.

Module-05 Calculus (Integral): Indefinite integrals of standard forms, integration by parts, substitution and partial fractions.

Module-06 Measures of central value; mean, mode and median measures of central tendency, measures of dispersion.

Module-07 Standard deviation and standard error of means, coefficient of variation.

Module-08 Elements of binomial and Poisson distributions, Normal distribution curve and properties.

Suggested Readings / Books:

1. A Textbook of Mathematics for XI-XII Students. NCERT Publications. Vol I-IV 1991
2. Seshagiri P. Rao, A Textbook of Remedial Mathematics, Ist edition, 2008, Pharma Med Press
3. Schaum's Differential Equations. Mc Graw Hill,Singapore
4. Bolton's Pharmaceutical Statistics. Practical and Clinical Applications. Marcel Dekker, New York, 1990
5. Gupta, S.P. Statistical Methods. Sultan Chand & Co., New Delhi, 1990.

BPHM 302 Pharmacognosy II

Module-01 Resins: Study of Drugs Containing Resin and Resin Combination like Colophony, podophyllum, jalap, cannabis, capsicum, myrrh, asafoetida, balsam of tolu, balsam of peru, benzoin, turmeric and ginger.

Module-02 Tannins: Study of tannins and tannin containing drugs like Gambir, black catechu, gall and myrobalan.

Module-03 Volatile Oils: General methods of obtaining volatile oils from plants. Study of volatile oils of Mentha, oriander, Cinnamon and Cassia.

Module-04 Study of volatile oils of Lemon peel, Orange peel, Lemon grass, Citronella, Caraway, Dill, Spearmint, Clove, Fennel, Nutmeg, Eucalyptus, Chenopodium, Cardamom, Valerian, Musk, Palamarosa Gaultheria and Sandal wood.

Module-05 Phytochemical Screening: Preparation of extracts, and fractionation into single constituent fractions using column chromatographic methods of isolation. Chemical and chromatographic methods of screening of alkaloids and saponins.

Module-06 Chemical and chromatographic methods of screening of cardenolides and bufadienolides, flavonoids and leucoanthocyanidins, tannins & polyphenols, anthraquinones, cyanogenetic glycosides, amino acids in plant extracts.

Module-07 Fibers: Study of fibers used in pharmacy such as cotton, silk, wool, nylon, glass-wool, polyester and asbestos. Pharmaceutical standards of fiber products.

Module-08 Pharmaceutical aids: Study of pharmaceutical aids of category dispersing, emulsifying, suspending agents and viscosity builders, e.g., like talc, diatomite, kaolin, bentonite, gelatin and natural colors.

Suggested Reading/ Books

1. Trease, G. E. and Evans, W.C. Pharmacognosy, Published by Elsevier, a Division of Reed Elsevier India Pvt. Ltd., New Delhi.
2. Kokate, C.K., Purohit, A.P. and Gokhale, S.B Pharmacognosy, Nirali Prakashan, Pune.
3. Handa, S.S and Kapoor, V.K. Textbook of Pharmacognosy, Vallabh Prashan, New Delhi.
4. Wallis, T.E. Textbook of Pharmacognosy, Fifth Edition, CBS Publishers and Distributors, New Delhi.
5. Tyler, V.C., Brady, L.R. and Robers, J.E. Pharmacognosy. Lea & Febiger, Philadelphia.

BPHM 303 Pharmaceutics – III (Unit Operations I)

Module-01 Unit Operations: Introduction, basic laws.
Fluid Flow : Types of flow, Reynold‟s number, Viscosity, Concept of boundary layer, basic equations of fluid flow, valves, flow meters, manometers and measurement of flow and pressure.

Module-02 Material Handling Systems:
a**.** Liquid handling- Different types of pumps.
b. Gas handling- various types of fans, blowers and compressors.
c. Solid handling- Bins, Bunkers, Conveyers, Air transport.

Module-03 Filtration and Centrifugation: Theory of filtration, filter aids, filter media, industrial filters including filter press, rotary filter, edge filter, etc. Factors affecting filtration, mathematical problems on filtration, optimum cleaning cycle in batch filters. Principles of centrifugation, industrial centrifugal filters, and centrifugal sedimenters.

Module-04 Crystallization: Characteristics of crystals like-purity, size, shape,geometry, habit, forms size and factors affecting them. Solubility curves and calculation of yields. Supersaturation theory and its limitations, Nucleation mechanisms, Crystal growth.

Module-05 Crystallization: Study of various types of Crystallizers, tanks, Caking of crystals and its prevention. Numerical problems on yields.
Refrigeration and Air Conditioning: Principles and applications of refrigeration and air conditioning.

Module-06 Dehumidification and Humidity Control: Basic concepts and definition, wet bulb and adiabatic saturation temperatures, Psychrometric chart and measurement of humidity, application of humidity measurement in pharmacy, equipments for dehumidification operations.

Module-07 Material of Construction: General study of composition, corrosion, resistance, Properties and applications of the materials of construction with special reference to stainless steel and glass. Factors affecting the choice.

Module-08 Industrial hazards and Safety Precautions: Mechanical, Chemical, Electrical, fire and dust hazards. Industrial dermatitis, Accident records etc. **Suggested**

Readings / Books

1. Badger, W.L. and Banchero, J.T. Introduction to Chemical Engineering. McGraw Hill International Book Co., London.
2. Brown, C.G. Unit Operations (Indian Ed.) CBS Publishers & Distributors.
3. McCabe, W.L. and Smith, J.C. and Harriolt, P.Unit Operations of Chemical Engineering.5th

4. Edition McGraw Hill International Book Co., London.
5. Bhatt N.D. and Panchal, V.M. Machine Drawing Charocar Publishing House, Opp. Amul Dairy, Anand , 388001 (India) .

BPHM 304 Anatomy, Physiology & Health Education II

Module-01Digestive 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.

Module-02 Respiratory System: Anatomy of respiratory organs, functions of respiration, mechanism and regulation of respiration, respiratory volumes and vital capacity

Module-03 Central Nervous System: Functions of different parts of brain and spinal cord. Neurohumoral transmission in the central nervous system, reflex action, electroencephalogram, specialized functions of the brain, Cranial nerves and their functions.

Module-04 Autonomic Nervous System: Physiology and functions of the autonomic nervous system. Mechanism of neurohumoral transmission in the A.N.S. **Urinary System:** Various parts, structures and functions of the kidney and urinary tract. Physiology of urine formation and acid-base balance. Diseases of the urinary system.

Module-05 Reproductive System: Male and female reproductive systems and their hormones, physiology of menstruation, coitus and fertilization. Sex differentiation, spermatogenesis & oogenesis. Pregnancy its maintenance and parturition.

Module-06 Endocrine System: Basic anatomy and physiology of Pituitary, Thyroid, Parathyroid, Adrenals, Pancreas, Testes and Ovary, their hormones and functions.

Module-07Sense Organs: Basic anatomy and physiology of the eye (vision), ear (hearing), taste buds, nose (smell) and skin (superficial receptors).

Module-08: Concepts of health and disease: Disease causing agents and prevention of disease. **Classification of food requirements:** Balanced diet, nutritional deficiency disorders, their treatment and prevention, specifications for drinking water. **Demography and family planning:** Medical termination of pregnancy. **First Aid:** Emergency treatment of shock, snake bites, burns, poisoning, fractures and resuscitation methods.

Suggested Readings/ Books

1. Tortora, G.J. and Grabowski, S.R.Principles of Anatomy and Physiology 9th edt.2000 Collins College Publishers, Luciano, New York
2. Guyton, A.C. & Hall, J.E. W.B. Textbook of Medical Physiology.9thedt.1996Sanders Co.New York
3. Chaurasia, B.DHuman Anatomy, Parts I, II & III.8th edt.1995 Regional and CBS Publishers & Distributors, New Delhi
4. Chatterjee, C.C. Human Physiology, part I&II11th edt.1992Medical Allied Agency, Calcutta

BPHM 305 Pharmaceutical Industrial Management

Module-01 Concept of Management: Administrative Management (Planning, Organizing, Staffing, Directing and Controlling), Entrepreneurship development, Operative Management (personnel, Materials, Production, Financial, Marketing, Time/space, margin/ Morale), Principles of Management (Co-ordination, Communication, Motivation, Decision Making, leadership, innovation, creativity, delegation of Authority/ Responsibility, Record keeping). Identification of key points to give maximum thrust for development and perfection.

Module-02 Accountancy: Principles of Accountancy, Ledger posting and book entries, preparation of trial balance, columns of a cash book, Bank reconciliation statement, rectification of errors, profits and loss account, balance sheet, purchase, keeping and pricing of stocks, treatment of cheques, bills of exchange, promissory notes of hundies, documentary bills.

Module-03 Economics: Principles of economics with special reference to the laws of demand and supply, demand schedule, demand curves, labor welfare, general principlesof insurance & inland, foreign trade, procedure of exporting and importing goods.

Module-04 Pharmaceutical Marketing: Functions, buying, selling, transportation, storage, finance, feedback, information, channels of distribution, wholesale, retail, departmental store, multiple shop and mail order business.

Module-05 Salesmanship: Principles of sales promotion, advertising, ethics of sales, merchandising, literature, detailing. Recruitment, training, evaluation, compensation to the pharmacist.

Module-06 Market Research:

a. Measuring & Forecasting Market Demands- Major concept in demand measurement, estimating current demand, Geodemographic analysis, estimating industry sales, market share & future demand.
b. Market Segmentation & Market Targeting.

Module-07 Material Management: A brief exposure of basic principles of materials management major areas, scope, purchase, stores, inventory control and evaluation of materials management.

Module-08 Production Management: A brief exposure of the different aspects of Production Management- Visible & Invisible inputs, methodology of activities, performance evaluation techniques, process flow, process know how, maintenance management.

Suggested Readings / Books

1. Mohan S, Jai D.” Drug Store and Business Management “, 1st edition, 1995,S.V Kar & Co, Jalandhar .
2. Singh S, Singh P.” Drug Store and Business Management”, 1st edition, 1995, S.Dinesh & Co.Circular Road Jalandhar.
3. Koontz & O‟Donnel Principles of Management Tata Mc Graw Hill, Delhi.
4. G. Vidya Sagar, Pharamceutical Industrial Management, 2nd edition, 2005, Pharma Book Syndicate

BPHM 306 Pharmaceutical Chemistry IV (Organic Chemistry - II)

Module-01 Heterocyclic Chemistry: Nomenclature, structure, reactions and synthesis of different heterocyclic systems -furan, thiophene, pyrole, pyridine-

Module-02Heterocyclic Chemistry: Nomenclature, structure, reactions and synthesis of different heterocyclic systems imidazole, oxazole, thiazole, quinoline and isoquinoline, phenothiazine**).**

Module-03 Carbohydrates: Monosaccharides, detailed structure determination of glucose including cyclic structure, Killiani- Fischer synthesis, Ruff degradation conversion of aldopentose to aldohexose and aldohexose to aldopentose and disaccharides.

Module-04 Carbohydrates:: structure determination of maltose, cellobiose, lactose, sucrose, Polysaccharides: starch, cellulose**.**

Module-05 Proteins: Structure, properties, synthesis of. *a* -amino acids, peptides, terminal residual analysis and synthesis**.**
Nucleic acids: Introduction, structure of nucleic acid bases, structures of nucleosides, structure of nucleotldes, RNA & DNA**.**

Module-06 Fats and oils: (phospholipids, glycolipids and lipoprotein),Analysis of Oil and Fat(Acid, Saponification and iodine values determinations)

Module-07 Xanthine derivatives (caffeine, theophylline, theobromine**).**
Coumarines: Introduction examples.

Module- 08 Aryl halides (nucleophilic aromatic substitution reactions), *a, β* -unsaturated Carbonyl compounds (electrophilic addition, Michael addition, Diels-Alder reaction).

Suggested Readings / Books

1. L. Finar, Organic Chemistry, Vol. I & II, The English Language Book Society, London and Longman Group Limited, London (Latest Edition).
2. R. T. Morrison and R.N. Boyd, Organic Chemistry, 6th Edition, Prentice Hall of India, Private Limited, New Delhi (Latest Edition).
3. R. N. Acheson, An Introduction to the Chemistry of Heterocyclic Compounds, Inter-sciences Publishers, New York (Latest Edition).

BPHM 307 Lab Pharmacognosy-II

1. To identify Fennel by performing morphology and microscopic study
2. To identify Clove by performing morphology and microscopic study
3. To identify Nutmeg by performing morphology and microscopic study
4. To identify Dill by performing morphology and microscopic study
5. To identify Eucalyptus by performing morphology and microscopic study
6. To identify Caraway by performing morphology and microscopic study
7. To identify Spearmint by performing morphology and microscopic study
8. To perform phytochemical tests for Alkaloids (cinchona powder)
9. To perform phytochemical tests for Alkaloids using belladonna powder
10. To perform phytochemical tests for Cardiac glycosides using digitalis powder
11. To perform phytochemical tests for Tannins using black/pale catechu powder
12. To perform phytochemical tests for Saponins using liquorice powder
13. To perform phytochemical tests for Anthraquinones using rhubarb powder
14. To perform phytochemical tests for Anthraquinones using aloe powder
15. To perform phytochemical tests for Flavonoids using liquorice powder
16. To identify given sample of fibers (vegetable) by performing various tests
17. To identify given sample of fibers (animal) by performing various tests
18. To identify given sample of fibers (mineral and synthetic) by performing various tests
19. To identify gelatin by performing various tests
20. To identify podophyllum by performing morphological and microscopic study
21. To identify turmeric by performing morphological and microscopic study
22. To identify ginger by performing morphological and microscopic study
23. To identify morphologically all the drugs listed in the theory

Suggested Reading/ Books:

1. Kokate, C.K. *Practical Pharmacognosy*, 4th Edn, 1994. Published by M.K Jain for Vallabh Prakashan , Delhi, India.
2. Wallis, T.E. *Practical Pharmacognosy*, 4th Edn, 2011. Published by PharmaMed Press, Hyderabad, India.
3. Brain, K.R. and Turner, T.D. *The Practical Evaluation of Phytopharmaceuticals*. Wright- Scientechnica, Bristol.
4. Trease, G.E. and Evans, W.C. *Pharmacognosy*. Published by Elsevier, a Division of reed Elsevier India Pvt. Ltd., New Delhi.
5. Tyler, V.E. Jr. and Schwarting, A.E. *Experimental Pharmacognosy*. Burgess Pub. Co, Hinneapois,Minnesotta.

BPHM 308 Lab Pharmaceutics-II (Unit Operations I)

1. To measure the flow of fluids and their pressure using manometer at different stages.
2. To determine the Reynolds number and calculate of fractional losses.
3. To determine the rate of flow of fluid by venturimeter.
4. To determine the effect of various factors influencing flow of fluids.
5. To determine the filtration rate using different shapes of filter paper.
6. To study the effect of filter aid on the rate of filtration and determine the optimum concentration of filter aid.
7. To study the effect of surface area on the rate of filtration.
8. To study the effect of viscosity on the rate of filtration.
9. To prepare and submit copper sulphate crystals by using supersaturation technology.
10. To prepare the crystals of sucrose.
11. To prepare the crystals of sucrose by using seeding method.
12. To study and draw neat and clean diagram of various crystal shapes and their applications.
13. To prepare and study the crystal habit of salycilic acid.
14. To determine the humidity by dew point method.
15. To determine the humidity by psychometric charts.
16. To prepare and submit chart of glass materials used in construction.
17. To prepare and submit chart of Steel materials used in construction.
18. To prepare and submit chart of concrete materials used in construction.
19. To prepare and submit industrial hazards by chemical and their safety precautions.
20. To prepare and submit industrial hazards by electrical and their safety precautions.
21. To prepare and submit industrial hazards by dust and their safety precautions.
22. To prepare and submit industrial hazards by mechanical and their safety precautions.

