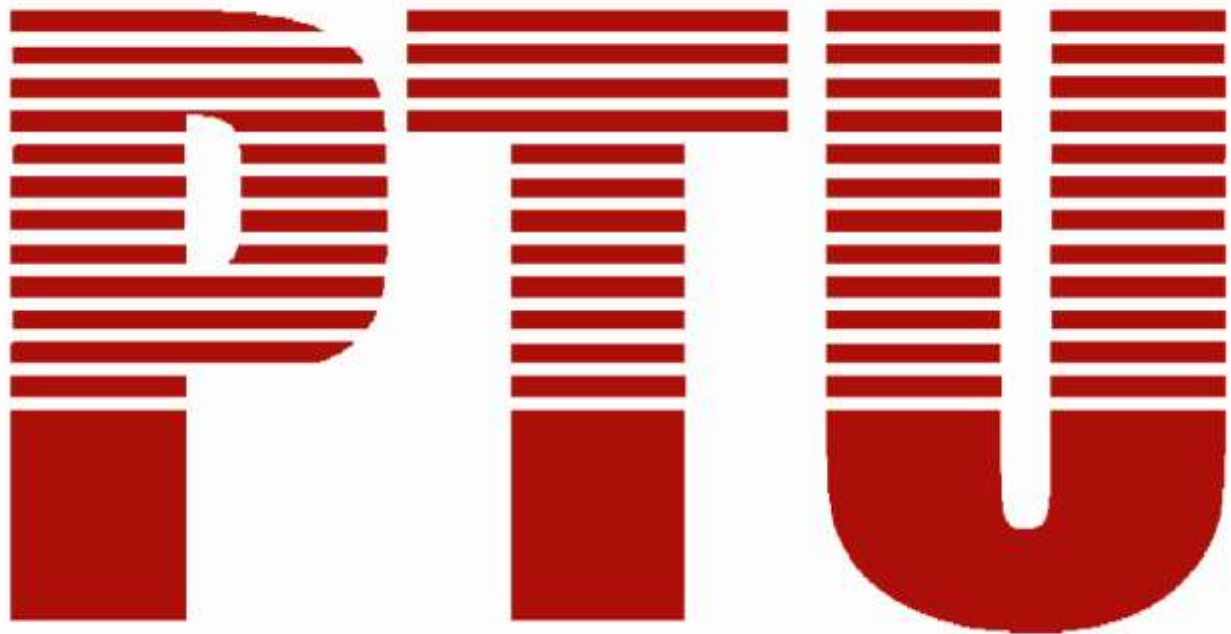


**Scheme & Syllabus of
Bachelor in Pharmacy
Batch 2011**



**By
Department of Academics**

Punjab Technical University

First Semester

Contact Hours 32 Hrs.

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

Second Semester

Contact Hours 32 Hrs.

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

Third Semester

Contact Hours 32 Hrs.

Course Code	Course Name	L+T	P	Total Marks	
				Internal Marks	External Marks
BPHM301	Pharmaceutical Mathematics	3+1	-	20	80
BPHM 302	Pharmacognosy-II	2+1	-	20	80
BPHM 303	Pharmaceutics-III (Unit Operation-I)	2+1	-	20	80
BPHM 304	Anatomy, Physiology & Health Education-II	2+1	-	20	80
BPHM 305	Pharmaceutical Industrial Management	2+1	-	20	80
BPHM 306	Pharmaceutical Chemistry-IV (Organic Chemistry-II)	3+1		20	80
BPHM 307	Lab Pharmacognosy-II	-	3	20	80
BPHM 308	Lab Pharmaceutics-III (Unit Operation-I)	-	3	20	80
BPHM 309	Lab Anatomy, Physiology & Health Education-II	- -	3	20	80
BPHM310	Lab Pharmaceutical Chemistry-IV (Organic Chemistry-II)	- -	3	20	80
	Total	20	12	200	800
	Grand Total	32H/W		1000	

Fourth Semester

Contact Hours 32 Hrs.

