GITAM UNIVERSITY

(Declared as Deemed to be University u/s 3 of the UGC Act 1956)

ACADEMIC REGULATIONS
COURSE STRUCTURE
&
SYLLABUS

FOR

BACHELOR OF PHARMACY (B. Pharm)

A Four Year Degree Course under semester pattern
(Effective from the academic session 2009-10)
Approved in the 5th Academic Council meeting held on 19th September, 2009

GITAM INSTITUTE OF PHARMACY

(ISO 9001:2008 Certified)
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ACADEMIC REGULATIONS FOR
BACHELOR OF PHARMACY (B.PHARM) PROGRAMME

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ACADEMIC REGULATIONS FOR BACHELOR OF PHARMACY (B. Pharm) PROGRAMME

CHAPTER I INTRODUCTION

1. Short title extent and commencements

These regulations shall be called as Academic Regulations of GITAM University for B. Pharm programme.The academic regulations shall come in to force from the academic session 2008-09.

Programme title	: Bachelor of Pharmacy
Abbreviation	: B. Pharm
Type of programme	: A four year degree programme divided in to eight Semesters
Duration of the programme	: 4 years for 10+2 Science stream : 3years for D. Pharmacy holders (Lateral entry- Direct admission in to III semester)
Pattern	: Semester
Number of years and Semester	: 4 years divided in to 8 semesters with two semesters per year

2. Definitions

GITAM stands for Gandhi Institute of Technology & Management Viasakhapatnam.
University means GITAM UNIVERSITY
B. Pharmacy includes 4 year academic programme & 3 year lateral entry programme after D. Pharmacy (Direct admission in to III semester B. Pharmacy Porgramme)
GAT (UGP) stands for GITAM Admission Test (Under Graduate Pharmacy)
ER91 Stands for Education Regulation 1991 as framed by Pharmacy Council of India u/s 10 of Pharmacy Act 1948
NSS stands for National Service Scheme
NCC stands for National Cadet Corps
PCI stands for Pharmacy Council of India, a statutory body of Govt. of India constituted u/s 3,chapter of Pharmacy Act 1948
Examining authority: The GITAM UNIVERSITY shall be the authority to conduct the B. Pharmacy examinations for the candidates of GITAM Institute of Pharmacy.

Address of the Examining authority:
GITAM UNIVERSITY
Gandhinagar Campus, Rushikonda
Visakhapatnam-530 045 India
Website: www.gitam.edu

CHAPTER - II ADMISSION CRITERIA

Admission in to B. Pharm programme of GITAM UNIVERSITY are governed by the rules and regulations of GITAM UNIVERSITY.

3. Minimum qualification for admission into Bachelor of Pharmacy programme

(i) A pass in 10+2 Science or its equivalent examination as approved by GITAM UNIVERSITY, with a minimum aggregate of 60% marks in the Science group of Physics, Chemistry & Mathematics/Biology.

(ii) Candidate should qualify in the All India Common Entrance test GAT (UGP) of GITAM UNIVERSITY for B. Pharmacy programme.

4. Minimum qualification for admission into III semester of Bachelor of Pharmacy

(i) A pass in Diploma in Pharmacy (ER 91)with 60% of marks from any Pharmacy college established in India by law and duly approved by PCI u/s12 of the Pharmacy Act 1948

(ii) Candidate should qualify the Common Entrance test conducted by GITAM UNIVERSITY

5. Admission Notification

The admission notification inviting applications for admission in to B. Pharmacy programme shall be published in leading English & Telugu daily and shall also be available in the University website with all relevant details including the application form, information brochure & syllabus for the admission test.