BPHM 309 Lab - Anatomy, Physiology & Health Education-II

1. Microscopic study of Human Cell.
2. Microscopic study of Different tissues: Epithelial tissue, connective tissue, nervous
3. tissue & skeletal tissue.
4. To study the anatomy of Skelton and bone using physiological model.
5. Estimation of bleeding time, clotting time and blood group.
6. Determination of Hemoglobin and oxygen carrying capacity of Blood.
7. Estimation of Blood cells: RBC, WBC Count
8. Estimation of human blood ESR.
9. Determination of Pulse rate, Blood Pressure and body temperature.
10. Understanding the significance of ECG
11. Microscopic study of different tissues involved in digestive system.
12. Microscopic study is different tissues involved in respiratory system.
13. Determination of vital capacity and experiments on spirometry.
14. Microscopic study of different parts of brain and spinal cord.
15. Physiological experiment on nerve-muscle preparations.
16. Microscopic study of different tissues involved in urinary system.
17. Simple experiments involved in the analysis of normal and abnormal urine.
18. Collection of specimens, appearance, determination of pH of urine by pH meter.
19. Quantitative determination of sugar, protein, tri glycerides, urea, lipid profile, uric acid & creatinine.
20. Microscopic study of different tissues involved in reproductive system.
21. Microscopic study of different types of endocrine glands.
22. Study the morphology of sense organs using physiological models: Eye, ear, nose, tongue and skin.

Suggested Readings/ Books:

1. Shukant R. Apte: Experimental Physiology.
2. Ramesh K. Goyal, Natyar M. Patel and Shailesh A. Shah: Practical Anatomy,
3. Physiology and Biochemistry.
4. Sir John Y. Dacie and S. M. Lewis: Practical Haematology.

BPHM 310 Lab - Pharmaceutical Chemistry-IV (Organic Chemistry-II)

1. To perform synthesis of picric acid.
2. To perform synthesis of glucosazone.
3. To perform synthesis of benzoin.
4. To perform synthesis of benzil.
5. To perform synthesis of benzocaine.
6. To perform synthesis of benzillic acid.
7. To determine saponification value of given oil.
8. To determine acid value of given oil.
9. To determine iodine value of given oil.
10. To perform synthesis of caprolactam oxime (Beckmann rearrangement)
11. To perform synthesis of coumarin.
12. To perform synthesis of benzimidazole.
13. To perform synthesis of fluorescin.
14. To perform synthesis of benzaldehyde.
15. To perform synthesis of schiff‟s bases of benzaldehyde.

Suggested Readings / Books:

1. FG MANN, BC SAUNDERS, “Practical Organic Chemistry” fourth edition, published by Orient Longman Private Limited.
2. Anees A Siddiqu, seemi Siddiqui, “Experimental Pharmaceutical Chemistry” 2nd edition, CBS Publisher and distributors.
3. Rama Rao Nadenla ,” Pharmaceutical chemistry, Part -1 (Chemistry of Heterocyclic and Natural compounds) first edition, vallabh prakashan.

SEMESTER IV

BPHM 401 Pharmaceutics – IV (Unit Operations II)

Module- 01 Stoichiometry: Unit processes material and energy balances, molecular units, mole fraction, gas laws, mole volume, primary and secondary quantities, equilibrium state, rate process, steady and unsteady states, dimensionless equations, dimensionless formulae, dimensionless groups, different types of graphic representation, mathematical problems.

Module- 02 Heat Transfer : Source of heat, heat transfer, steam and electricity as heating media, determination of requirement of amount of steam/electrical energy, steam pressure, Boiler capacity, Mathematical problems on heat transfer.

Module- 03 Evaporation : Basic concept of phase equilibria, factor affecting evaporation, evaporators, film evaporators, single effect and multiple effect evaporators, Mathematical problems on evaporation.

Module- 04 Distillation: Raoult's law, phase diagrams, volatility; simple steam and flash distillations, principles of rectification, Calculation of number of theoretical plates, Azeotropic and extractive distillation. Mathematical problems on distillation.

Module- 05 Drying: Moisture content and mechanism of drying, rate of drying and time of drying calculations; classification and types of freeze drying dryers.

Module- 06 Drying: Behaviour of solids during drying, MC,EMC,CMC and LOD dryers used in pharmaceutical industries and special drying methods. Mathematical problems on drying.

Module- 07 Size Reduction and Size Separation: Definition, objectives of size reduction, factors affecting size reduction, laws governing energy and power requirements of mills including ball mill, hammer mill, fluid energy mill etc.

Module- 08 Mixing: Theory of mixing, solid-solid, solid-liquid and liquid-liquid mixing equipments.

Books Recommended

1. Carter SJ. "Cooper & Gunn's Tutorial Pharmacy", 6th edition, CBS Publishers & Distributors, New Delhi.
2. Badger WL, Banchero JT. "Introduction to Chemical Engineering". McGraw Hill International Book Co., London.
3. Perry RH, Green DW. "Chemical Engineers Handbook", 7th edition, 1998, McGraw Hill, International Editors Ltd, London.
4. Subramanyam CVS, Setty JT, Suresh S, Devi VK." Pharmaceutical Engineering- Principles & practices", 1st edition,2002, Vallabh Prakashan , Delhi.

5. Subramanyam CVS, Setty JT, Suresh S, Devi VK.” Practical Pharmaceutical Engineering”, 1st edition, 2002, Vallabh Prakashan , Delhi.
6. Sudakar Reddy, Pharmaceutical Engineering : Practical Manual (Unit Operations), PharmaMed Press.

BPHM 402 Pharmaceutical Analysis-II

Module 01 Non- aqueous Titrations: Theoretical consideration, scope and limitations, acid base equilibria in non-aqueous media, titration of weak bases, titration of weak acids, indicators, pharmaceutical products should be selected for illustration.

Module 02 Complexometric Titrations: Concept of complexation and chelation, Werner's Coordination number and electronic structure of c]mplexions, stability constants, titration curves, masking and demasking agents, types of Complexometric titrations, metal ion indicators, factors influencing the stability of complexes, applications.

Module 03 Miscellaneous Methods of Analysis : Diazotisation titration, Kjeldahl nitrogen determination, Karl- Fischer titration, Oxygen flask combustion**. Extractions Procedures**: Separation of drugs from excipients, The Craige method of multiple extraction, continuous counter - current extraction, effect of temperature, pH, Inert solute, association, ion-pair formation, the emulsion problems in extractions.

Module 04 Nuclear Chemistry and Radioactivity as an Analytical Tool: Nuclear composition, forces and stability, isotopes, radioactive emission, measurement of radioactivity, modes of decay, half life period, artificial radioactivity, applications in pharmacy. Radiopharmaceutical and contrast media: Radio-pharmaceuticals, radiopharmaceutical preparations and radiopaque contrast media, counting statistical errors and corrections, safety.

Module 05 Chromatography: Gas chromatography: Introduction; Principles of gas chromatography, basic GLC apparatus, carrier gases; sample introduction, column, column efficiency, solid support, liquid phases, branches of gas chromatography; Detectors, temperature effect; Applications of GLC in Pharmaceutical analysis. HPLC Introduction, Theory & nomenclature, instrumentation, liquid-solid chromatography.

Module 06 Chromatography: Liquid- liquid chromatography, exclusion chromatography; HPLC columns; Solvent selection in HPLC; Data handling in HPLC, Applications of HPLC. TLC Quantitative Estimation. Ion-Exchange and Molecular Sieve Processes. Theory of ion-exchange, types of exchangers, ion exchange equilibria, ion-exchange capacity, ion-exchange separation, applications in pharmaceutical analysis, molecular sieve separation and applications.

Module 07 Electrochemistry The electric cell, electrode potential, half cells, types of half cells, sign convention, Nemst equation, the salt bridge, activity series, standard potential, standard hydrogen electrode, measuring the relative voltage of half cells, calculations of standard potential, reference electrodes, indicator electrodes.

a. Potentiometry Theoretical consideration, ion-selective electrodes, measurement of potential, location of the end point, equipment, analytical applications, direct measurement of a metal concentration, differential curves, determination of Ksp, pH

measurements, dead-stop titrations; pH meter, pH definition, relation of pH to potential, equipment, applications.

b. Conductometric and High Frequency Titrations and their Applications.

Module 08 Electrochemistry

a. Coulometric Titrations: Its basic principles and Applications.
b. Polarography and Its Applications: Theory, mass transport processes, current processes, current potential relationship, polarization, choice of eletrodes, effect of oxygen, instrumentation, calculation of concentration, laboratory design and safety.
c. Amperometric Titrations and Its Applications Phase Solubility Analysis: Theory, experimental procedures, applications in Pharmaceutical analysis.

Suggested Readings / Books:

1. A.H. Beckett and J.B. Stenlake, Practical Pharmaceutical Chemistry, Vol. I & II, The Athlone Press of the University of London (Latest Edition).
2. J. Bassett, R.C. Denney, G.H. Jeffery & J. Medhan, Vogel's Textbook of Quantitative Inorganic Analysis Including Elementary Instrumental Analysis. The English Language Book Society and Longman (Latest Edition).
3. H. H. Willard, L.L. Merritt; Jr., and J.A. Dean, Instrumental Mehtods of Analysis, Van Nostrand Reinhold, New York (Latest Edition).
4. L. G. Chatten, Pharmaceutical Chemistry, Vols. I and II, Marcel Dekker, New York (Latest Edition).
5. Braun, Introduction to Instrumental Analysis, I edition, PharmaMed Press Danzer, K., Analytical Chemistry Theoretical and Metrological Fundamentals, Springer.

BPHM 403 Pharmacognosy – III

Note: Study of the biological sources, cultivation, collection, commercial varieties, chemical constituents, substitutes, adulterants, diagnostic macroscopic, microscopic features, uses and specific chemical tests of following groups of drugs containing glycosides:

Module- 01 Saponins : Liquorice, ginseng, dioscorea, sarsaparilla, and senega; Cardioactive glycosides: digitalis, squill

Module- 02 Cardioactive glycosides: strophanthus and thevetia; Anthraquinone glycosides: Aloe, senna, rhubarb and cascara.

Module- 03 Others: Psoralea, *Ammi majus*, *Ammi visnaga*, gentian, saffron, chirata, quassia. **Note:** Studies of traditional drugs used in Indian system of medicine, common vernacular names, botanical sources, morphology, chemical nature of chief constituents, pharmacological, categories and common uses and marketed formulations of following indigenous drugs.

Module- 04 Amla, Kantkari, Stavari, Gilo (Guruch), Bhilawa, Kalijiri, Bach, Rasna and Punarnava

Module- 05 Chitrack, Apamarg, Gokhru, Shankhapushpi, Brahmi, Adusa, Arjuna and Ashoka

Module- 06 Methi, Lahsun, Palash, Guggal, Gyumnema, Shilajit, Nagarmotha, kalmegh and Neem.

Module- 07 The holistic concept of drug administration in traditional systems of medicine. Introduction to ayurvedic system and ayurvedic preparations like Arishtas, Asvas, Gutikas, Tailas, Churnas, Lehyas and Bhasmas.

Module- 08 Standardization of Ayurvedic and herbal products and scope of clinical validation of these products.

Suggested Reading/ Books:

1. Wallis, T.E. Textbook of Pharmacognosy, Fifth Edition, CBS Publishers and Distributors, New Delhi.
2. Trease, G. E. and Evans, W.C. Pharmacognosy, Published by Elsevier, a Division of Reed Elsevier India Pvt. Ltd., New Delhi.
3. Kokate, C.K., Purohit, A.P. and Gokhale, S.B Pharmacognosy, Nirali Prakashan, Pune.
4. Rangari, V. D. Pharmacognosy & Phytochemistry, Volume II, Second Edition, Career Publication, Nashik. (Module 4, 5 & 6).
5. Indian Herbal Pharmacopoeia, Revised New Edition 2002, Published by Indian Drug Manufacturers Association, Mumbai.
6. Saharan, V. A. A Textbook of Pharmacognosy, Student Edition, Jodhpur.

BPHM 404 Pathophysiology of Common Diseases

Module 1: Basic Principles of Cell Injury and Adaptation: Causes of Cellular injury, pathogenesis, morphology of cell injury. Intercellular alterations in lipids, proteins and carbohydrates, Cellular adaptation, atrophy, hypertrophy.

Module 2: Basic Mechanisms involved in the process of inflammation and repair: Alterations in vascular permeability and blood flow, migration of WBCS, acute and chronic inflammation, mediators of inflammation, brief outline of the process of repair.

Module 3: Pathophysiology of Inflammatory Diseases: Rheumatoid arthritis, gout, ulcerative colitis, peptic ulcer, asthma

Module 4: Pathophysiology of cardiac Disorder: hypertension, angina, congestive heart failure, atherosclerosis, myocardial infarction, arrhythmia.

Module 5: Pathophysiology of diseases of Microbes: various types of Hepatitis, tuberculosis, urinary tract infections, sexually transmitted diseases, AIDS

Module 6: Pathophysiology of Liver and renal diseases: liver cirrhosis, acute and chronic renal failure

Module 7: Pathophysiol;ogy of CNS Disorders: epilepsy, psychosis, depression, mania, Alzheimer disease, Parkinson diseases

Module 8: Pathophysiology of common diseases: diabetes, anemia, Iatrogenic diseases, and common types of neoplasm.

Suggested Readings/ Books:

1. Cotran, R.S., Kumar, V., Collins, T. Robbins Pathological Basis of Disease. 7th edt.2003 W.B. Saunders Co.New York.
2. J.T. Dipiro, R.L. Talbert, , G.C. Yee, G.R. Matzke, B.G. Wells, L. Michael Posey (eds.), Pharmacotherapy : A Pathophysiologic Approach, 6th ed.., The McGraw Hill Companies, Inc.,2005.
3. E.T. Herfindal and D.R Gourley, Text Book of Therapeutics: Drug and Disease Management, 7th ed., Lippincott Williams & Wilkins, USA, 2000.
4. Dennis L. Kasper, Eugene Braunwald, Anthony S. Fauci, Stephen L. Hauser, Dan L. Longo, J. Larry Jameson, and Kurt J. Isselbacher, (Eds.), Harrison's Principles of Internal Medicine, 16th ed., The McGraw Hill Companies, Inc., 2004.

BPHM 405 Pharmaceutics V (Physical Pharmacy)

Module- 01 Matter and Properties of Matter : State of matter, change in the state of matter, latent heats and vapor pressure, sublimation-critical point, Eutectic mixtures, gases, aerosols - inhalers, relative humidity, liquid complexes, liquid crystals, glassy state, solids crystalline, amorphous and polymorphism.

Module- 02 Micromeretics and Powder Rheology: Particle size and distribution, average particle size, number and weight distribution, particle number, methods for determining particle volume, optical microscopy, sieving, sedimentation, measurement, particle shape, specific surface, methods of determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.

Module- 03 Surface and Interfacial Phenomena: Liquid interface, surface and interfacial tensions, surface free energy, measurement of surface and interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB classification, solubilization, detergency, adsorption at solid interfaces, solid- gas and solid-liquid interfaces, complex films, electrical properties of interface.

Module- 04 Viscosity and Rheology : Newtonian systems, Law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling ball, rotational viscometers.

Module- 05 Dispersion Systems: Colloidal Dispersions: Definition, types, properties of colloids, protective colloids, applications of colloids in pharmacy; Suspensions and Emulsions: Interfacial properties of suspended particles, settling in suspensions, theory of sedimentation, effect of Brownian movement, sedimentation of flocculated particles, sedimentation parameters, wetting of particles, controlled flocculation, flocculation in structured vehicles, rheological considerations; Emulsions-types, theories, physical stability.

Module- 06 Complexation: Classification of complexes, methods of preparation and analysis, applications.