Course Code	Course Name	L+T	P	Total Marks	
				Internal Marks	External Marks
BPHM 401	Pharmaceutics-IV (Unit Operation-II)	2+1	-	20	80
BPHM 402	Pharmaceutical Analysis-II	3+1	-	20	80
BPHM 403	Pharmacognosy-III	2+1	-	20	80
BPHM 404	Pathophysiology of Common Diseases	2+1	-	20	80
BPHM 405	Pharmaceutics-V (Physical Pharmacy)	3+1	-	20	80
BPHM406	Intellectual Property Rights	2+1	-	20	80
BPHM 407	Lab Pharmaceutics-IV (Unit Operation-II)	-	3	20	80
BPHM 408	Lab Pharmaceutical Analysis-II	-	3	20	80
BPHM 409	Lab Pharmacognosy-III	-	3	20	80
BPHM 410	Lab Pharmaceutics-V (Physical Pharmacy)	-	3	20	80
	Total	20	12	200	800
	Grand Total	32H/W		1000	

Fifth Semester

Contact Hours 32 Hrs.

Course Code	Course Name	L + T	P	Total Marks	
				Internal Marks	External Marks
BPHM 501	Pharmaceutical Chemistry-V (Biochemistry)	2+1	-	20	80
BPHM 502	Pharmaceutics-VI (Pharmaceutical Technology-I)	2+1	-	20	80
BPHM 503	Pharmacology-I	3+1	-	20	80
BPHM 504	Pharmacognosy-IV	2+1	-	20	80
BPHM 505	Pharmaceutics- VII (Biopharmaceutics & Pharmacokinetics)	3+1	-	20	80
BPHM 506	Lab Pharmaceutical Chemistry-V (Biochemistry)		3	20	80
BPHM 507	Lab Pharmaceutics-VI (Pharmaceutical Technology-I)		3	20	80
BPHM 508	Lab Pharmacology-I		3	20	80
BPHM 509	Lab Pharmacognosy-IV		3	20	80
BPHM 510	Lab Pharmaceutics- VII (Biopharmaceutics & Pharmacokinetics)		3	20	80
	Total	17	15	200	800
	Grand Total	32H/W		1000	

Sixth Semester

Contact Hours 32 Hrs.

Course Code	Course Name	L+T	P	Total Marks	
				Internal Marks	External Marks
PBHU 601	Communication Skills-II	2+1		20	80
BPHM 602	Pharmaceutical Chemistry-VI (Medicinal Chemistry-I)	3+1	-	20	80
PHM 603	Pharmaceutical Jurisprudence & ethics	2+1	-	20	80
PHM 604	Pharmacology-II	3+1	-	20	80
PHM 605	Pharmacognosy-V	2+1	-	20	80
PHM 606	Pharmaceutical Microbiology	2+1	-	20	80
PHM 607	Lab Pharmaceutical Chemistry-VI (Medicinal Chemistry-I)	-	3	20	80
PHM 608	Lab Pharmacology-II	-	3	20	80
PHM 609	Lab Pharmacognosy-V	-	3	20	80
PHM 610	Lab Pharmaceutical Microbiology	-	3	20	80
	Total	20	12	200	800
	Grand Total	32H/W		1000	

Seventh Semester

Contact Hours 31 Hrs.

Course Code	Course Name	L+T	P	Total Marks	
				Internal Marks	External Marks
BPHM701	Pharmaceutical Biotechnology	2+1	-	20	80
BPHM702	Pharmaceutics-VII (Pharmaceutical Technology-II)	2+1	-	20	80
BPHM703	Pharmacology-III	2+1	-	20	80
BPHM704	Pharmaceutical Chemistry-VII (Medicinal Chemistry-II)	3+1	-	20	80
BPHM705	Lab Pharmaceutical Biotechnology	-	3	20	80
BPHM706	Lab Pharmaceutics-VII (Pharmaceutical Technology-II)	-	3	20	80
BPHM707	Lab Pharmacology-III	-	3	20	80
BPHM708	Lab Pharmaceutical Chemistry-VII (Medicinal Chemistry-II)	-	3	20	80
BPHM709	Project Work	-	6	20	80
BPHM710**	Industrial Training	-	-	20	80
	Total	13	18	200	800
	Grand Total	31H/W		1000	

Eighth Semester

Contact Hours 36Hrs.