6. GAT (UGP)

GAT (UGP) will be of total 2 hour duration (without break). The test consists of three parts:

Part I : Mathematics/ Biology
Part II : Physics
Part III : Chemistry

All questions are of objective type (multiple choice questions), each question with a choice of four answers, only one being the correct choice. Each correct answer fetches 3 marks, while each incorrect answer has a penalty of 1 mark. No marks are awarded for not attempted questions. There will be 100 questions in all. The number of questions and marks in each part is as follows:

Part	Subject	No. of Questions	Marks
I	Mathematics/ Biology	40	120
II	Physics	30	90
III	Chemistry	30	90
Total		**100**	**300**

The questions are so designed that a good student will be able to answer 100 questions in 120 minutes. However, candidates should keep in mind the fact that there is negative marking for wrong answers and any attempt to answer the questions by pure guessing may result in a reduction in the total score. All the questions and instructions of the test will be in **English** only.

7. Syllabus for GAT (UGP)

The detailed syllabus of GAT (UGP) relating to Mathematics/ Biology, Physics and Chemistry is given in the website of University (www.gitam.edu).

8. Rank List

The rank list will be prepared on the basis of the performance in the GAT (UGP) conducted by GITAM UNIVERSITY.

9. Selection Criteria

The admissions will be made on the basis of rank obtained in the GAT (UGP) and by following the rule of reservation, as applicable to GITAM UNIVERSITY.

10. Terms & Conditions

The terms & conditions as may be notified and the related guidelines and instructions issued by the University, from the from time to time are applicable for admission to the programme

11. General

The Management of GITAM UNIVERSITY reserves the right to change any of the conditions enumerated herein for the purpose of complying with any of the regulations of UGC or any other competent authorities

The decision of the vice-chancellor of GITAM University, on all matters related to admissions and allied aspects, is final.

CHAPTER - III REGISTRATION

12. Registration of the Candidates admitted in to the B. Pharmacy programme

The candidates provisionally admitted to the B. Pharm programme are required to apply in the prescribed format to GITAM UNIVERSITY along with the Migration Certificate issued by the competent authority of the qualifying examination, within one month of the date of admission along with requisite fees & other fees, for registration as a registered student of GITAM UNIVERSITY.

The return of matriculates in the prescribed form along with the original documents & applications of each candidate shall be submitted to the University in stipulated time. Upon completion of the process of registration, each candidate shall be allotted an unique registration number which shall be valid for the full duration of the programme.

13. Medium of instruction & Examination

Medium of instruction & Examination shall be in **English**

14. Academic Calendar - No. of working days & No. of holidays

Instruction and examination in each academic year is spread over two semesters. The number of teaching weeks in each semester shall be fifteen to eighteen with a minimum of 90 teaching days excluding the period of examination.

Each year GITAM UNIVERSITY shall draw out an academic calendar of academic & associated activities, list of holidays & such other aspects as may be deemed appropriate for each semester/year.

Each period of instruction shall be of one hour duration. Seven periods of instruction are provided on each day and there are six working days in a week (Monday to Saturday).

CHAPTER IV– CONTINUOUS ASSESSMENT

The assessment of the student's performance in each theory course will be based on Continuous internal evaluation and semester-end examinations.

15. Award of marks for continuous assessment & maintenance of records

A regular record of both Theory and Practical class work and examinations conducted in a semester shall be maintained for each student. Continuous internal evaluation shall carry 30 marks, as per the distribution described below for each theory and practical subject.

16. Continuous Assessment And Examinations:

The assessment of the student's performance in each course will be based on continuous internal evaluation and semester-end examination. The marks for each of the component of assessment are fixed as shown in the Table 1.

Table 1: Assessment Procedure

S.No.	Component of assessment	Marks allotted	Type of Assessment	Scheme of Examination
1	Theory	30	Continuous evaluation	(i) Two mid semester examinations are to be conducted for 10 marks each. (ii) 5 marks are allocated for attendance. (iii) 5 marks are allocated for assignments.
		70	Semester-end examination	The semester-end examination question paper in theory courses will be for a maximum of 70 marks.
	Total	100		

2	Practicals	30	Continuous evaluation	(i) One examination for a maximum of 20 marks will be conducted by the teacher handling the lab course during mid of the semester (ii) 10 marks are allocated regular performance in the lab.
		70	Semester end Examination	One examination for a maximum of 70 marks will be scheduled at the end of the semester by the Principal. He will appoint one examiner in the relevant course, in addition to the teacher who handled the lab course in the semester.
	Total	100		

Continuous assessment: Theory

The distribution of marks for various components of continuous assessment is furnished below:

Subject	Sessional Examinations	Attendance	Assignments	Total
Theory	20 marks	05 Marks	05 Marks	30 marks

1) There shall be two sessional examinations of 10 marks each in a semester.
The mode of question paper can be of short answer type or long answer type depending on the nature of the subject.