Module- 07 Kinetics and Drug Stability: General considerations & concepts, half-life determination, Influence of temperature, light, solvent, catalytic species and other factors, Accelerated stability study, expiration dating.

Module- 08 Buffers: Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.

Books Recommended

1. Sinko PJ."Martin's Physical pharmacy & Pharmaceutical sciences", 5th edition, 2006, B.I. Publications Pvt Ltd, New Delhi.

2. Carter SJ. “Cooper & Gunn’s Tutorial Pharmacy”, 6th edition, 200, CBS Publishers & Distributors, New Delhi.
3. Remington’s The Science & Practice of Pharmacy Mack Publishing Co. Easton, PA
4. Gaud and Gupta “ Practical Physical Pharmacy”, I edition, reprint 2008, CBS Publisher and Distributor, New Delhi.
5. Subhramanyam CVS. “Textbook of Physical Pharmaceutics”, 2nd edition , 2007, Vallabh Prakashan, New Delhi.

BPHM 406 Intellectual Property Rights

Module -01 Introduction to Intellectual Property : Introduction, definition, Basic Principles and Acquisition of Intellectual Property Rights, Kinds of Intellectual Property and Economic importance of Intellectual Property

Module- 02 Patents: Overview, Historical development (Patent Act 1970 – amendments of 1999, 2000, 2002 and 2005), Concepts, Novelty, Utility, Inventiveness/Non-obviousness, Contents of a Patent Application, Specification, Provisional, Complete, Disclosure aspects and Claims.

Module-03 Infringement: Definition, methods of Infringement Determined, Direct, contributory, and Induced, Defences to Infringement.

Module-04 Trade Mark : Introduction, Historical development, concept, law of National trade mark, Need for Protection of Trademarks, Kinds of Trademarks, International Legal Instruments on Trademarks, Well known Trademark, Procedure for registration of Trademarks Registration of Trademarks, Infringement of Trademarks, Passing Off, Defences and Remedies.

Module-05 Copyright: introduction, Concepts, Idea- Expression dichotomy, Works protected under Copyright law, Authorship and ownership, Rights conferred on copyright owners plagiarism and related right

Module-06 Industrial Design: Introduction, Need for Protection of Industrial Designs, Subject Matter of Protection and Requirements, The Designs Act, 2000, Procedure for obtaining Design Protection, Revocation, Infringement and Remedies

Module-07 Cyber Crimes: Introduction, Essential Ingredients of Crime, Types of Internet Crimes and Infringement and remedies.

Module-08 International Scenario: Introduction to the leading international instruments concerning intellectual property rights: GATT, GATS, the Berne Convention, Universal Copyright Convention, the Paris Convention, TRIPS, the World Intellectual Property Rights Organization (WIPO) and the UNESCO.

Suggested Readings/ Books:

1. Akehust's Modern Introduction to International Law, Ed. By Peter Malanczuk, 7th Edition, (Revised)
2. W.R. Cornish, Intellectual Property, Sweet & Maxwell, London (2000)
3. Kerly's Law of Trade Marks and Trade Names, 14th Edition, Thomson, Sweet & Maxweel.
4. A. K. BanSal, Law of Trade Marks in India (2009 Edition) Institution of Constitutional and Parliamentary Studies and Centre for Law, Intellectual Property and Trade, New Delhi.

5. N.S. Gopalakrishnan & T.G. Agitha, Principles of Intellectual Property (2009), Eastern Book Company, Lucknow
6. W.R. Cornish, Intellectual Property, Sweet & Maxwell, London (2000)
7. Prof. Bernt Hugenholtz & Dr. Lucie Guibault (Edited), Kluwer Copyrights Cases, Wolters Kluwer
8. N.S. Gopalakrishnan & T.G. Agitha, Principles of Intellectual Property (2009), Eastern Book Company, Lucknow

BPHM 407 Lab- Pharmaceutics – IV (Unit Operations II)

1. To represent the data in different types of graphic representations and their significance.
2. To determine the overall heat transfer co-efficient.
3. To determine the radiation constant of Iron cylinder.
4. To determine the radiation constant of Copper cylinder.
5. To determine the radiation constant of Brass cylinder.
6. To determine the radiation constant of the metal at different temperature.
7. To draw neat and clean labelled diagram of various evaporation stills with advantage and disadvantages.
8. To study the effect of temperature on evaporation of the given slurry (2% CaCo3/MgCo3).
9. To study the effect of surface area on evaporation of the given slurry and represent the data in graphical form.
10. To determine the rate of distillation using simple distillation glass assembly.
11. To determine the rate of distillation using simple distillation steel assembly.
12. To separate out miscible liquids using fractional distillation and calculate its efficiency.
13. To determine the rate of drying of the given sample.
14. To study the effect of time and temperature on rate of drying.
15. Give labelled neat and clean diagrams of dryers and elaborate their mechanism.
16. To dry a given wet solid and to construct the drying curve and to determine average moisture content.
17. To determine the equilibrium moisture content (EMC), critical moisture content (CMC), rate of drying and total time of drying of starch slurry.
18. To studying the mechanism of lyophillization (freeze drying) with its application.
19. To reduce the particle size of coarse powder by ball mill and to determine critical speed of the ball mill.
20. To study the effect of number of balls on reduction of particle size in ball mill.
21. To study the effect of number of balls on reduction of particle size in rod mill.
22. To study the degree of mixing by spatulization method.
23. To study the degree of mixing by blade mixer using benzoic acid and sand.
24. To determine the degree of mixing of solid and semisolid using salicylic acid in ointment.
25. To illustrate solid-solid mixing.
26. Draw a neat and clean diagram of different mixers used in pharmaceutical mixing.

BPHM 408 Lab- Pharmaceutical Analysis-II

1. Non aqueous Titrations: Preparation and standardization of perchloric acid and sodium/ potassium/ lithium methoxides solutions; Estimations of some pharmacopoeial products.
2. Complexometric Titrations: Preparations and standardization of EDTA solution, some exercises related to pharmacopoeial assays by complexometric titrations.
3. Miscellaneous Determinations: Exercises involving diazotisation, Kjeldahl, Karl-Fischer, Oxygen flask combustion and gasometry methods. Determination of alcohol content in liquid galenicals, procedure (BPC) shall be covered.
4. Experiments involving separation of drugs from excipients.
5. Chromatographic analysis of some pharmaceutical products.
6. Exercises based on acid base titration in aqueous and non-aqueous media, oxidation reduction.
7. Titrations using potentiometric technique, Determination of acid-base disassociation constants and plotting of titration curves using pH meter.
8. Exercises involving polarimetry.
9. Exercises involving conductometric and polarographic techniques.

Suggested Readings / Books:

1. A.H. Beckett and J.B. Stenlake, Practical Pharmaceutical Chemistry, Vol. I & II, The Athlone Press of the University of London (Latest Edition).
2. J. Bassett, R.C. Denney, G.H. Jeffery & J. Medhan, Vogel's Textbook of Quantitative Inorganic Analysis Including Elementary Instrumental Analysis. The English Language Book Society and Longman (Latest Edition).
3. H. H. Willard, L.L. Merritt; Jr., and J.A. Dean, Instrumental Mehtods of Analysis, Van Nostrand Reinhold, New York (Latest Edition).
4. L. G. Chatten, Pharmaceutical Chemistry, Vols. I and II, Marcel Dekker, New York (Latest Edition).
5. Braun, Introduction to Instrumental Analysis, I edition, PharmaMed Press
6. Danzer, K., Analytical Chemistry Theoretical and Metrological Fundamentals, Springer

BPHM 409 Lab- Pharmacognosy – III

1. To study morphological and microscopical characters of liquorice.
2. To study morphological and microscopical characters of digitalis.
3. To study morphological and microscopical characters of squill.
4. To study morphological characters of senega.
5. To study morphological and microscopical characters of senna.
6. To study morphological and microscopical characters of cascara.
7. To study morphological characters of rhubarb.
8. To study morphological characters of aloe.
9. To study morphological characters of gentian.
10. To study morphological characters of saffron.
11. To study morphological characters of chirata.
12. To study morphological characters of quassia.
13. To study morphological characters and enlist the various formulation in the market of amla.
14. To study morphological characters and enlist the various formulation in the market of bach.
15. To study morphological characters and enlist the various formulation in the market of rasna.
16. To study morphological characters and enlist the various formulation in the market of punarnava.
17. To study morphological characters and enlist the various formulation in the market of ashoka.
18. To study morphological characters and enlist the various formulation in the market of arjuna.
19. To study morphological characters and enlist the various formulation in the market of adusa.
20. To study morphological characters and enlist the various formulation in the market of gokhru.
21. To study morphological characters and enlist the various formulation in the market of shankhpusphi.
22. To study morphological characters and enlist the various formulation in the market of bramhi.
23. To study morphological characters and enlist the various formulation in the market of methi.
24. To study morphological characters and enlist the various formulation in the market of lahsun.
25. To study morphological characters and enlist the various formulation in the market of neem.
26. To study morphological characters and enlist the various formulation in the market of guggal.
27. Introduction to traditional system of medicine.
28. To formulate churana an ayurvedic formulation (for example Hingvastak Churna).

29. Standardization of ayurvedic medicine by using marker compounds.
30. Standardization of herbal medicine by using marker compounds.

Suggested Reading/ Books:

1. Wallis, T. E. Practical Pharmacognosy, 4th Edition, PharmaMed Press, Hyderabad.
2. Vasudevan, T. N. and Laddha, K. S. Herbal Drug Microscopy, 1st Edition, Yucca Publishing House, Dombivli.
3. Jackson, B. P. and Snowdown, D. W. Atlas of Microscopy, CBS Publishers & Distributors (P) Ltd., New Delhi.
4. Khandelwal, K. R. Practical Pharmacognosy, 19th Edition, Nirali Prakashan, Pune.
5. Kokate, C. K. Practical Pharmacognosy, 4th Edition, Vallabh Prakashan, Delhi.

BPHM 410 Lab- Pharmaceutics V (Physical Pharmacy)

1. To determine the density of water at different temperature by using density bottles.
2. To study the effect of sodium chloride in different concentration on the density of water at room temperature.
3. To prepare the different concentration of sucrose in water and determine the density at room temperature.
4. To determine the viscosity of liquid by using Oswald viscometer at room temperature
5. To study the effect of concentration of liquid on viscosity.
6. To study the viscosity of given sample by using Brookfield viscometer.
7. To determine the surface tension of liquid using stalogometer.
8. To study the effect of concentration on surface tension.
9. To calibrate the eye piece micrometer (ocular micrometer).
10. To determine the particle size distribution of powder by sieving method.
11. To determine the particle size in disperse method by microscopic method.
12. To determine the particle size of dispersed medium by sedimentation mehod.
13. To determine the bulk density of given powder materials.
14. To determine the angle of repose of given powder materials.
15. To study the effect of glidant of flow properties of powder.
16. To determine the compressibility index of given powder.
17. To study the effect of temperature on surface tension.
18. To evaluate the complexation behavior of caffeine and Para amino benzoic acid.
19. To determine the shelf life of aspirin solution (in 0.1N HCl solution) using accelerated stability.
20. To study the effect of concentration of tragacanth of physical stability of calcium carbonate suspension.
21. To measure the physical stability of benzyl benzoate lotion (emulsion for external use).
22. To prepare 100ml of a pharmaceutical buffer of pH 5.0 (acetate buffer) and verify the same by measuring ph using a pH meter.
23. To determine the buffer capacity of acetate buffer at various concentration and find out the ph maximum buffer capacity.

Books Recommended

1. J.S. Patrick, Martin physical pharmacy and pharmaceutical science, (2006) 5th edition,B.I. Waverly Pvt Ltd, New Delhi, India.
2. R. S. Gaud and G.D. Gupta, Physical Pharmacy, (2001), 1st edition, CBS Publisher, New Delhi.
3. Indian Pharmacopoeia, (2010), 6th edition, published by Indian Pharmacopoeia Commission, Ghaziabad.
4. C.V.S. Subramanyam, Text book of physical pharmaceutics, (2010), 2nd edition, VALLABH PRAKASHAN, Delhi.

SEMESTER V

BPHM 501 Pharmaceutical Chemistry-V (Biochemistry)

Module 01 Biochemical organization of the cell, cell membrane structure and functions. Detail study of Fluid Mosaic Model. Transport processes : Passive diffusion, facilitated diffusion, endocytosis, exocytosis and phagocytosis

Module 02 Enzymes: Nomenclature, enzyme kinetics and its mechanism of action, mechanism of inhibition, enzymes and iso-enzymes in clinical diagnosis. Co-enzymes: Co-enzymes and their significance. Metals as co-enzymes and their significance.

Module 03 Carbohydrate Metabolism: Conversion of polysaccharide to glucose-1- phosphate, Glycolysis and fermentation and their regulation, gluconeogenesis and glycogenolysis, Metabolism of galactose and galactosemia, role of sugar nucleotides in biosynthesis, and Pentosephosphate pathway.

Module 04 The concept of free energy, bioenergetics, production of ATP and its biological significance. The Citric Acid Cycle: Significance, reactions and energetic of the cycle, Amphibolic role of the cycle, and Glyoxalic acid cycle.

Module 05 Lipids Metabolisim: oxidation, Biosynthesis of ketone bodies and their utilization, biosynthesis of saturated and unsaturated fatty acids, Control of lipid metabolism, Essential fatty acids & eicosanoids (prostaglandins, thromboxanes and leukotrienes), phospholipids,and sphingolipids.

Module 06 Biological Oxidation: Enzymes and co-enzymes involved in oxidation reduction & its control, respiratory chain its role in energy capture and its control, Inhibitors of respiratory chain and oxidative phosphorylation, Mechanism of oxidative phosphorylation. Amino acid: Biosynthesis of amino acids,Catabolism of amino acids, Conversion of amino acids to specialized products

Module 07 Nitrogen & Sulphur Cycle: Ammonia assimilation, Incorporation of sulphur in organic compounds, Release of sulphur from organic compounds Metabolism of Ammonia and Nitrogen Containing Monomers: Nitrogen balance , Urea cycle, metabolic disorders of urea cycle, Metabolism of sulphur containing amino acids, Porphyrin biosynthesis, formation of bile pigments, hyperbilirubinemia.

Module 08 Biosynthesis of Nucleic Acids: Brief introduction of genetic organization of the mammalian genome, alteration and rearrangements of genetic material, Biosynthesis of DNA and RNA. Purine biosynthesis, Purine nucleotide interconversion, Pyrimidine biosynthesis and Formation of deoxyribonucleotides Genetic Code and Protein Synthesis: Genetic code, Components of protein synthesis, and Inhibition of protein synthesis. Brief account of genetic engineering and polymerase chain reactions. Regulation of gene expression.

Suggested Readings / Books:

1. Conn, E.E. and Stump, P.K. Outlines of Biochemistry. John Wiley & Sons, New York
2. Jayaraman, J. Laboratory Manual in Biochemistry. Wiley Eastern Ltd., New Delhi.
3. Lehninger, A.L. Biochemistry, Worth Publisher, Inc.
4. Plumer, D.T. An Intoduction to Practical Biochemistry. Tata McGraw Hill, New Delhi.
5. Harper's Biochemistry, Lange Publishing Group.

BPHM 502 Pharmaceutics-V (Pharmaceutical Technology I)

Module- 01 Liquid Dosages Forms: Introduction, types of additives used in formulations, Vehicles, stabilizers, preservatives, suspending agents, emulsifying agents, solubilizers, colors, flavours and others, manufacturing packaging and evaluation of clear liquids, suspensions and emulsions official in pharmacopoeia.

Module- 02 Semisolid Dosage Forms: Definitions, types, mechanisms of drug penetration, factors influencing penetration, semisolid bases and their selection. General formulation of semisolids, clear gels manufacturing procedure, evaluation and packaging.