Course Code	Course Name	L+T	P	Total Marks	
				Internal Marks	External Marks
BPHM801	Pharmaceutics-IX (Dosage Form Design)	3+1	-	20	80
BPHM802	Pharmaceutical Analysis-III	2+1	-	20	80
BPHM803	Pharmacognosy-VI	2+1	-	20	80
BPHM804	Pharmacology-IV (Clinical Pharmacy & Drug Interaction)	3+1	-	20	80
BPHM805	Pharmaceutical Chemistry-VIII (Medicinal Chemistry-III)	3+1	-	20	80
BPHM806	Lab Pharmaceutics-IX (Dosage Form Design)	-	3	20	80
BPHM807	Lab Pharmaceutical Analysis-III	-	3	20	80
BPHM808	Lab Pharmacognosy-VI	-	3	20	80
BPHM809	Lab Pharmaceutical Chemistry-VIII (Medicinal Chemistry-III)	-	3	20	80
BPHM810	Dissertation on Project Work	-	6	20	80
	Total	18	18	200	800
	Grand Total	36/H/W		1000	

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

* Indicates an exercise of interaction of the students with the respective teacher in the classes. The students would express their difficulties, understanding the subject.

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

First Semester

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:

- i. Identify the significant points and conclusions as given in the text.
- ii. 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.
- iii. Generally read the stance or the point of view of the writer and present it in the form of a summary

- iv. 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.
- v. 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:

- i. Convey information on concrete or abstract topics with clarity and precision.
- ii. Write about objects or events with appropriate detail in both descriptive and narrative form.
- iii. Explain ideas and build up arguments with adequate support in a convincing manner.
- iv. Use language with some degree of flexibility in consideration to the reader.
- v. 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, Business Communication and Communicative English, Sultan Chand, New Delhi.
4. S.P. Dhanavel English and Communication Skills for Students of Science and Engineering (with audio CD).

BPHM 101 Pharmacognosy-I

PART-A

1. Definition, history, scope and development of Pharmacognosy. **(02)**
2. **Sources of drugs:** Biological, marine, mineral and plant tissue culture as sources of drugs. **(03)**
3. **Plant Cell, Histology and Morphology:** Structure of plant cell and its non-living 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. **(04)**

(04)

4. **Classification of drugs:** Alphabetical, morphological, taxonomical, chemical and pharmacological. (02)
5. **Plant taxonomy:** Study of the following families with special reference to medicinally important plants-Apocynaceae, Solanaceae, Rutaceae, Umbelliferae, Leguminosae, Rubiaceae, Liliaceae, Graminae, Libiatae, Cruciferae, Papaveraceae. (10)

PART-B

6. **Cultivation, collection, processing and storage of crude drugs:** Factors influencing cultivation of medicinal plants. Polyploidy, mutation and hybridization with reference to medicinal plants (04)
7. **Quality control of crude drugs:** Adulteration of crude drugs. Brief introduction to evaluation of crude drugs by organoleptic, microscopic, physical, chemical and biological methods. Introduction to crude drug monograph and its importance in registration of herbal products. (08)
8. **Introduction to Phytoconstituents of drugs:** Definition, classification and properties and identification tests of alkaloids, glycosides, terpenoids, steroids and flavonoids. (05)
9. **Introduction to Chromatographic Techniques:** Column, Paper, Thin Layer (TLC). (02)

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, Hinneapolis, Minnesota
7. Brain, K.R. and Turner, T.D. The Practical Evaluation of Phytopharmaceuticals. Wright-Scientifica, Bristol.

BPHM 102 Pharmaceutical Chemistry-I

PART-A

1. Impurities in Pharmaceutical Substances & their control sources and types of impurities, their limits, limit test for chlorides, sulphates, iron, lead, arsenic & heavy metals (04)
2. **Pharmaceutical Aids & Necessities**
- a. **Antioxidants:** Theory, the selection of Antioxidants, Official antioxidants (Hypophosphorous Acid, Sodium bisulphite, Sodium thiosulphate, Sodium nitrite) (03)

- b. **Water:** Official water (Water, Purified water, Water for injection, Bacteriostatic water for injection, Sterile water for injection) (03)

3. 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, Electrolytes used in acid base therapy (Sodium acetate, Potassium acetate, Sodium bicarbonate, Sodium citrate, Potassium citrate, Sodium lactate, Ammonium chloride), Electrolyte combination therapy. (07)

4. Essential and Trace Elements:

Iron, Copper, Zinc, Chromium, Manganese, Molybdenum, Selenium, Sulphur and Iodine. Official Iodine Products (Iodine, Potassium iodide, Sodium iodide). (03)

5. Gastrointestinal Agents

- a. **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. (05)

Protectives and Adsorbents: Introduction. Bismuth containing products, Bismuth subnitrate, Bismuth subcarbonate, Kaolin, Activated charcoal. (02)

- b. **Saline Cathartics:** Introduction, Sodium phosphate, Potassium sodium tartrate, Magnesium hydroxide, Magnesium citrate, Magnesium sulphate, Potassium phosphate, Potassium bitartrate, Calomel. (04)