Module- 03 Suppositories: Classification, Ideal requirements, bases, manufacturing procedure, packaging and evaluation.

Module- 04 Blood Products and Plasma Substitutes: Collection, processing and storage of whole human blood, concentrated human RBCs, dried human plasma, human fibrinogen, human thrombin, human normal immunoglobulin, human fibrin foam, plasma substitutes, ideal requirements, PVP, dextran etc. for control of blood pressure as per I.P.

Module- 05 Pharmaceutical Aerosols: Definition, propellants, general formulation, manufacturing and packaging methods, pharmaceutical applications.

Module- 06 Opthalmic Preparations: Requirements, formulation, methods of preparation, containers, evaluation.

Module- 07 Cosmeticology and Cosmetic Preparations: Fundamentals of cosmetic science, structure and functions of skin and hair. Formulation, preparation and packaging of cosmetics – deodorants and antiperspirants, shampoo, face powder, dentifrice, mouth wash and gargles,

Module- 08 Cosmeticology and Cosmetic Preparations: Formulation, preparation and packaging of cosmetics –nail polish, Lipsticks, shaving cream, Cleansing cream, anti acne cream, eye lashes and baby care products (baby powder, baby soap and baby shampoo).

Books Recommended

1. Aulton ME. “Pharmaceutics- The Science of Dosage Form Design”, 1st edition, 1998, ELBS/Churchill Livingstone, New York.
2. Lachman L, Lieberman HA, Kanig JL.” The Theory & Practice of Industrial Pharmacy”, 3rd edition, 1991, Varghese Publishing House, Bombay.
3. Banker GS, Rhode CT. “Modern Pharmaceutics”, 4th edition, Informa Healthcare, New York.
4. Allen LV, Popovich NG, Ansel HC”, Ansel’s pharmaceutical Dosage Forms & Drug Delivery Systems”, 8th edition, 2005.
5. Sagarin, Balsam MS.” Cosmetic Science & Technology”, Vol. 1-3 2nd ed. John Wiley.
6. Butter H., Poucher’s Perfumes Cosmetics and Soaps, 10th edition, 2007, Springer.

BPHM 503 Pharmacology I

Module -01General Pharmacology : Introduction to Pharmacology, Sources of drugs, Dosage forms and routes of administration, mechanism of action, Combined effect of drugs, Factors modifying Drug action, tolerance and dependence, Pharmacogenetics.

Module -02: Principles of Basic and Clinical pharmacokinetics, Adverse Drug Reactions and treatment of poisoning, ADME drug interactions, Bioassay of Drugs and Biological Standardization, Discovery and development of new drugs.

Module -03: Pharmacology of Peripheral Nervous System: Neurohumoral Parasympathomimetics and Parasympatholytics transmission

Module -04: Pharmacology of Peripheral Nervous System: Sympathomimetics, Adrenergic transmission (autonomic and Somatic Receptor and neuron blocking agents)

Module -05: Ganglionic, stimulants and blocking agents. Neuromuscular blocking Agents. Local anesthetic Agents

Module -06: Pharmacology of Central Nervous System: Neurohumoral transmission in the C.N.S. General Anesthetics. Aliphatic Alcohols and disulfiram. Sedatives, hypnotics, Anti-anxiety agents and Centrally acting muscle relaxants.

Module -07: Psychopharmacological agents: anti psychotics, antidepressants, anti maniacs and hallucinogens Anti-epileptics drugs. Anti-Parkinsonian Drugs.

Module -08: Analgesics, Antipyretics, Anti-inflammatory and Anti-gout drugs Narcotic analgesics and antagonists CNS stimulants, Drug Addiction and Drug Abuse

Suggested Readings/ Books:

1. Tripathi K.D. Essential of Medical Pharmacology.6th edt. 2008. Jaypee brother medical publisher. New Delhi.
2. Gilman, A.G., Goodman, L.S.,Goodman and Gilman's The Pharmacological Basis of Therapeutics. 11th edt.2006 Editors J.G.Hardmanetal. Pergamon Press, New York
3. Harvey AR,Champ CP Pharmacology 3rd Edt 2006 Lippincott Willams &Wilkins Philadelphia.

BPHM 504 Pharmacognosy-IV

Note: Systematic study of source, cultivation, collection, processing, commercial varieties, chemical constituents, substitutes, adulterants, uses, and specific chemical tests of following alkaloid containing drugs:

Module- 01 Pyridine - piperidine: Tobacco, areca and lobelia; Imidazole: Pilocarpus

Module- 02 Tropane: Belladonna, hyoscyamus, datura, duboisia, and coca; Steroidal: Veratrum, kurchi and withania

Module- 03 Quinoline and isoquinoline: cinchona, ipecac, opium; Indole: Ergot, rauwolfia, catharanthus, nux-vomica and physostigma.

Module- 04 Alkaloidal amine: Ephedra and colchicum; Glycoalkaloid: Solanum; Purines: Coffee, tea and cola.

Module- 05 Role of medicinal and aromatic plants in national economy. Biological sources, preparation, identification tests and uses of the following enzymes: Diastase, papain, pepsin, trypsin and pancreatin.

Module- 06 General biosynthetic pathways of natural products like alkaloids, glycosides, terpenoids, lignans, quassinoids, carotenoids and flavonoids.

Module- 07 General biosynthetic pathways of natural products like terpenoids, lignans, quassinoids, carotenoids and flavonoids.

Module- 08 Plant bitters and sweeteners; Introduction, classification and study of different chromatographic methods -TLC, Paper chromatography, Column chromatography, HPTLC, HPLC, GC, Ion exchange chromatography, Size exclusion chromatography, Droplet counter current chromatography and their applications in evaluation of herbal drugs.

Suggested Reading/ Books:

1. Beckett, A. H. and Stenlake, J. B. Practical Pharmaceutical Chemistry, 4th Edition-Part Two, CBS Publishers & Distributors, New Delhi.
2. Trease, G. E. and Evans, W.C. Pharmacognosy, Published by Elsevier, a Division of Reed Elsevier India Pvt. Ltd., New Delhi.
3. Kokate, C.K., Purohit, A.P. and Gokhale, S.B Pharmacognosy, Nirali Prakashan, Pune.
4. Wallis, T.E. Textbook of Pharmacognosy, Fifth Edition, CBS Publishers and Distributors, New Delhi.
5. Ansari, S. H. Essentials of Pharmacognosy, 3rd Edition, Birla Publication Pvt. Ltd., Delhi.
6. Sharma, B. K. Instrumental Metods of Chemical Analysis, 26th Edition, Goel Publishing House, Meerut.

BPHM 505 Pharmaceutics VII (Biopharmaceutics and Pharmacokinetics)

Module- 01 Introduction: Biopharmaceutics and Pharmacokinetics and their role in formulation development and clinical setting. Biopharmaceutics : a. Passage of drugs across biological barrier (passive diffusion, active transport, facilitated diffusion and pinocytosis) b. Factors influencing absorption- Physicochemical, physiological and pharmaceutical. c. Drug distribution in the body, plasma protein binding.

PHARMACOKINETICS

Module- 02

a. Significance of plasma drug concentration measurement
b. Compartment and model-Definition and Scope.
c. Pharmacokinetics of drug absorption – Zero order and first order absorption rate constant using Wagner – Nelson and Loo- Reigelman method.

Module- 03

d. Volume of distribution and distribution coefficient.
e. Compartment kinetics- one compartment and two compartment models. Determination of pharmacokinetic parameters from plasma and urine data after drug administration by intravascular and oral route.

Module- 04

f. Curve fitting (method of Residuals), regression procedures.
g. Clearance concept, Mechanism of renal clearance, clearance ratio, Determination of renal clearance.

Module- 05

h. Extraction ratio, hepatic clearance, biliary excretion, Extrahepatic circulation.
i. Non-Compartmental concept of mean residence time (MRT)

Module- 06 Non-linear pharmacokinetics with special reference to one compartment model after I.V. drug administration, Michaelis Menten Equation, detection of non-linearity (Saturation mechanism).

Module- 07 & Module- 08 Bioavailability and bioequivalence:

a. Measures of bioavailability, Cmax, tmax and area under the curve (AUC)
b. Design of single dose bioequivalence study and relevant statistics.
c. Review of regulatory requirements for conduct of bioequivalent studies.

Books Recommended

1. Notari, R.E. Biopharmaceutics & Pharmacokinetics- An Introduction. Marcel Dekker.
2. Rowland, M. and Tozer, T.N. Clinical Pharmacokinetics. Lea & Febiger, N.Y.
3. Gibaldi, M. Biopharmaceutics and Clinical Pharmacokinetics. 4th edition, 2008, PharmMed Press.

4. Shargel, L. and Yu, A. Applied Biopharmaceutics and Pharmacokinetics. Appleton & large,Norwalk.
5. Wagner, J.G. Fundamentals of Clinical Pharmacokinetics. Drug Intelligence Publications,Hamilton.
6. Stephen H. Curry, Drug Disposition and Pharmacokinetics, 3rd edition 2008, PharmMed Press

BPHM 506 Lab- Pharmaceutical Chemistry-V (Biochemistry)

1. Preparation of standard buffers (citrate, phosphate and carbonate) and measurement of pH
2. Titration curve for amino acids.
3. Separation of amino acids by two dimensional paper chromatography and gel electrophoresis.
4. Separation of lipids by TLC.
5. Separation of serum proteins by electrophoresis on cellulose acetate.
6. Quantitative estimation of amino acids.
7. Quantitative estimation of proteins.
8. Determination of glucose by means of the enzyme glucose oxidase.
9. Enzymatic hydrolysis of glycogen by alpha- and beta- amylases.
10. Isolation and determination of RNA and DNA.
11. Effect of temperature on the activity of alpha-amylase.
12. Estimation of SGOT, SGPT, Alkaline phosphotase and Bilirubinu in the serum.

Biochemistry

1. To prepare standard buffer solutions and measure its pH.
2. To separate lipids by thin layer chromatography.
3. To study the denaturation of proteins.
4. To study the general reactions of proteins.
5. To separate amino acids by thin layer chromatography.
6. To estimate blood glucose by oxidase method.
7. To study the general test for lipids.
8. To study the general reactions for monosaccharides.
9. To isolate casein from milk.
10. To perform normal urine analysis.
11. The quantitative estimation of amino acids using the ninhydrin reaction.
12. To study the general test for disaccharides.
13. To estimate the amount of creatinine present in urine sample.
14. To study the general test for polysaccharides.
15. To carry out Biuret assay method for proteins.
16. To carry out Folin-Lowry method of protein assay.
17. To determine the acid value of a given lipid sample.
18. The determination of saponification value of a fats.
19. The determination of iodine number of a fat sample.
20. To study titration curves of amino acids.

Suggested Readings / Books:

1. A.L. Lehninger, Principles of Biochemistry, (1990), CBS Publishers and Distributers (P) Ltd, Delhi, India.
2. A. C. DEB, Fundamentals of Biochemistry, (2008)19th edition, New Central Book Agency (P) Ltd. Kolkata, India.
3. D.M. Vasudevan and S. Sreekumari, Textbook of Biochemistry for Medical Students, (2008), 5th edition, JAYPEE brothers medical publishers (P) Ltd. New Delhi.
4. V. K. Malhotra, Biochemistry for Students, 11th edition, JAYPEE Brothers medical publishers (P) Ltd. New Delhi.
5. Plumer, D.T. An Introduction to Practical Biochemistry, (1999), 3rd Edition, Tata McGraw Hill, New Delhi.
6. Rama Rao Nadendla, Pharmaceutical Organic Chemistry Part-1 Chemistry of Heterocyclic and Natural Compounds, (2008), Vallabh Publications, New Delhi.

BPHM 507 Lab- Pharmaceutics-V (Pharmaceutical Technology I)

1. To develop and evaluate Paracetamol solution by taking different solvents and cosolvent system.
2. To prepare and evaluate calamine lotion.
3. To prepare and evaluate antacid suspension.
4. To determine the HLB of liquid paraffin using modified gum acacia method.
5. To prepare liquid paraffin emulsion IP and determine the effect of homogenization time on globule size distribution.
6. To prepare and evaluate salicylic acid ointment.
7. To calculate displacement value of given drug and prepare 10 suppositories.
8. To prepare and evaluate tannic acid suppositories.
9. To examine, describe and sketch different parts of an aerosol package.
10. To prepare and evaluate aerosol dosage form of silver sulphenamide.
11. To prepare and evaluate sodium bicarbonate eye solution.
12. To prepare liquorice liquid extract by percolation.
13. To collect and store rat blood.
14. To prepare and evaluate vanishing cream.
15. To prepare and evaluate cleansing lotion for oily skin.
16. To prepare and evaluate all purpose cream.
17. To prepare and evaluate sunscreen cream.
18. To prepare and evaluate nail lacquer.
19. To prepare and evaluate anti-caries toothpowder.
20. To prepare and evaluate antibacterial mouthwash.

BPHM 508 Lab- Pharmacology I

1. Study of some commonly used instrument in experimental pharmacology.
2. Preparation of different solutions for experiments. Drug dilutions, use of molar and w/v solutions in experimental Pharmacology.
3. Study of the common laboratory animals use in pharmacology practical.
4. Study of the methods of handling of various laboratory animals.
5. Study of standard techniques for sacrifice and making animal unconscious.
6. Study of standard techniques for collection of blood sample.
7. Study of different routes of administration of drugs in mice/rats.
8. To study the effect of hepatic microsomal enzyme induction on the duration of action of pentobarbital sodium.
9. Study of the pentobarbitone effect on loss of righting reflex in mice.
10. Study of the chlorpromazine effect on the locomotor activity of mice using Actophotometer.
11. Study of the apomorhine induced compulsive behaviour in mice.
12. Study of the muscle relaxant property of diazepam in mice using rotarod.
13. Study of the analgesic effect of morphine in mice using tail-flick method.
14. Study of the analgesic effect of morphine in mice using hot plate method.
15. Study of the analgesic effect of morphine against acetic acid induced writhing in mice.
16. Study of the anti inflammatory property of indomethacin against carrageenan induced paw oedema.
17. Study of the anti-convulsant activity of phenytoin against maximal electro shock induced in rats.
18. Study of the anti-convulsant property of diazepam against pentyleneterazol-induced convulsions in mice.
19. Study of the anti-anxiety effect of diazepam in mice using elevated plus maze apparatus.
20. Study of the anxiolytic effect of diazepam in mice using mirrored chamber apparatus.
21. Study of the phenothiazine-induced catatonia in rats.
22. Study of the mydriactic effect of topically applied atropine on rabbit eye.

Suggested Readings/ Books:

1. Macleod, L.J. Pharmacological experiments on intact preparations. Latest edition, Publisher: Churchill livingstone.
2. Ghosh, M.N Fundamentals of Experimental Pharmacology. 4th edt. 2008**,** Scientific Book Agency, Kolkatta.
3. Goyal R. K.,Practical in pharmacology, B.S. Shah Prakasan ,Ahmedabad
4. Kulkarni, S.K. Handbook of Experimental Pharmacology. 3rd edt.1999 Vallabh Prakashan, Delhi
5. Tripathi Pharmacological Experiments in Intact & Isolated Preparations.