PART-B

6. Topical Agents

- a. **Protective:** Definition, Protective products, Talc, Insoluble Zinc compounds (Zinc oxide, Calamine, Zinc stearate), Titanium dioxide, Aluminium as a protective agent, Silicone polymer. (04)
- b. **Antimicrobials and Astringents:** Antimicrobial terminology, mechanism of action, control of antimicrobial/ astringent action. (03)
- c. **Oxidative Antimicrobial Agents:** Hydrogen peroxide, Zinc peroxide, Sodium carbonate, Potassium permanganate, Iodine preparation and compounds. (03)

d. 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. **(05)**

7. 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). **(04)**

8. Co-ordination Compounds and Complexation: Theoretical considerations and official products (Calcium disodium edetate, Disodium edetate, Dimercaprol & Penicillamine) **(03)**

9. Miscellaneous Inorganic Pharmaceutical Agents: Inhalants, respiratory stimulants, expectorants and emetics, antidotes, tableting aids and suspending agents. **(02)**

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

PART-A

- 1. 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. **(10)**
- 2. 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) 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 H_3BO_3 , HCl, NaOH and Na_2CO_3 . (10)

PART-B

3. 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, concept of formal potential, oxidation reduction curves, redox indicators, potassium permanganate titrations, iodimetry and iodometry, ceric sulphate titrations, potassium iodate titrations, sodium 2, 6- dichlorophenol - indophenol titrations, pharmaceutical applications. (10)

4. 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, 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. (12)

5. 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. (5)

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. 3rd 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.
- know computer programming, data analysis, calculation and graphing using formulae and function.

PART-A

1. Computer Fundamentals:

a. 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. **(2)**

b. Number System: Decimal, Binary, Basic Binary arithmetic (Conversion to and from decimal numbers, Binary addition and subtraction). **(4)**

c. 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). **(4)**

2. 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. **(5)**

3. 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. **(5)**

PART-B

4. 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. **(4)**

5. 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. **(8)**

6. Computer Applications:

a. Word Processing: Techniques, File manipulation, Formatting, Printing setups Table handling, Mail merge, etc. using MS-Word **(2)**

b. Spreadsheet Package: Worksheets, Formatting sheets, Calculations and graphing using formulae and functions, Import and export of data using MS-Excel. **(2)**

c. Graphics: Objectives and types of graphics , Presentation packages, Slides designing, Diagrams and graphs, Import & Export data using MS-Power Point. **(2)**

d. Data Security against Viruses: Definition of computer viruses, Detection, prevention and cure against viruses using anti-virus software packages. **(2)**

e. 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. **(2)**

Suggested Readings/ Books:

1. Fundamentals of Computers by Rajaraman, Prentice Hall of India.
2. Tiwari, NK, Computer Fundamental with Pharmacy Applications, 1st 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.

PART-A

1. Pharmacy Profession: History of Pharmacy, Pharmacy as a career, Pharmaceutical education in India and abroad, Pharmacopoeia of India and other Pharmacopoeias, Other official books. **(4)**

(4)

2. Introduction to different dosage forms, their classification with examples (Official formulation), their relative application. (5)
3. Definitions, general formulation, manufacturing procedures and official products of solutions, aromatic waters, syrups, spirits, elixirs, glycerides, lotions, liniments, gargles, mouth washes, douches, draught preparation. (10)

PART-B

4. **Additive of dosage forms:** Introduction, classification and uses of following additives in formulation of different dosage forms: preservatives, antioxidants, surfactants, hydrocolloids, Diluents, binders, lubricants, organoleptic additives. (6)
5. **Crude Extracts:** Infusion, decoction, tincture, and extracts, methods of preparation of dry, soft and liquid extracts of IP. (5)
6. **Allergenic extracts:** Types of allergens, preparation of extracts testing and standardization of extracts. (5)
7. **Important terms of Pharmaceutics:** Definition and examples of expectorant, pharmaceutical aid, additives. (5)

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. Preparation, microscopic examination of stem, root and leaf of monocot and dicot plants. Morphological characteristics of plant families mentioned in Theory.
2. Microscopic measurements of cells and cell contents: Starch grains, calcium oxalate crystals and phloem fibres.
3. Determination of leaf constants such as stomatal index, stomatal number, veinlet number, vein-termination number and palisade ratio.
4. Identification of crude drugs belonging to carbohydrates and lipids.
5. Preparation of herbarium sheets.