BPHM 509 Lab- Pharmacognosy-IV

1. To study morphological characters and powder microscopy of Tobacco.
2. To study morphological characters and powder microscopy of Areca.
3. To study morphological characters and powder microscopy of Lobelia.
4. To study morphological characters and powder microscopy of Datura.
5. To study morphological characters and powder microscopy of Belladonna.
6. To study morphological characters and powder microscopy of Hyoscyamus.
7. To study morphological characters and powder microscopy of Withania.
8. To study morphological characters and powder microscopy of Kurchi.
9. To study morphological characters and powder microscopy of Cinchona.
10. To study morphological characters and powder microscopy of Ipecac.
11. To study morphological characters and powder microscopy of Rauwolfia.
12. To study morphological characters and powder microscopy of Nux Vomica.
13. To study morphological characters and powder microscopy of Vinca.
14. To study morphological characters and powder microscopy of Colchicum.
15. To study morphological characters and powder microscopy of Ephedra.
16. To study morphological characters and powder microscopy of Coffee/Tea.
17. Mention list of important medicinal and aromatic plants in India.
18. To prepare a general chart of alkaloid from shikimic acid pathway.
19. To prepare a general chart of glycosides from shikimic acid pathway.
20. To prepare a general chart of terpenoids from acetate-mevalonate pathway.
21. To prepare a general chart of flavonoids from polyketide pathway.
22. To perform TLC of isolated volatile oil from given plant material.
23. To perform TLC of crude extract from given plant material.

Suggested Reading/ Books:

1. Wallis, T. E. Practical Pharmacognosy, 4th Edition, PharmaMed Press, Hyderabad.
2. Vasudevan, T. N. and Laddha, K. S. Herbal Drug Microscopy, 1st Edition, Yucca Publishing House, Dombivli.
3. Jackson, B. P. and Snowdown, D. W. Atlas of Microscopy, CBS Publishers & Distributors (P) Ltd., New Delhi.
4. Khandelwal, K. R. Practical Pharmacognosy, 19th Edition, Nirali Prakashan, Pune.
5. Kokate, C. K. Practical Pharmacognosy, 4th Edition, Vallabh Prakashan, Delhi.

BPHM 510 Lab - Pharmaceutics VII (Biopharmaceutics and Pharmacokinetics)

1. Practice the method for determining the line of best fit by using linear regression analysis.
2. Compute AUC of given plasma drug concentration-time data using numeric and non-numeric methods.
3. Determine the influence of excipients on the rate of release of drug from different dosage forms.
4. Determine various PK parameters of drug following ICBM kinetics after administration through IV infusion.
5. Verify the Noyes-Whiteny law of dissolution.
6. Calculate the elimination rate constant from urinary excretion data using rate of excretion and sigma minus methods.
7. Perform the dissolution of tetracycline capsule and study the effect of antacid on its release.
8. Apply method of residuals on the given data of drug obeying ICBM kinetics after administration as a single oral dose and also calculate various parameters using semilog graph paper.
9. Find the acid neutrilization capacity of given brand of antacid tablets.
10. Simulate the plasma drug concentration for multiple drug administration in a linear system using superposition principle for a single oral dose of drug.
11. Compute various PK parameters using non-compartmental analysis from orally administered drug data.
12. Determine the rate constant and half life of first order reaction of an ester by graphic and substitution method.
13. Apply method of residuals on the given plasma drug concentration-time data of a drug obeying 2CBM kinetics after IV bolus administration and also calculate various PK parameters viz. intercept, microconstants and transfer rate constant using semilog graph paper.
14. Predict plasma concentration of drug after multiple IV bolus administration by superposition principle and plot graph between plasma drug concentration and time up to seven dosing intervals.
15. Apply non-compartmental approach on the given plasma drug concentration versus time data of an IV administered drug and calculate various PK parameters.
16. Plot the plasma drug concentration-time data sets of different doses of a drug on semilog graph paper and identify the portion of plasma drug concentration-time data which is non-linear.
17. Plot the given plasma drug concentration-time data on semilog graph paper and identify whether it is zero order or first order process.
18. Compute various PK parameters from the given plasma drug concentration-time data of first order process using semilog graph paper and write down the equation for the line produced on the graph.
19. Determine the absolute bioavailability and relative bioavailability from the given AUC-dose data of the formulations containing the same drug.
20. Layout a Latin square cross over design for a bio-equivalance study, comparing three different drug formulations (A,B&C) and four different formulations (A,B,C&D).

SEMESTER VI

EVSC 101 Environmental Science

Objective/s and Expected outcome: Upon successful completion of the course, students should be able to:

1. Measure environmental variables and interpret results
2. Evaluate local, regional and global environmental topics related to resource use and management
3. Propose solutions to environmental problems related to resource use and management
4. Interpret the results of scientific studies of environmental problems
5. Describe threats to global biodiversity, their implications and potential solutions

SECTION-A

Introduction: Definition and scope and importance of multidisciplinary nature of environment. Need for public awareness. **(2)**

Natural Resources: Natural Resources and associated problems, use and over exploitation, case studies of forest resources and water resources. **(4)**

Ecosystems: Concept of Ecosystem, Structure, interrelationship, producers, consumers and decomposers, ecological pyramids-biodiversity and importance. Hot spots of biodiversity. **(4)**

Environmental Pollution: Definition, Causes, effects and control measures of air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management: Causes, effects and control measure of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster Management : Floods, earthquake, cyclone and landslides. **(5)**

SECTION-B

Social Issues and the Environment From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Case studies. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of pollution) Act. Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation Public awareness **(5)**

Human Population and the Environment, Population growth, variation among nations. Population explosion – Family Welfare Programme. Environment and human health, Human Rights, Value Education, HIV/AIDS. Women and child Welfare. Role of Information Technology in Environment and human health. Case studies **(4)**

Suggested Readings/ Books:

1. Agarwal, K. C. 2001 Environment Biology, Nidi Publ. Ltd. Bikaner.
2. Jadhav, H & Bhosale, V.M. 1995. Environment Protection and Laws. Himalaya Pub House, Delhi 284p.
3. Rao M. N. & Datta A.K. 1987. Waste Water Treatment. Oxford & IBH Publ. Co. Pvt. Ltd. 345 p.
4. Principle of Environment Science by Cunninghan, W.P.
5. Essentials of Environment Science by Joseph.
6. Environment Pollution Control Engineering by Rao, C.S.
7. Perspectives in Environmental Studies by Kaushik, A.
8. Elements of Environment Science & Engineering by Meenakshi.
9. Elements of Environment Engineering by Duggal.

BPHM 601 Pharmaceutical Chemistry-VI (Medicinal Chemistry-I)

Module -01 Physicochemical and Stereochemmical aspects of drugs including bioisosterism in relation to biological activity, Drug-Receptor interaction.

Module -02 Conventional methods of drug design, Lead,Discovery of Lead, lead optimization Vitamins: Water soluble and fat soluble vitamins

Module -03 Introduction, Structure, Stereochemistry, Nomenclature, Synthesis of specified drugs (given in parenthesis), mode of action, Structure Activity Relationships (if any) uses and Physicochemical properties of the following classes of drugs: Adrenergic hormones and drugs including biosynthesis, storage, release and metabolism of Catecholamine (Isoprenaline, Adrenaline, Salbutanol).

Module -04 Introduction, Structure, Stereochemistry, Nomenclature, Synthesis of specified drugs (given in parenthesis), mode of action, Structure Activity Relationships (if any) uses and Physicochemical properties of the following classes of drugs: Cholinergic and Anticholinestarases including biosynthesis, storage, release and metabolism of acetylcholine (Neostigmine bromide,Pyridostigmine Bromide)

Module- 05 Introduction, Structure, Stereochemistry, Nomenclature, Synthesis of specified drugs (given in parenthesis), mode of action, Structure Activity Relationships (if any) uses and Physicochemical properties of the following classes of drugs: Antispasmodic and Antiulcer drugs (Propantheline bromide,Dicyclomine hydrochloride) Antiparkinsonism drugs (Apomorphine).

Module -06 Introduction, Structure, Stereochemistry, Nomenclature, Synthesis of specified drugs (given in parenthesis), mode of action, Structure Activity Relationships (if any) uses and Physicochemical properties of the following classes of drugs: Neuromuscular blocking agents (Succinylcholine chloride,Gallamine triethiodide). Prostaglandins and other Eicosanoids: Nomenclature, biosynthesis and biological activity.

Module -07 Introduction, Structure, Stereochemistry, Nomenclature, Synthesis of specified drugs (given in parenthesis), mode of action, Structure Activity Relationships (if any) uses and Physicochemical properties of the following classes of drugs: Antihistamines including Sodium Cromoglycate (Chloropheniramine).

Module -08 Introduction, Structure, Stereochemistry, Nomenclature, Synthesis of specified drugs (given in parenthesis), mode of action, Structure Activity Relationships (if any) uses and Physicochemical properties of the following classes of drugs: Analgesic-antipyretics and Non-steroidal Anti-inflammatory agents: (Indomethacin, and Phenylbutazone).

Suggested Readings / Books:

1. Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry, Eleventh Edition, edited by J. H. Block and J. M. Beale Jr., Lippincott Williams & Wilkins, Philadelphia, 2004.

2. Foye's, Principles of Medicinal Chemistry, Sixth Edition, Wolters Kluwer (India), Lea & Febiger, Philadelphia, USA, 2008.
3. Hansch, C. Comprehensive medicinal Chem. Vol.IV, Quantitative Drug Design. Pergamom Press, Oxford.
4. Singh, H. and Kapoor, V.K. Medicinal and Pharmaceutical Chemistry, Second Edition Vallabh Prakashan, Delhi,2005.

BPHM 602 Pharmaceutical Jurisprudence & Ethics

Module- 01 Introduction

a. Pharmaceutical Legislations- A brief review.
b. Drugs & Pharmaceutical Industry- A brief review.
c. Pharmaceutical Education- A brief review.
d.

BRIEF STUDY OF THE FOLLOWING WITH SPECIAL REFERENCE TO THE MAIN PROVISIONS.

Module- 02 Code of Pharmaceutical Ethics Pharmacy Act 1948. Drugs Price Control Order.

Module- 03 Drugs and Cosmetics Act 1940 and Rules 1945.

Module- 04 Medicinal & Toilet Preparations (Excise Duties) Act 1955. Narcotic Drugs & Psychotropic Substances Act 1985 & Rules.

Module- 05 Poisons Act 1919 Drugs and Magic Remedies (Objectionable Advertisements) Act 1954. Medical Termination of Pregnancy Act 1970 & Rules 1975.

Module- 06 Prevention of Cruelty to Animals Act 1960. States Shops & Establishments Act & Rules. Insecticides Act 1968.

Module- 07 AICTE Act 1987, Factories Act 1948, Minimum Wages Act 1948 & Patents Act 1970.

Module- 08 A brief study of the Various Prescription/Non-prescription Products, Medical / Surgical accessories, Diagnostic aids, appliances available in the market.

Note: The teaching of all the above Acts should cover the latest amendments.

Books Recommended

1. Jain, N.K.A Textbook of Forensic Pharmacy. Vallabh Prakashan, New Delhi.
2. Mithal, B.M. A Textbook of Forensic Pharmacy. National Book Depot, Kolkatta.
3. Kokate and Gokhale, Textbook of Forensic Pharmacy, 2006, Pharma Book Syndicate, Hyderabad

BPHM 603 Pharmacology II

Module 1: Pharmacology of Cardiovascular System: Digitalis and cardiac glycosides. Antihypertensive drugs.

Module 2: Pharmacology of Cardiovascular System: Antianginal and Vasodilator drugs, including calcium channel blockers and beta adrenergic antagonists. Antihyperlipedimic drugs

Module 3: Pharmacology of Cardiovascular System: Antiarrhythmic drugs. Drugs used in the therapy of shock

Module 4: Drugs Acting on the Hemopoietic System: Hematinics Anticoagulants, Vitamin K and hemostatic agents. Fibrinolytic and anti-platelet drugs Blood and plasma volume expanders.

Module 5: Drugs acting on urinary system: Fluid and electrolyte balance, Diuretics

Module 6: Autacoids: 5- HT and their antagonists. Prostaglandins, thromboxanes and leukotrienes.

Module 7: Histamine, Pentagastrin , Cholecystokinin, Angiotensin, Bradykinin and Substance P.

Module 8: Drugs Acting on the Respiratory System: Anti-asthmatic drugs including bronchodilators. Anti-tussives and expectorants. Respiratory stimulants.

Suggested Readings/ Books:

1. Goodman Gilman, A., Rall, T.W., Nies, A.I.S. and Taylor, P. Goodman and Gilman's The pharmacological Basis of therapeutics. 11th Ed, 2006. Publisher Mc Graw Hill, Pergamon press.
2. Craig, C.R.&Stitzel, R.E. Modern Pharmacology. Latest edition. Publisher: Little Brown.Co
3. Katzung B.G. Basic & Clinical Pharmacology 4th edt. 2008 Churchill Livingstone New York
4. Tripathi, K. D. Essentials of medical pharmacology. 6th Ed, 2008. Publisher: Jaypee, Delhi.
5. Rang, H.P. & Dale, M.M. Pharmacology. 6th edition, 2007. Publisher: Churchill Living stone.
6. Satoskar, R.S. and Bhadarkar, S.D. Pharmacology and pharmacotherapeutics. 16th edition (single volume), 1999. Publisher: Popular, Dubai.

BPHM 604 Pharmacognosy – V (Chemistry of Natural Products)

Module- 01 Chemical and spectral approaches to simple molecules of natural origin. Concept of stereoisomerism taking examples of natural products.

Module- 02 Chemistry and pharmacological activity of medicinally important monoterpenes (Citral, α- Terpineol, Menthol, α-Pinene, Camphor), Sesquiterpenoids (Farnesol, Zinziberene), Diterpenoids (Phytol), Triterpenoids (Squalene).

Module- 03 Carotenoids : a- carotenoids, b- carotenes, vitamin A, Xanthophylls of medicinal importance.

Module- 04 Glycosides: Chemistry, pharmacological activity of digitoxin, digoxin, hecogenin, sennosides, diogenin and sarasapogenin.

Module- 05 Alkaloids : Chemistry and pharmacological activity of atropine and related compounds; quinine and reserpine

Module- 06 Alkaloids: morphine, papaverine, ephedrine, ergot and vinca alkaloids.

Module- 07 Chemistry and pharmacological activity of medicinally important lignans, quassinoids and flavonoids.

Module- 08 Chemistry and therapeutic activity of penicillin, streptomycin and tetracycline.

Suggested Reading/ Books:

1. Finar, I. L. Organic Chemistry, Volume 2: Stereochemistry and The Chemistry of Natural Products, 5th Edition, Dorling Kindersley (India) Pvt. Ltd., Licensees of Pearson Education in South Asia, New Delhi.
2. Agarwal, O. P. Chemistry of Organic Natural Products, Volume I, 41st Edition, Krishna Prakashan Media (P) Ltd., Meerut.
3. Agarwal, O. P. Chemistry of Organic Natural Products, Volume II, 40th Edition, Krishna Prakashan Media (P) Ltd., Meerut.
4. Bhat, S. V., Nagasapagi, B. A. and Sivakumar, M. chemistry of Natural Products, Narosa Publishing House, New Delhi.
5. Pandeya, S. N. A Textbook of Medicinal Chemistry of Natural Products, SG Publisher, Varanasi.
6. Chatwal, G. R. Organic Chemistry of Natural Products, Volume I, 4th Edition, Himalaya Publishing House, Delhi.
7. Chatwal, G. R. Organic Chemistry of Natural Products, Volume II, 2nd Edition, Himalaya Publishing House, Delhi.

BPHM 605 Pharmaceutical Microbiology

Module- 01 Introduction: Historical development and scope of pharmaceutical microbiology, Structure of Bacterial Cell. **Classification of microbes and taxonomy**: Actinomycetes, Bacteria, Rickettsiae, spirochetes and viruses.

Module- 02 Identification of microbes: Stains and types of staining techniques, electron microscopy. **Nutrition, cultivation and Isolation**: bacteria, Actinomycetes, fungi and virus.

Module- 03 Microbial genetics and variation : Structure of gene, genetic code, transcription, translation, mutation and regulation of gene expresion, bacterial enzymes.

Module- 04 Control of Microbes : physical and chemical methods : **Disinfectants** : Dynamics of disinfection, factors affecting the process of disinfection, Evaluation of liquid disinfectants & methods of measuring growth inhibition (MIC). Types of chemical agents employed for disinfection, antisepsis and preservation with their full description & use.

Module- 05 Control of Microbes : physical and chemical methods : **Principles and Practice of sterilization methods** : Introduction, sensitivity of microorganisms, typical survival curves for bacterial spores exposed to moist heat or gamma radiations, expression of resistance in therms of D value and Z value & sterility assurance. Sterilization methods (Heat, Gaseours, Radiations & Filtration using different filter devices) with emphasis on sterilization of items used in hospital, thermolabile drugs and injectables. Monitoring of sterilization processes. Laminar aseptic hoods and aseptic processing.

Module- 06 Sterlity Testing : Methods and media used with emphasis of the specific details of the sterility testing of parenterals and ophthalmics and other non injectable preparations such as catgut etc.

Module- 07 Immunology : Infection, Factors influencing infection, immunity-Natural and acquired, Antigen containing preparations – Diphtheria, tetanus, staphylococcus, plague and BCG vaccine, Antibody containing preparation and Diagnostic preparations.

Module- 08 Microbial assays of antibiotics, vitamins and amino acids.

Books Recommended

1. Hugo and Russel. “Pharmaceutical Microbiology”, 6th edition, 1998, Balckwell Scientific Publication, Oxford
2. Prescott LM, Harley GP, Klein DA.” Microbiology”. 5th Edition, V.C.Brown Publishers, Oxford.
3. Pelczar MJ, Chan ECS, Krieg NR. ” Microbiology”, 5th edition, 1993, Tata McGraw Hill Publishing company Ltd., New Delhi.
4. Ananthanarayan R, Panikar CKJ. “Textbook of Microbiology”, 5th edition, 1999, Orient Longmann Ltd, Chennnai.
5. Gaud and Gupta, Practical Microbiology, 3rd edition reprint 2008, Nirali Prakashan, Pune.

BPHM 606 Lab - Pharmaceutical Chemistry-VI (Medicinal Chemistry-I)

1. To determine the partition coefficient of succinic acid between ether and water.
2. To determine the optical rotary power of given solution.
3. To determine the refractive index of given liquid.
4. To study the stereochemical aspects of given organic compounds using models.
5. To prepare the models of given drugs e.g. Ephedrine, Salbutamol and study the effect of stereoisomerism on their pharmacological activity.
6. To calculate pKa value for 4-methyl-3,5-dimethylbenzoic acid, 3-methoxy-4-hydroxy benzoic acid, p-nitrobenzoic acid, 3-methyl-4-nitrobenzoic acid using Hammett equation.
7. To calculate the Molecular connectivity index (MCI) for drugs like Ibuprofen, Epinephrine, Atropine, Propranolol.
8. To formulate QSAR (using simple regression method) between activity of given samples.
9. To synthesize and submit Aspirin.
10. To establish the pharmacopoeial standards of synthesized Aspirin.
11. To carry out the spectral analysis of synthesized Aspirin.
12. To synthesize and submit Paracetamol.
13. To synthesize and submit p-Bromoacetanilide.
14. To synthesize and submit metamfepramone hydrochloride.
15. To synthesize and submit methyldopa.
16. To establish the pharmacopoeial standards of synthesized methyldopa.
17. To synthesize and submit 7-hydroxy-4-methylcoumarin.

Suggested Readings / Books:

1. Aurther I. Vogel, Elementry practical organic chemistry Part 2. qualitative organic analysis 2nd edition, 1987, CBS publishers and distributors.
2. B. D. Khosla, V. C. Garg, Adarsh Gulati, Senior practical physical chemistry 12th edition, 2006, R.Chand and company, New Delhi.
3. Robert Thronton Morrison, Robert Neilson Boyd, Organic chemistry, 6th edition, 1992, Prentice Hall of India.
4. S. S. Kadam, K. R. Mahadik, K. G. Bothara, principles of meidcinal chemistry vol. I and II, 19th edition, 2009, Nirali parkashan, Pune.
5. Ashutosh Kar, advanced practical medicinal chemistry, Ist edition, 2004, New age intenational limited.
6. Aurther I. Vogel, Elementry practical organic chemistry Part 1. small scale preparations 2nd edition, 1987, CBS publishers and distributors.
7. B. S. Furniss, A. J. Hannaford, P. W. G. Smith, A. R. Tatchell, Vogel's textbook of practical organic chemistry, 5th edition, 2006, Dorling Kindersley publishers.
8. Indian Pharmacopoeia, An official book by govt. of India Ministry of health and family welfare, 6th edition Vol. II, 2010, published by Indian pharmacopoeia commission Ghaziabad.

BPHM 607 Lab- Pharmacology II

1. Study of some basic instruments used for isolated tissue experiments.
2. To prepare the physiological salt solution used in isolated tissue experiments.
3. Study (identification, isolation and preparation) of some commonly used standard isolated muscle preparations used for various isolated tissue experiments.
4. Effect of various agonists and antagonists and their characterization using isolated preparations like frog's rectus abdomens muscle and isolated ileum preparations of rat, guinea pig tracheal chain and rabbit jejunum.
5. Potentiation of acetylcholine responses with anticholinesterases.
6. Determination of dose ratio.
7. To record CRC of acetylcholine using guinea pig ileum / rat intestine.
8. To record the CRC of 5-HT on rat fundus preparation.
9. To record the CRC of histamine on guinea pig ileum/ rat intestine preparation.
10. To record the CRC of noraderenaline on rat anococcygeus muscle preparation.
11. To record the CRC of oxytocin using rat uterus preparation.
12. Determination of pD2 value.
13. To demonstrate study the ionotropic and chronotropic effects of drugs on isolated Rat/Rabbit/frog heart.
14. To demonstrate study the effects of drugs on normal and hypodynamic Rat/Rabbit/frog heart.
15. Demonstrate Blood Pressure of anaesthetized Dog/Cat/Rat: To demonstrate the effects of various drugs on the B.P. and respiration including the Vasomotor Reversal of Dale and nicotinic action of acetylcholine.

Suggested Readings/ Books:

1. Macleod, L.J. Pharmacological experiments on intact preparations. Latest edition, Publisher: Churchill livingstone.
2. Ian Kitchen. Textbook of in vitro practical pharmacology. Latest edition, Publisher: Black well Scientific.
3. Ghosh, M.N. Fundamentals of Experimental Pharmacology. Scientific Book Agency, Kolkatta.
4. Grover J.K., Experiments in Pharmacy & Pharmacology, CBS Publishers, New Delhi.
5. Kulkarni S.K., Hand Book of Experimental Pharmacology, Vallabh Prakashan, Delhi.
6. Goyal R. K.,Practical in pharmacology, B.S. Shah Prakasan ,Ahmedabad.

BPHM 608 Lab -Pharmacognosy – V (Chemistry of Natural Products)

1. To isolate the total alkaloidal content of the given drug, confirm by chemical tests and report its per cent yield.
2. To isolate the total flavonoidal content of the given drug, confirm by chemical tests and report its per cent yield.
3. To isolate the total tannin content of the given drug, confirm by chemical tests and report its per cent yield.
4. To isolate the total saponin content of the given drug, confirm by chemical tests and report its per cent yield.
5. To isolate atropine from belladonna leaves and repot its per cent yield.
6. To perform TLC profile of the isolated atropine to check its purity.
7. To isolate nicotine picrate from tobacco powder and repot its per cent yield.
8. To perform TLC profile of the isolated nicotine picrate to check it purity.
9. To isolate calcium citrate from lemon juice.
10. To isolate pectin from orange peel.
11. To isolate hesperidine from orange peel.
12. To perform TLC profile of hesperidine with reference standard.
13. To isolate starch from potato.
14. To isolate volatile oil from cardamom and perform its TLC.
15. To isolate volatile oil from lemon grass and perform its TLC.

Suggested Reading/ Books:

1. Kokate, C. K. Practical Pharmacognosy, 4th Edition, Vallabh Prakashan, Delhi.
2. Khandelwal, K. R. Practical Pharmacognosy, 19th Edition, Nirali Prakashan, Pune.

BPHM 609 Lab - Pharmaceutical Microbiology

1. To Study Compound microscope and its parts.
2. To Study different equipments in microbiology laboratory.
3. To Study the motility of microbes by hanging drop method.
4. To Prepare Bacterial Smear from both a liquid broth and agar medium.
5. To study given sample of microorganisms by simple staining.
6. To study given sample of microorganisms by Gram's staining method.
7. To study given sample of microorganisms by Negative staining method.
8. To Determine the Phenol-Coefficient of market disinfectants with the help of standard disinfectant.
9. To prepare and sterilize culture medium such as Nutrient agar media and nutrient broth medium for the growth of bacteria.
10. To prepare Nutrient broth medium and to determine the bacterial population.
11. To sterilize the given sample of powder/glassware's by using hot air oven.
12. To sterilize the given sample of Rubber gloves/surgical cotton by using Moist heat sterilization.
13. To determine the potency of antibiotic by biological assay by diffusion method.
14. To carry out sterility testing for tap water, sterilized water and water for injection.
15. To prepare the pure culture from the mixed culture by streak plate method.
16. To Study the working of air flow bench and aseptic transfer.

Practical/Books Recommended

1. R.S. Gaud and G.D. Gupta, Practical Microbiology, (2008), 3rd edition, Nirali Prakashan, Pune.
2. K. R. Aneja, Experiments in microbiology, plant pathology and tissue culture, wishwa prakashan.
3. R. K.Chandrakant, pharmaceutical microbiology experiments and technique, (2008), 2nd edition, Carrer publication, Nashik.

SEMESTER VII

BPHM 701 Pharmaceutical Biotechnology

Module- 01 Introduction : Definition and application of biotechnology in pharmaceutical sciences. **Immunology :** Principles, antigens and haptens, immune system, cellular humoral immunity, immunological tolerance.

Module- 02 Culturing Microorganisms : Batch culture, continous culture, Fed-batch culture and use of culture system for the production of microbial products.

Module- 03 Genetic Recombination : Transformation, conjugation, transduction, protoplast fusion and gene cloning and their applications. Development of hybridoma for monoclonal antibodies. Study of drugs produced by biotechnology such as Activase, Humulin,Streptokinase Humatrope, Hepatitis B vaccine etc.

Module- 04 Fermentation Technique : Introduction of fermentation, fermenter technoilogy, control of different parameters. Isolation of mutants, factors influencing rate of mutation. Design of fermentation process.

Module- 05 Fermentation Technique: Isolation of fermentation products - penicillins, streptomycins, tetracyclines, vitamin B12 & ethanol.

Module- 06 Microbial Transformation : Introduction, types of reactions mediated by microorganisms, design of biotransformation processes, selection of organisms, biotransformation process and its improvements with special reference to steroids.

Module- 07 & Module- 08 Enzyme immobilization : Techniques of immobilization of enzymes, factors affecting enzyme kinetics. Study of enzymes such as hyaluronidase, penicillinase, streptokinase and streptodornase, amylases and proteases etc. immobilization of bacteria and plant cells.

Books recommended

1. Trevan, Boffey, Goulding and Stanbury, Biotechnology the Biological Prianciples, Tata McGraw Hill.
2. Hugo and Russel. “Pharmaceutical Microbiology”, 6th edition, 1998, Balckwell Scientific Publication, Oxford.
3. Trevan MD, Boffey S, Goulding KH, Stanbury P.” Biotechnology- The Biological Principles “, 1st edition, 1998, Tata McGraw Hill, New Delhi.
4. Crueger W, Crueger A.” Biotechnology”, 2nd edition, 20000, Panima Publishing Corporation, New Delhi.
5. Vyas SP, Dixit VK.”Pharmaceutical Biotechnology”, 1st edition ,2007, CBS Publishers & Distributors, New Delhi.
6. Ward, O.P. “Fermentation Technology, Principles, Processes & products” Open University press, Milton Keynes, U.K.
7. Gaud, Gupta and Gokhale, Practical Biotechnology, 3rd edition, 2008, Nirali Prakashan, Pune.

BPHM 702 Pharmaceutics- VIII (Pharmaceutical Technology- II)

Module- 01 Capsules: Introduction, types, advantages and disadvantages, material and method of preparation hard gelatin capsules, size of capsules, method of capsule filling, soft gelatin, capsule shell and capsule content, importance of base absorption and minimum/gm factors in soft capsules, evaluation, quality control, stability testing and storage of capsule dosage forms.

Module- 02 Microenapsulation: Types of microcapsules, importance on microencapsulation in pharmacy, microencapsulation by phase separation, coacervation, multi orifice, spray drying, spray congealing, polymerization complex emulsion, air suspension technique, coating pan and other techniques, evaluation of micro capsules.

Module- 03 Tablets: a. Formulation of different types of tablets, granulation technology or large scale by various techniques, physics of tablets making, different types of tablet compression machinery and the equipment employed, evaluation of tablets. b. Coating of Tablets:- Types of coating, film forming materials, formulation of coating solution, equipments for coating, coating process evaluation of coated tablets. c. Stability kinetics and quality assurance.

Module- 04 Parenteral Products: Preformulation factors, routes of administration, water for injection, pyrogenicity, non-aqueous vehicles, isotonicity and methods of its adjustment. Formulation details, containers and closures and selection.

Module- 05 Parenteral Products: Prefilling treatment, washing of containers and closures, preparation of solution and suspensions, filling and closing of ampoules, vials, infusion fluids, lyophilization & preparation of sterile powders, equipment for large scale manufacture and evaluation of parenteral products. Aseptic Techniques:- source of contamination and methods of prevention, design of aseptic area, laminar flow bench services and maintenance. Sterility testing of Pharmaceuticals.

Module- 06 Surgical products:- Definition, primary wound dressing, absorbents, surgical cotton, surgical gauzes etc. bandages, adhesive tape, protective cellulosic hemostastics, official dressings, absorbable and non absorbable sutures, ligatures and catguts. Medical prosthetics and organ replacement materials.

Module- 07 Packaging of Pharmaceutical Products: Packaging components, types, specifications and methods of evaluation, stability aspects of packaging. Packaging equipments, factors influencing choice of containers, legal and other official requirements for containers, package testing.

Module- 08 Controlled release (CR) delivery systems: Principle, Advantages and Disadvantages, Classification and types of oral drug delivery system, transdermal and parenteral CR drug delivery agents.

Books Recommended

1. Aulton ME. "Pharmaceutics- The Science of Dosage Form Design", 1st edition, 1998, ELBS/Churchill Livingstone, New York.
2. Lachman L, Lieberman HA, Kanig JL." The Theory & Practice of Industrial Pharmacy", 3rd edition, 1991, Varghese Publishing House, Bombay.
3. Banker GS, Rhode CT. "Modern Pharmaceutics", 4th edition, Informa Healthcare, New York.
4. Allen LV, Popovich NG, Ansel HC", Ansel's pharmaceutical Dosage Forms & Drug Delivery Systems", 8th edition, 2005.
5. Lieberman HA, Lachman L, Sachwartz JB." Pharmaceutical Dosage Forms: Tablets", 2nd edition, 2005, Vols 1-3 Marcel Dekker, N.Y.
6. Bentia Simson, Microencapsulation, 2nd edition, 2007, Tylor's and Fransis.

BPHM 703 Pharmacology III

Module 01: Drugs Acting on the Gastrointestinal Tract: Antacids, Anti Secretory and Anti-ulcer drugs. Laxatives and antidiarrhoeal drugs.

Module 02: Drugs Acting on the Gastrointestinal Tract: Emetics and anti- emetics, Appetite Stimulants and Suppressants Miscellaneous- Carminatives, demulcents, protectives, adsorbents, Astrigents, digestants, enzymes and mucolytics.