BPHM 107 Lab Pharmaceutical Chemistry-I

The background and systematic qualitative analysis of inorganic mixtures of up to four radicals. Six Mixtures to be analyzed, preferably by semi-micro methods. All identification tests for pharmacopoeal inorganic pharmaceuticals and qualitative tests for cations & anion should be covered.

Limit test for some selected compounds.

BPHM 108 Lab Pharmaceutical Analysis-I

The students should be introduced to the main analytical tools through demonstrations. They should have a clear understanding of a typical analytical balance, the requirements of a good balance, weights, care and use of balance, methods of weighing and errors in weighing. The students should also be acquainted with the general apparatus required in various analytical procedures.

1. Standardization of analytical weights and calibration of volumetric apparatus.
2. **Acid base Titrations** : Preparation and standardization of acids and bases; some exercises related with determination of acids and bases separately or in mixture form, some official assay procedures e.g. boric acid should also be covered.
3. **Oxidation Reduction Titrations** : Preparation and standardization of some redox titrants e.g. potassium permanganate, potassium dichromate, iodine, sodium thiosulphate, etc. Some exercises related to determination of oxidizing and reducing agents in the sample shall be covered. Exercises involving potassium iodate, potassium bromate, iodine solution, titanous chloride, sodium 2, 6- dichlorophenol indophenol, and ceric ammonium sulphate.
4. **Precipitation Titrations** : Preparation and standardization of titrants like silver nitrate and, ammonium thiocyanate, Titrations according to Mohr's, Volhard's and Fajan's methods.
5. **Gravimetric Analysis** : Preparation of gooch crucible for filtration and use of sintered glass crucible, Determination of water of hydration, Some exercises related to gravimetric analysis should be covered.

BPHM109 Lab Computer Science & Applications

Aim	Titles
Aim 01	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.
Aim 02	Installation of DOS and simple exercises on TYPE, REN, DEL, CD, MD, COPY, TREE, BACKUP commands.
Aim 03	Exercises on entering text and data (Typing Practice) Features of Windows as an operating system.
Aim 04	File Management using Ms Word, Page set up using Ms Word Editing a document using Ms Word.
Aim 05	Formatting a document using Ms Word Tables and Borders using Ms Word Working with more than one window in MS Word
Aim 06	Perform application of MS Excel
Aim 07	Application of Menu commands, Work books and Creating a chart
Aim 10	Customize MS-Excel

Aim 11	Introduction to MS-Power Point and use of Wizards and Templates Preparing Presentations.
Aim 12	Prepare and submit a scientific power point presentation using various effects and application of power point
Aim 13	Prepare a program in C language to find sum of any two numbers.
Aim 14	Prepare a program in C language to find gross salary
Aim 15	Prepare a program in C language to find table (mathematical) of any number.
Aim 16	Prepare a program in C language to find greatest in 3 numbers
Aim 17	Prepare a program in C language to show the use of conditional operator
Aim 18	Program to find that entered year is leap year or not
Aim 19	Prepare a program in C language to find whether given no is even or odd
Aim 20	Display the kind of output on screen (in the left of the screen) 1 22 333 4444
Aim 21	Write a C program to find the sum of first 100 natural number.
Aim 22	Prepare a program in C language to find the sum of first 100 odd or even numbers.
Aim 23	Write a C program to display first 25 Fibonacci number.
Aim 24	Write a C program to display first 100 prime numbers
Aim 25	Write a C program to find factorial numbers and to print the accepted no and its reverse numbers

Second Semester

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 IITTH, 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 Publishers.
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)

PART-A

1. **Introduction:** Definition, Scope and future trends in Dispensing (2)
2. **Prescription:** Definition, various part of prescription, Handling of prescription, source of errors in prescription, General dispensing procedures including labelling of dispensing products. (4)
3. **Pharmaceutical calculations:** Posology, calculation of doses for infants, adults and elderly patients; Enlarging and reducing recipes percentage solutions, allegation, alcohol dilution, proof spirit, isotonic solutions and displacement value. (10)

4. **Principles involved and procedures adopted in dispensing of:** Typical prescriptions like mixtures, solutions, emulsions, creams, ointments, powders, capsules, pastes, jellies, suppositories, ophthalmic, pastilles, lozenges, pills, lotions, liniments, inhalations, paints, sprays, tablet triturates etc. (18)