Module 03: Pharmacology of Endocrine System: Hypothalamic and pituitary hormones. Thyroid hormones and anti thyroid drugs, parathormone, calcitonin and Vitamin D. Insulin, oral hypoglycaemic agents and Glucagon.

Module 04: Pharmacology of Endocrine System ACTH and corticosteroids, Androgens and anabolic steroids Estrogens, progesterone and oral contraceptives, Drugs acting on the uterus.

Module 05: Chemotherapy General Principles of Chemotherapy Sulfonamides and cotrimoxazole

Module 06: Chemotherapy Antibiotics- penicillins, cephalosporins, chloramphenicol,erythromycin, Quinolones and miscellaneous antibiotics.

Module 07: Chemotherapy Chemotherapy of tuberculosis, leprosy, fungal diseases, viral diseases, urinary tract infections and sexually transmitted diseases. Chemotherapy of malignancy and immunosuppressive agents.

Module 08: Principles of Toxicology Definition of poison, general principles of treatment of poisoning with particular reference to barbiturates, opioids, organophosphorous and atropine poisoning. Heavy metals and heavy metal antagonists.

Suggested Readings/ Books:

1. Gilman, A.G., Goodman, L.S.,Goodman and Gilman's The Pharmacological Basis of Therapeutics. 11th edt.2006 Editors J.G.Hardmanetal. Pergamon Press, New York.
2. Katzung B.G. Basic & Clinical Pharmacology 4th edt. 2008 Churchill Livingstone New York.
3. Craig, C.R. and Stitzel, R.E. Modern Pharmacology. Latest edition. Publisher: Little Brown and company.
4. Tripathi K.D. Essential of Medical Pharmacology.6th edt. 2008. Jaypee brother medical publisher. New Delhi.
5. Rang M.P., Dale M.M. and Riter, J.M. Pharmacology. 6th edt.2007Churchill Livingstone.London.

BPHM 704 Pharmaceutical Chemistry-VII (Medicinal Chemistry-II)

Note: Common for all modules as applicable - Introduction, Structure, Stereochemistry, Nomenclature, Synthesis of specified drugs (given in parenthesis), mode of action, Structure Activity Relationships (if any) uses and Physicochemical properties of the following classes of drugs:

Module 01 Steroids: Biosynthesis of Cholesterol; Estrogens (Oestradiol), Nonsteroidal estrogens (Stilboesterol), Antiestrogens, Progestogens, (progesterone from stigmasterol), Synthetic Progesterone (norethisterone), antiprogestogens, oral contraceptives.

Module 02 Steroids: Androgens (biosynthesis of testosterone and its synthesis from diosgenin), anabolic agents and adrenocorticoids (pathway for steroidogenesis),SAR of glucocorticoids.

Module 03 General Anaesthetics: Inhalational anaesthetics, Intravenous anaesthetics. **Local Anaesthetics**: Esters (Benzocaine), Amides (Lignocaine).

Module 04 Hypnotics and Sedatives: Barbiturates (Phenobarbitone);benzodiazepines (Nitrazepam) **Opioid Analgesics**: Morphine and related drugs; Synthetic modifications of Morphine, totally synthetic analgesics; 6, 7-Benzomorphinan (Pentazocine), 4-phenylpiperidines (pethidine), Methadone and related derivatives; endogenous opioid peptides and opioid antagonists (Nalorphine).

Module 05 Anticonvulsants: Barbiturates; Hydantoin (Phenytoin); Oxazolidinediones (Troxidone); Benzodiazepines and Carbamazepine. **Antitussives:** Centrally acting Antitussives, Opium alkaloids and related agents and Synthetic Antitussives, Peripherally acting antitussives and Expectorants. **Central Nervous System Stimulants**: Natural and Synthetic (Nikethamide); methylxanthines (Theophyllines) and Modified methylxanthines.

Module 06 Psychopharmacological Agents: Antipsychotic agents: Phenothiazines (chlorpromazine); butyrophenones and miscellaneous; **Antidepressants:** Tricyclic antidepressants (Amitryptyline), Atypical antidepressants; Monoamine oxidase inhibitors; **Anxiolytics:** Meprobamate and related drugs (Meprobamate); benzodiazepines (Diazepam)

Module 07 Diuretics: Carbonic anhydrase inhibitors (Acetazolamide); Thiazides and related drugs (Bendrofluazide); High ceiling diuretics (Frusemide), Aldosterone antagonists (spironolactone); other potassium sparing diuretics and osmotic diuretics.

Module 08 Cardiovascular agents: Cardiac glycosides; Antihypertensive agents; Antianginals and vasodilators; Antiarrhythmic drugs; Antihyperlipidemic drugs; Anticoagulant and platelet aggregation inhibitors (methyldopa, propranolol, procainamide, nitroglycerin).

Suggested Readings / Books:

1. Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry, Eleventh Edition, edited by J. H. Block and J. M. Beale Jr., Lippincott Williams & Wilkins, Philadelphia, 2004.

2. Pharmaceutical Chemicals in Perspective, B.G. Reuben and H.A. Wittcoff, John Wiley & Sons, New York, 1989.
3. Foye's, Principles of Medicinal Chemistry, Sixth Edition, Wolters Kluwer (India), Lea & Febiger, Philadelphia, USA, 2008.
4. Singh, H. and Kapoor, V.K. Medicinal and Pharmaceutical Chemistry, Second Edition Vallabh Prakashan, Delhi, 2005.

BPHM 705 Lab – Pharmaceutical Biotechnology

1. To isolate the micro-organism from sample of soil.
2. To isolate the micro-organism from sample of water.
3. To isolate the micro-organism from sample of air.
4. To study the antigen antibody interaction by blood group testing.
5. To demonstrate the lab scale fermenter.
6. To study the growth curve of bacteria (E. Coli/Yeast).
7. Production of ethanol using immobilizer sacrolysis cerevisiae from grape juice.
8. Production of ethanol using solid state fermentor.
9. To produce white wine/ red wine from grapes.
10. To perform the distillation of bioproducts.
11. To prepare standard curve of carbohydrate content of given sample by anthrone method.
12. To estimate carbohydrate content in given sample by anthrone method.
13. To study the various types of methods for immobilization of enzymes.
14. To perform immobilization of enzyme.
15. To study the effect of temperature on kinetics.
16. To study the effect of concentration of enzyme on kinetics.
17. To study the effect of pH on its kinetics.
18. To study different type of enzymes and its application.
19. To isolate vitamin B12 from fermented products.
20. To study the factors that affecting rate of mutation.
21. To study the effect of physical factors on mutagen of micro-organism.
22. To study the effect of chemical factors on mutagen of micro-organism.
23. To study the genetic recombination techniques and their applications.
24. To prepare the charts of various vaccine production.
25. To study the different types of vaccines used by humans.

BPHM 706 Lab - Pharmaceutics- VIII (P'ceutical Technology- II)

1. To study the common instrument used in production and evaluation of dosage form i.e. tablet, capsule, injection etc.
2. To evaluate various pharmacopoeial standards of given tablet of paracetamol (Crocin).
3. To carry out the disintegration test for enteric coated tablet (ecosprin-75, delayed release tablet).
4. To carry out the comparative study of USP dissolution apparatus and IP dissolution apparatus.
5. To prepare and evaluate Paracetamol tablet by wet granulation method.
6. To prepare and evaluate ferrous sulphate tablets.
7. To prepare acetyl salicylic acid tablets by wet granulation method.
8. To prepare and evaluate acetyl salicylic acid tablet by dry granulation method.
9. To prepare and evaluate effervescent aspirin tablets.
10. To prepare and evaluate paediatric dispersible aspirin tablets.
11. To prepare and evaluate chewable antacid tablet.
12. To study the base adsorption and determination of capsule fill weight.
13. To prepare herbal capsule of given material.
14. To formulate and evaluate microcapsule by temperature change method .
15. To formulate and evaluate microcapsule by solvent evaporation method.
16. To prepare sterile water for injection.
17. To prepare ascorbic acid injection.
18. To prepare dextrose injection (5%).
19. To prepare sodium chloride injection.
20. To prepare electrolyte maintenance IV fluid solution.
21. To prepare compound sodium chloride injection (Ringer's injection).
22. To perform the evaluation test of glass.
23. To perform evaluation test of rubber closures.
24. To study general material for packaging.
25. To evaluate surgical cotton under the following parameters
    (a) Absorbency (b) loss on drying (c) fibre size
26. To study the ligatures and sutures. (marketed products)
27. To evaluate various parameters of pharmaceutical bandages

BPHM 707 Lab - Pharmacology III

1. To calculate the pA2, value of atropine using actylcholine as an agonist on rat ileum preparation.
2. To calculate the pA2, value of mepyramine or chlorpheniramine using histamine as agonist on guinea pig / rat ileum.
3. To estimate the strength of the test sample of agonist/drug (e.g. Acetylcholine, Histamine, 5- HT, Oxytocin, etc.) using a suitable isolated muscle preparation employing Matching bioassay ,interpolation bioassay, Bracketing assay and multiple point bioassay.
4. To study the Anti- secretory and anti- ulcer activity using pylorus ligated rats.
5. To study the effect of drug/ drug on intestinal motility in rat/mice.
6. To study the pharmacokinetics of a drugs in rabbits/rat.
7. To carry out bioassay of heparin sodium as per IP(2010).
8. To carry out bioassay of Streptokinase as per IP(2010).
9. To carry out bioassay of Insulin as per IP(2010).

Suggested Readings/ Books:

1. Macleod, L.J. Pharmacological experiments on intact preparations. Latest edition, Publisher: Churchill livingstone.
2. Ian Kitchen. Textbook of in vitro practical pharmacology. Latest edition, Publisher: Black well Scientific.
3. Ghosh, M.N. Fundamentals of Experimental Pharmacology. Scientific Book Agency, Kolkatta.
4. Grover J.K., Experiments in Pharmacy & Pharmacology, CBS Publishers, New Delhi.
5. Kulkarni S.K., Hand Book of Experimental Pharmacology, Vallabh Prakashan, Delhi.
6. Goyal R. K.,Practical in pharmacology, B.S. Shah Prakasan ,Ahmedabad .
7. Indian pharmacopeia 2010 ,Govt. of India

BPHM 708 Lab - Pharmaceutical Chemistry-VII (Medicinal Chemistry-II)

1. To prepare the models of given compds &designate stereochemistry according to sequence rule.
2. To prepare the models of different tropane alkaloids.
3. To prepare the models of quinine & its diastereomers.
4. To prepare the models of diff. isomers of chloromphenicol.
5. To prepare the models of optical isomers of ephedrine.
6. To prepare & study the models of morphine and diosgenin.
7. To synthesize 5,5 diphenyl hydantoin.
8. To establish pharmacopieal standards of phenytoin.
9. To carry out spectral studies of phenytoin.
10. To synthesize biphenic acid from anthranilic acid.
11. To synthesize cyclohexanone oxime from cyclohexanone.
12. To synthesize caprolactam by Beckmann rearrangement.
13. To synthesize p- nitro benzoic acid from p- nitro toluene.
14. To synthesize PABA from p- nitro benzoic acid.
15. To synthesize benzocaine from PABA.
16. To establish pharmacopieal standards of benzocine.
17. To synthesize barbituric acid from urea.
18. To establish pharmacopieal standards of barbituric acid.
19. To carry out spectral studies of barbituric acid.
20. To carry out spectral studies of given compound.

Suggested Readings / Books

1. H.Singh and V.K. Kapoor. Medicinal and Pharmaceutical Chemistry, Second ed.2005 Vallabh prakashan, Delhi.
2. Jaime N Delgado. William A Remeirs. Wilson and Gisvold Textbook of organic medicinal and pharmaceutical chemistry, 11th ed.2004.J.B.Lippincott company.
3. Thomas Nogardy. Donald F Weaver. Medicinal Chemistry.3rd ed.1988.Oxford University Press.
4. S.S.Kadam,K.R.Mahadik,K G Bothra. Principles of Medicinal Chemistry.Vol I &II.19th ed. 2009.Nirali prakashan, pune.

BPHM 709 Lab – Project Work

BPHM 710 Industrial Training (Evaluation)

SEMESTER VIII

BPHM 801 Pharmaceutics-IX (Dosage Form Design)

Module 01 Preformulation studies : Study of physical properties of drugs like physical form, particle size, shape, density, wetting, dielectric constant. Solubility, dissolution and organoleptic property and their effect on formulation, stability and bioavailability.

Module 02 Study of chemical properties of drugs like hydrolysis, oxidation, reduction, racemization, polymerization etc., and their influence on formulation and stability of products. Study of pro-drugs in solving problems related to stability, bioavailability and elegancy of formulation.

Module 03 Design, development and process validation methods for pharmaceutical operations involved in the production of pharmaceutical products with special reference to tablets, suspensions.

Module 04 Stabilization and stability testing protocol for various pharmaceutical products.

Module 05 Performance evaluation methods : a. In vitro dissolution studies for solid oral dosage forms, Federal perspectives on Immediate Release (IR) and Extended Release (ER) products. b. Brief Concepts of Biopharmaceutics Classification Scheme (BCS), in-vitro in-vitro correlation and bio-waiver.

Module 06 Important federal considerations for bio-availability and bio-equivalence studies for oral products; Statistical considerations including Crossover ANOVA.

Module 07 GMP and quality assurance, Quality audit.

Module 08 Design, development, production and evaluation of controlled released formulations.

Books Recommended

1. Aulton ME. “Pharmaceutics- The Science of Dosage Form Design”, 1st edition, 1998, ELBS/Churchill Livingstone, New York.
2. Lachman L, Lieberman HA, Kanig JL.” The Theory & Practice of Industrial Pharmacy”, 3rd edition, 1991, Varghese Publishing House, Bombay.
3. Banker GS, Rhode CT. “Modern Pharmaceutics”, 4th edition, Informa Healthcare, New York.
4. Lieberman HA, Lachman L, Sachwartz JB.” Pharmaceutical Dosage Forms: Tablets”, 2nd edition , 2005, Vols 1-3 Marcel Dekker, N.Y.
5. Jain NK. “Controlled and novel drug delivery”, 3rd edition, 2004, CBS Publishers & Distributors, New Delhi.

BPHM 802 Pharmaceutical Analysis-III

Module 01 Electromagnetic Radiations: Nature of Electromagnetic Radiations,the interaction between energy and matter. **Ultraviolet and Visible Spectrophotometry**: Electronic excitation, quantitative laws, deviations from Beer's law, graphical presentation of data, chromophores, photometric error, instrumentation (light sources, prism and grating monochromators, photoemissive and photomultiplier tubes), single and double beam instruments, spectrophotometric measurements, concentration and optimum absorbance value, applications.

Module 02 Fluorometric Analysis: Theory, quantitative description, experimental factors affecting fluorescence intensity, factors affecting Io and F directly, relationship of fluorescence to molecular structure, instrumentation (cells, light sources, wavelength selection, detectors), correction of spectra, pharmaceutical applications.

Module 03 Infrared Spectrophotometry: Theory, characteristic absorption bands of organic functional groups, interpretation of infrared absorption Spectra; Frequency range, bandwidth and scan speed, concentration range and absorbance value, preparation of sample, sample cell, IR instrumentation, (light sources, monochromator detectors), qualitative and quantitative applications in pharmaceutical analysis, analytical shortcomings.

Module 04 X-Ray Spectroscopy: An introduction to the theory of x-ray spectroscopy (Miller indices, Space lattice and unit cell, Bravais lattices). Interplanar spacing in crystal system. Diffraction of x-ray by crystals, Bragg's equation, powder method, x-ray diffraction pattern of cubic system (NaCl),applications in pharmaceutical analysis.

Module 05 Nuclear Magnetic Resonance Spectroscopy: An introduction to the theory of NMR, magnetic properties of the nuclei, nuclear magnetic moments, absorption of energy, chemical shift, shielding and deshielding, spin-spin coupling, NMR instrumentation, typical spectra, analytical application in pharmaceutical analysis.

Module 06 Mass Spectrometry: Instrumentation, Basic principle determination of the molecular formula, recognition of the molecular ion peak, fragmentation and analytical application in pharmaceutical analysis.

Module 07 Flame Photometry: Origin of spectra, atomization and ionization, instrumentation (nebuliser, mirrors, burners, slits, monochromator, detector, background emission, interferences, qualitative & quantitative applications in pharmaceutical analysis).

Module 08 Atomic Absorption Spectroscopy: Theory of absorption of radiant energy by atoms, equipment, analytical applications. **Polarimetry**, its Principles and Applications

Suggested Readings / Books:

1. L.G. Chatten, Pharmaceutical Chemistry, V 01. 1 and 2, Marcel Dekker, NY (Latest Edition).

2. A. H. Beckett and J. B. Stenlake, Practical Pharmaceutical Chemistry,Vol. 1 and 2, Athlone Press of the University of London (Latest Edition).
3. H. Willard, L.L., Marriott; Jr., J. A. Dean, Instrumental Methods of Analysis, Van Nostrand Reinhold, N.Y. (Latest Edition).
4. J. W. Robinson, Undergraduate Instrumental Analysis, Marcel and Dekker Inc., NY, 1970 (Latest Edition).
5. V. M. Parikh, Absorption Spectroscopy of Organic Molecules, Addison-Wesley Publishing Co., London, 1974 (Latest Edition).

BPHM 803: Pharmacognosy – VI

Module- 01 World-wide trade in medicinal plants and derived products with special reference to diosgenin (dioscorea), taxol (Taxus sps) digitalis, tropane alkaloid containing plants, papain, Cinchona, Ipeacac, Liquorice, Ginseng, Aloe, Valerian, Rauwolfia and laxative plants.

Module- 02 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.

Module- 03 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.

Module- 04 Historical development of plant tissue culture, types of cultures, nutritional requirements, growth and their maintenance. Applications of plant tissue culture in pharmacognosy.

Module- 05 Chemotaxonomy of medicinal plants and fungal toxins.

Module- 06 Marine Pharmacognosy, novel medicinal agents from marine sources.

Module- 07 Natural allergens and photosensitizing agents.

Module- 08 Herbs, health foods, neutraceuticals and Herbal cosmetics. Introduction to registration aspects of herbal products for marketing. Agencies controlling regulatory aspects for herbal products at national and international level (WHO, EMEA etc).

Suggested Reading/ Books:

1. Atal, C.K. and Kapur, B.M. Cultivation & Utilization of Medicinal Plants, RRL Jammu.
2. Kalia, A.N. Textbook of Industrial Pharmacognosy, CBS Publishers & Distributors, New Delhi.
3. Ansari, S.H. Essentials of Pharmacognosy. Third Edition 2009, Birla Publication Pvt. Ltd., Delhi.
4. Remington. The Science and Practice of Pharmacy, Vol. I & II, Mack Publishing Company, Pennsylvania.
5. Wagner, H. and Bladt, S. Plant Drug Analysis- A Thin Layer Chromatography Atlas, Second Edition, Springer India Pvt. Ltd., New Delhi.

BPHM 804 Pharmacology-IV (Clinical Pharmacy & Drug Interactions)

Module 01: Introduction to Clinical Pharmacy Basic Concepts of Pharmacotherapy. Clinical Pharmacokinetics and individualization of Drug Therapy. Drug Delivery systems and their Biopharmaceutic and Therapeutic Considerations. Drug use during Infancy and in the Elderly (Pediatrics and Geriatrics).

Module 02: Drug use during pregnancy. Drug induced Diseases. The Basics of Drug Interactions. General Principles of Clinical Toxicology.

Module 03: Interpretation of Clinical Laboratory Tests. Therapeutic Drug Monitoring. Concept of Essential Drugs and Rational Drug use.

Module 04: Cardiovascular Disorders-Hypertension, Congestive Heart Failure, Angina, Acute Myocardial Infarction, Cardiac arrhythmias.

Module 05: CNS Disorders: Epilepsy, Parkinsonism, Schizophrenia, Depression. Respiratory Disease-Asthma.

Module 06: Gastrointestinal Disorders- Peptic ulcer, Ulcerative colitis, Hepatitis, obesity, Endocrine Disorders-Diabetes mellitus and Thyroid Disorders, erectile dysfunction.

Module 07: Infectious Diseases-Tuberculosis, Urinary Tract Infection, Enteric Infections, Upper Respiratory Infections – malaria, amebiosis, HIV Hematopoietic Disorders-Anemias.

Module 08: Joint and Connective Tissue Disorders- rheumatic disorder such as rheumatoid arthritis, Juvenile rheumatoid arthritis, ankylosing, spondylitis Gout and Hyperuricemia, Neoplastic Diseases-Acute Leukemia, Hodgkin's disease.

Suggested Readings/ Books:

1. Laurence, D.R. & Bennet, P.N. Clinical Pharmacology, 9th edt. 2006Churchil Livingstone New York.
2. Grahm smith D G. Aronson J K Oxford text book of clinical pharmacology and drug therepy.1984 Oxford University press USA.
3. Remington's The Science and Practice of Pharmacy, Mach Publishing Co. Pennsylvania.
4. Rowland, M. and Tozer, T.N. Clinical Pharmacokinetics Lea and Febiger, N.Y.
5. Winter, M.E. Basic Clinical Pharmacokinetics, Applied Therapeutics Inc., San Fransisco.

BPHM 805 Pharmaceutical Chemistry-VIII (Medicinal Chemistry-III)

Module 01 Drug Metabolism: Introduction, General pathways of drug metabolism: Phase I (Functionalization) and Phase II (Conjugation) Phase I: Oxidative reactions, Reductive reactions and Hydrolytic Reactions Phase II: Glucuronic acid conjugation, Sulphate conjugation, Amino acid conjugation, Glutathione conjugation, Acetyl conjugation and Methyl conjugation.

Note (Module 02- 08) Introduction, Structure, Stereochemistry, Nomenclature, Synthesis of specified drugs (given in parenthesis), mode of action, Structure Activity Relationships (if any) uses and Physicochemical properties of the following classes of drugs:

Module 02 Antibacterials: Penicillins, Cephalosporins, Tetracyclines, Aminoglycosides, Polypeptides antibiotics, Chloramphenicol, Quinolones, Sulphonamides. Antimycobacterials: (p-Aminosalicyclic acid, Thiacetazone, Isoniazid, Dapsone)

Module 03 Antimalarials: Quinoline and analogues, 4-Aminoquinolines, 8-Aminoquinolines, 9-Aminoacridines, Biguanides (Chloroquine, Primaquine), Artemisinin & its derivatives

Module 04 Antiamoebic and antiprotozoal drugs: Emetine hydrochloride, quinoline derivatives, organometallic compounds, Metronidazole (Metronidazole, Diloxanide furoate).

Module 05 Anthelmintics: Drugs used in cestode infection, antifilarial agents (Thiabendazole, Niclosamide, Hexylresorcinol)

Module 06 Antifungal drugs: (Clotrimazole ,Ketoconazole) Antiviral agents: Introduction to DNA, RNA and retroviruses.

Module 07 Antineoplastic agents: Alkylating agents, Antimetaboilities, Antitumor alkaloids, Hormones agonist and antagonists (Tamoxifen, Thiotepa, Chlorambucil),Antibiotics,Vinca Alkaloids and Paclitaxel.

Module 08

a. Hormones: Thyroid and Antithyroid Drugs; Insulin & Oral hypoglycemic agents

b. Diagnostic Agents and Organic Pharmaceutical Aids

Suggested Readings / Books

1. Singh & Kapoor. Medicinal & Pharmaceutical chemistry. 1st edition, 2001. Vallabh publications, Delhi.
2. Wilson & Gisvolds. Text book of Organic Medicinal & Pharmaceutical Chemistry. 11th edition, 1998. Lippincott Willians & Wilkins, London.
3. Lemke, Willians, Roche & Zito. Foye's Principles of Medicinal Chemistry. 6th edition, 2008. Lippincott Willians & Wilkins, London.
4. Nogrady & Weaver. Medicinal Chemistry. 3rd edition, 2005. Oxford University, Newyork.
5. Wermuth. The Practice of Medicinal Chemistry. 2nd edition, 2004. Elsevier India Pvt Ltd, New Delhi.

BPHM 806 Lab - Pharmaceutics-IX (Dosage Form Design)

1. To determine the flow properties of given sample of powder and study effect of glidants on flow.
2. To determine the partition coefficient of given sample of drug.
3. To carry out the solubility studies of given poorly water soluble drug.
4. To perform assay of aspirin and study the effect of adverse condition on aspirin.
5. To find out E1%, 1cm of Paracetamol.
6. To study dissolution apparatus and perform validation of dissolution apparatus.
7. To perform dissolution study of marketed Paracetamol tablets .
8. To perform comparative study of dissolution of marketed products. (i) Crocin (ii) Welset .
9. To perform dissolution study and compare data of conventional and sustained release diclofenac sodium tablet.
10. To study Pharmacokinetic Parameters of given IV and oral data.
11. To Formulate & Evaluate Microcapsules of Paracetamol using ethyl cellulose.
12. To formulate and evaluate transdermal patch of Salbutamol Sulphate.
13. To formulate and evaluate microcapsule of diclofenac sodium.
14. To formulate and evaluate topical gel of paracetamol.
15. To enhance the solubility of Paracetamol by solid dispersion technique.
16. To formulate and evaluate sodium alginate beads.

BPHM 807 Lab - Pharmaceutical Analysis-III

1. To study the instrumentation and working of ultraviolet–visible spectrophotometer and infrared spectrophotometer.
2. To calculate the λmax. of given compounds using Woodward-Fieser rules.
3. To interpret the given IR spectra.
4. To interpret the given NMR spectra.
5. To calibrate the absorbance scale of ultraviolet–visible spectrophotometer.
6. To calibrate the wavelength of ultraviolet–visible spectrophotometer.
7. To detect the stray light at a particular wavelength in ultraviolet–visible spectrophotometer.
8. To show the effect of solvent upon the absorption spectrum of phenol.
9. To show the effect of pH upon the absorption spectrum of sulphanilamide.
10. To estimate the amount of aspirin in the given formulation.
11. To estimate the amount of ascorbic acid in the given formulation.
12. To carry out the assay of ibuprofen by using ultraviolet–visible spectrophotometer.
13. To carry out the assay of caffeine and sodium benzoate injection.
14. To carry out the simultaneous estimation of paracetomol and diclofenac Sodium in the given formulation.
15. To determine the concentration of potassium in a dilute aqueous solution of potassium chloride.
16. To estimate sodium chloride by flame photometer.
17. To determine the absorption spectra of solutions of cyclohexanole to show the effect of dilution on the O-H absorption.

Suggested Readings / Books

1. H. Beckett and J. B. Stanlake, Practical Pharmaceutical Chemistry part 2, 4th edition, 1997, CBS publishers and distributors.
2. Donald L. Pavia, Gary M. Lapman, George S. Kriz, Introduction to Spectroscopy A guide for students of organic chemistry, 3rd edition, 2001, Brooks/Cole Thomson learning.
3. P. D. Sethi, Quantitative Analysis of Drugs in Pharmaceutical Preparations, 3rd edition, 1997, CBS publishers and distributors.
4. R. M. Silverstein and F. X. Webster, Spectrometric determination of organic compounds, 6th edition, 1997, John wiley and sons.
5. G. D. Devala Rao, Practical pharmaceutical analysis, 3rd edition, 2010, Birla publications.
6. B. G. Nagavi, Laboratory handbook of instrumental drug analysis,3rd edition, 2000, Vallabh prakashan.

BPHM 808 Lab - Pharmacognosy-VI

1. To extract Ammonium Glycyrrhizinate from Liquorice powder and perform TLC study of extracted compound.
2. To extract Piperine from Black Pepper and perform TLC study of extracted compound.
3. To extract total Cinchona alkaloids from powdered Cinchona bark and perform TLC study of extracted compound.
4. To extract Caffeine from Tea leaves and perform TLC study of extracted compound.
5. To isolate sennosides from the senna leaves and perform the TLC of the isolated compound.
6. To extract solanine from potato tubers.
7. To extract volatile oil from Fennel and perform TLC study of extracted oil.
8. To extract volatile oil from Eucalyptus leaves and perform TLC study of extracted oil.
9. To extract volatile oil from clove and perform TLC study of extracted oil.
10. To estimate carvone in the caraway oil.
11. To study and prepare various media used in plant tissue culture.
12. To establish the callus cultures from the seeds of *T. foenum-graceum.*
13. Estimation of Capsaicin in fruits of *Capsicum annum* using HPLC/HPTLC technique.
14. To prepare a herbal cosmetic preparation (cold cream/shaving cream/moisturizing cream etc).
15. To prepare an elaborated report on
    a. World-wide trade of medicinal plants *viz.* digitalis, cinchona, liquorice, rauwolfia, aloe and discuss their economic status at Indian perspective.
    b. The utilization of aromatic plants and name some plant based industries.
    c. Significance of chemotaxonomy of medicinal plants.
    d. Herbal nutraceuticals
    e. Herbal Cosmetics

Suggested Reading/ Books

1. WHO Guidelines (1998) Quality Control Methods for Medicinal Plant Materials, World Health Organisation.
2. Kokate CK (2003) Practical Pharmacognosy, Vallabh Prakashan, New Gyan Offset Printers, Delhi.
3. Khandelwal KR (2006) Practical Pharmacognosy Techniques and Experiments, 15th Ed., Nirali Prakashan, Pune.
4. Harborne JB (1973) Phytochemical Methods, Chapman and Hall, London.
5. Wallis CJ (1958) Practical Biology, II, William Heinemann Medical Books, London.
6. W.C. Evans, Trease and Evans (2002) Pharmacognosy, 15th edition, W.B. Saunders & Co., London.
7. Pharmacopoeia of India (1966, 1985) Govt. of India, Ministry of Health, India.

BPHM 809 Lab - Pharmaceutical Chemistry-VIII (Medicinal Chemistry-III)

1. To synthesize anthraquinone from o-benzoyl benzoic acid.
2. To synthesize acetanilide from aniline.
3. To synthesize benzophenone oxime from benzophenone.
4. To synthesize benzanilide from oxime.
5. To synthesize iodoform from ethyl alcohol.
6. To synthesize sulphanilic acid from aniline.
7. To synthesize sulphanilamide from acetanilide.
8. To establish pharmacopieal standards of PCM.
9. To carry out spectral studies of PCM.
10. To synthesize benzoic acid from benzamide.
11. To synthesize benzimidazole from o-phenylene diamine.
12. To synthesize p-bromo benzanilide from aniline.
13. To synthesize flurorescein from phthalic anhydride.
14. To synthesize benzyl from benzoin.
15. To establish pharmacopieal standards of diclofenac sodium.
16. To carry out spectral studies of diclofenac sodium.
17. To synthesize metronidazole from ethylene diamine.

Suggested Readings / Books

1. Singh & Kapoor. Medicinal & Pharmaceutical chemistry. 1st edition, 2001. Vallabh publications, Delhi.
2. Wilson & Gisvolds. Text book of Organic Medicinal & Pharmaceutical Chemistry. 11th edition, 1998. Lippincott Willians & Wilkins, London.
3. Lemke, Willians, Roche & Zito. Foye's Principles of Medicinal Chemistry. 6th edition, 2008. Lippincott Willians & Wilkins, London.
4. Nogrady & Weaver. Medicinal Chemistry. 3rd edition, 2005. Oxford university, Newyork.
5. Wermuth. The Practice of Medicinal Chemistry. 2nd edition, 2004. Elsevier India Pvt Ltd, New Delhi.