PART-B

5. **Incompatibilities:** Physical, therapeutic and chemical incompatibilities, inorganic incompatibilities including incompatibilities of metals and their salts, non-metals, acids, alkalis, organic incompatibilities. Purine bases, alkaloids, pyrazolone derivatives, amino acids, quaternary ammonium compounds, carbohydrates, glycosides, anaesthetics, dyes, surface active agents, correction of incompatibilities. Therapeutic incompatibilities. (7)
6. **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 counselling, role of pharmacist in community healthcare & education. (7)

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
6. Gaud RS & Gupta GD. Practical Pharmaceutics, 1st edition, Reprint 2008, , CBS Publishers & Distributors, New Delhi.

BPHM 202 Pharmaceutical Chemistry –II (Physical Chemistry)

PART-A

1. **Behaviour of Gases:** Kinetic theory of gases, Deviation from ideal behaviours and explanation. (5)
2. **The Liquid State:** Physical Properties (surface tension, parachor, viscosity, refractive index, optical rotation, dipole moments and chemical constituents). (5)
3. **Solutions:** Ideal and real solutions, solutions of gases in liquids, colligative properties, partition coefficient, conductance and its measurement, Debye Huckel Theory. (6)
4. **Thermodynamics:** First, Second and Third laws, Zeroth law, Absolute Temperature Scale, Thermochemical Equations, Phase-equilibria and Phase rule. (12)

PART-B

5. **Adsorption:** Freundlich and Gibbs adsorption, isotherms, Langmuir theory of adsorption (5)
6. **Photochemistry:** Consequences of light absorption, Jablenski diagram, Lambert-Beer Law, Quantum efficiency. (5)

7. **Chemical Kinetics:** Zero, first and second order reactions, complex reactions, theories of reaction kinetics, characteristics of homogeneous and heterogeneous catalysis, acid base and enzyme catalysis. (12)

8. **Quantum Mechanics:** Postulates of quantum mechanics, operators in quantum mechanics, the Schrodinger wave equation. (5)

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)

PART-A

1. **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. (6)

2. **Stereochemistry:** Introduction, stereoisomerism, enantiomerism, diastereoisomerism, optical activity, chiral center, racemic modification, meso-structures, configuration, reactions involving stereoisomers, stereoselective and stereospecific reactions. (8)

3. **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. (3)

PART-B

4. **Structure, Nomenclature, Preparation & Reactions of the following:**

Reactive Intermediate carbo cation; carbanions; carbenes, nitrene and nitrenium ions are to be discussed whichever involved.

- **Alkanes:** Introduction, Shapes, Nomenclature, Preparation, Halogenation(Chain Reaction), Analysis (2)
- **Alkenes & Alkynes:** Introduction, Properties, Preparation(Elimination reaction), Electrophilic Reaction, Ozonolysis, Markovnikov's rule, peroxide effect, Analysis (3)
- **Cyclic Analogs:** Baeyer strain theory, cyclopropane & cyclobutane, Angle Strain, cyclic ethers, crown ethers, epoxides, their analysis. (2)
- **Alkyl Halides:** Structure, Nomenclature, Properties, preparation, Reactions SN1 and SN2, Saytzeff's rule. (5)

- **Alcohols & Ethers:** Introduction, Structure, Nomenclature, Properties, Preparation, Williamsons Synthesis, their analysis (3)
- **Benzene and Arenes:** Aromaticity, properties, Nomenclature, Naphthalene, Anthracene, Electrophillic Aromatic substitution, Feidal Craft alkylaton, Analysis (6)
- **Aldehydes and Ketones:** Introduction, Nomenclature, Preparation, Nucleophillic Addition reactions, analysis. (5)
- **Carboxylic Acids & their Functional Derivatives:** Introduction, Nomenclature, Preparation, Acidity constant, conversions, Nucleophillic Acyl substitution, Acid Chlorides, Acid Anhydrides, Amides, Esters. (3)
- **Amines and Diazonium Salts:** Introduction, Nomenclature, Preparation, Properties, Basicity, Hofmandegradation of Amides, Analysis. (3)
- **Phenol:** Introduction, Nomenclature, Preparation, Properties,Acidity, Kolbes Reaction, Riemer tiemer reaction, Analysis (4)

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)

PART-A

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. (8)
2. **Osseous System:** Structure, composition and functions of skeleton, Classification of joints, types of movements of joints, Disorders of joints. (6)
3. **Skeletal Muscles:** Gross anatomy; physiology of muscle contraction, physiological properties of skeletal muscles and their disorders. (3)
4. **Smooth Muscles:** Morphology, Electrical and Mechanical Activity, molecular basis of contraction, relation of length to tension and plasticity. (3)
5. **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. (8)

PART-B

- 6. Lymph and Lymphatic System:** Composition, formulation and circulation of lymph; disorders of lymph and lymphatic system. Basic physiology and functions of spleen. (5)
- 7. Cardiovascular System:** Morphology, Electrical Properties, Pacemaker tissue Basic anatomy of the heart, Physiology of heart, blood vessels and circulation. Basic understanding of Cardiac cycle, heart sounds and understanding of Cardiac cycle, heart sounds and electrocardiogram. Blood pressure and its regulation. (5)
- 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). (5)

Suggested Readings/ Books

1. Tortora, G.J. and Grabowski, S. R. Principles of Anatomy and Physiology 9th ed. 2000 Collins College Publishers, Luciano, New York.
2. Guyton, A.C. & Hall, J.E. W.B. Textbook of Medical Physiology. 9th ed. 1996 Sanders Co. New York.
3. Chaurasia, B.D. Human Anatomy, Parts I, II & III. 8th ed. 1995 Regional and CBS Publishers & Distributors, New Delhi.
4. Chatterjee, C.C. Human Physiology, part I & II. 11th ed. 1992 Medical Allied Agency, Calcutta.
5. Ghai, C.L. A Textbook of Practical Physiology 5th Edition. Jaypee Brother New Delhi.

BPHM 205 Pharmaceutics –II (Hospital Pharmacy)

PART-A

1. Organization & Structure: Organization of a hospital and hospital Pharmacy, Responsibilities of hospital pharmacist, Pharmacy and therapeutic committee, Budget preparation and Implementation. (5)
2. Hospital Formulary: Contents, preparation and revision of hospital formulary. (2)
3. Drug Store Management and Inventory Control: (5)
 - i. Organization of drug store, Types of materials stocked, storage conditions.
 - ii. Purchase and Inventory Control-principles, purchase procedures, Purchase order, Procurement and stocking.
4. Drug distribution System in Hospitals: (5)
 - 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.

PART-B

5. 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. (7)

6. Drug Information Services: Sources of Information on drugs, disease, treatment schedules, procurement of information, computerized services (e.g., MEDLINE), Retrieval of information, Medication error. (4)

7. Records and Reports: Prescription filling, drug profile, patient medication profile, cases on drug interaction and adverse reactions, idiosyncratic cases etc. (4)

8. 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. (8)

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. **Dispensing of prescription falling under the categories:** Mixtures, solutions, emulsions, creams, ointments, powders, suppositories, ophthalmic, capsules, paste, jellies, pastilles, lozenges, pills, tablet triturates, lotions, liniments, inhalations, paints, etc.
2. Identification of various types of incompatibilities in prescription, correction thereof and dispensing of such prescriptions.
3. Dispensing procedures involving pharmaceuticals calculations, pricing of prescriptions and dosage calculations for pediatric and geriatric patients.
4. Dispensing of prescriptions involving adjustment of tonicity.
5. Categorization and storage of Pharmaceutical products based on legal requirements of labeling and storage.
6. Project report on Visit to the nearby Community for Counseling on the rational use of drugs and aspects of healthcare.

BPHM 207 Lab Pharmaceutical Chemistry –II (Physical Chemistry)

1. To determine molar mass by Rast method and cryoscopic method.
2. To determine refractive index of given liquids and find out the contribution of carbon, hydrogen and oxygen in molar refraction of a compound.
3. To determine molar mass of volatile liquids by Victor-Meyer method.

4. To determine the specific rotation of sucrose at various concentrations and determine the intrinsic rotation.
5. To determine the heat of solution, heat of hydration and heat of neutralization.
6. To determine the cell constant, verify Ostwald dilution law and perform conductometric titration.
7. To determine rate constant of simple reaction.

BPHM 208 Lab Pharmaceutical Chemistry –III (Organic Chemistry)

1. The student should be introduced to the various laboratory techniques through demonstrations involving synthesis of selected organic compounds (e.g. aspirin, pbromoacetanilide, anthraquinone from anthracine, reduction of nitrobenzene, etc.)
2. Identification of organic compounds and their derivatization.
3. Introduction to the use of stereo models.

BPHM 209 Lab Pharmaceutics –II (Hospital Pharmacy)

S. No.	Practical
01	To study different type of syringes and method of sterilization.
02	To sterilize the surgical cotton using autoclave.
03	To perform sterilization of surgical materials used in hospital.
04	To prepare and submit ascorbic acid injection.
05	To prepare and submit 500mL of dextrose infusion IP.
06	To test the sterility of the product provided to you.
07	To prepare and submit 10mL water for injection IP
08	To prepare and submit eye lotion for first aid.
09	To prepare and submit paraffin gauge.
10	To sterilize the surgical rubber gloves.
11	Preparations involving chemical and therapeutically incompatibility.
12	To examine the dressing material provided to you for different parameters.
13	Submit 10 gm of sterilize powder.
14	To prepare and submit oily phenol injection.
15	To prepare and submit 10 ml of eye drop.

Third Semester

BPHM 301 Pharmaceutical 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:

- A Textbook of Mathematics for XI-XII Students. NCERT Publications. Vol I-IV 1991
- Seshagiri P. Rao, A Textbook of Remedial Mathematics, 1st edition, 2008, Pharma Med Press
- Schaum's Differential Equations. Mc Graw Hill, Singapore
- Bolton's Pharmaceutical Statistics. Practical and Clinical Applications. Marcel Dekker, New York, 1990
- 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:

- Trease, G. E. and Evans, W.C. Pharmacognosy, Published by Elsevier, a Division of Reed Elsevier India Pvt. Ltd., New Delhi.
- Kokate, C.K., Purohit, A.P. and Gokhale, S.B Pharmacognosy, Nirali Prakashan, Pune.
- Handa, S.S and Kapoor, V.K. Textbook of Pharmacognosy, Vallabh Prashan, New Delhi.
- Wallis, T.E. Textbook of Pharmacognosy, Fifth Edition, CBS Publishers and Distributors, New Delhi.
- 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:

- Badger, W.L. and Banchemo, J.T. Introduction to Chemical Engineering. McGraw Hill International Book Co., London.
- Brown, C.G. Unit Operations (Indian Ed.) CBS Publishers & Distributors.
- McCabe , W.L. and Smith, J.C. and Harriott, P. Unit Operations of Chemical Engineering. 5th Edition McGraw Hill International Book Co., London.
- 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-01 Digestive System: Gross anatomy of the gastro-intestinal tract, functions of its different parts including those of liver, pancreas and gall bladder, various gastrointestinal secretions and their role in the absorption and digestion of food. Disorders of digestive system.

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-07 Sense 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:

- Tortora, G.J. and Grabowski, S.R. Principles of Anatomy and Physiology 9th ed. 2000 Collins College Publishers, Luciano, New York
- Guyton, A.C. & Hall, J.E. W.B. Textbook of Medical Physiology. 9th ed. 1996 Sanders Co. New York
- Chaurasia, B.D. Human Anatomy, Parts I, II & III. 8th ed. 1995 Regional and CBS Publishers & Distributors, New Delhi
- Chatterjee, C.C. Human Physiology, part I & II 11th ed. 1992 Medical 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 principles

of 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:

- Mohan S, Jai D." Drug Store and Business Management ", 1st edition, 1995, S.V Kar & Co, Jalandhar .
- Singh S, Singh P." Drug Store and Business Management", 1st edition, 1995, S.Dinesh & Co.Circular Road Jalandhar.
- Koontz & O'Donnel Principles of Management Tata Mc Graw Hill, Delhi.
- 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, pyrrole, pyridine-

Module-02 Heterocyclic 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 α -amino acids, peptides, terminal residual analysis and synthesis. **Nucleic acids:** Introduction, structure of nucleic acid bases, structures of nucleosides, structure of nucleotides, 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), α , β -unsaturated Carbonyl compounds (electrophilic addition, Michael addition, Diels-Alder reaction).

Suggested Readings / Books:

- L. Finar, Organic Chemistry, Vol. I & II, The English Language Book Society, London and Longman Group Limited, London (Latest Edition).
- R. T. Morrison and R.N. Boyd, Organic Chemistry, 6th Edition, Prentice Hall of India, Private Limited, New Delhi (Latest Edition).
- 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:

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

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

Suggested Readings/ Books:

- Shukant R. Apte: Experimental Physiology.
- Ramesh K. Goyal, Natyar M. Patel and Shailesh A. Shah: Practical Anatomy,
- Physiology and Biochemistry.
- 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:

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