2) Weightage for the attendance for the regular Theory classes shall be based on the following principle:

Percentage of Attendance	**Marks**
76% to 80%	1
81% to 85%	2
86% to 90%	3
91% to 95%	4
96% to 100%	5

Continuous assessment: Practical

The assessment of the student's performance in each practical course will be based on continuous internal evaluation and semester-end examinations. The distribution of marks for various components of continuous assessment is furnished below:

Subject	Sessional Examinations	Day-to-day performance	Total
Theory	20 marks	10 Marks	30 marks

1) There shall be one sessional practical examinations of 20 marks in the mid of the semester. The mode of question paper shall be based on the pattern suggested for the semester end examinations

2) The day-to-day performance of the candidate in the regular practical classes shall have a weightage of 10 marks for each practical class. The statement of day-to-day performance for each practical class in respect of each candidate shall be maintained by the institution, which is to be shown to the students at the end of each practical. The calculation for the day to day performance shall be as follows:

Marks obtained in the day to day performance =

Total marks obtained in the day to day performance in all the practicals of the semester
Total number of practical classes held in the semester

CHAPTER - V SEMESTER END EXAMINATIONS

17. Examinations (No. of examinations in an academic semester)

There shall be one examination at the end of each semester conducted by the University.

18. Examination Calendar

The examination calendar shall be notified by the University

19. Eligibility for appearing at the examinations/Minimum requirements of attendance in theory & practicals

Attendance Requirements

A student whose attendance is less than 75% in all the courses put together in any semester shall not be permitted to attend the end - semester examination.
However, the Vice Chancellor on the recommendation of the Principal / Director of the Institute may condone the shortage of attendance to an extent of 9%, to the students whose attendance is between 66% and 74% on genuine medical grounds supported by the Medical certificate issued by the competent authority approved for the purpose by the University, along with the prescribed Condonation fees..
If any candidate fails to satisfy the aforesaid regulations he/she shall not be allowed for the University Examinations at the end of the semester, and he/she shall not be allowed for promotion to the next higher class of study. He/she shall be required to repeat the regular

course of study of that academic semester along with the next regular batch of that particular semester.

20. Eligibility of Examiners

In respect of all theory examinations, the paper setting shall be done by an External paper setter. The panel of paper setters for each course is to be prepared by the Board of Studies in Pharmacy.

The panel of examiners in all the subjects of B. Pharm shall be submitted by the Principal/Director who is the chairman of BOS (Pharmacy), to the Vice Chancellor for necessary consideration and approval.

The paper setters are to be appointed by the academic council/ Vice Chancellor on the recommendations of Director of Evaluation / Controller of Examinations/Chairman BOS Pharmacy.

The examiners for setting theory question papers shall be appointed from outside the University, from any part of the country.

Persons from Universities, University Institutions, Deemed Universities, Accredited institutions /Govt. Institutions or Reputed private institutions shall be selected for setting question papers or for conducting practical examinations.

Eligibility criteria for appointment of examiners shall be a minimum of **M.Pharm** in relevant specialization with at least **3 years of degree level teaching experience** in reputed institutions, approved by PCI/AICTE.

21. Mode of Examinations

Each Theory paper shall be of 3 hours duration. The question shall be short answer and structured essay types. All practical Examinations shall be conducted in the laboratories as prescribed in the syllabus. The skills of the candidates in conducting experiments, interpreting results and arriving at logical conclusions shall be assessed. The oral examination is an integral part of the practical examination.

22. Special Examination

A student who has completed the stipulated period of study of eight semesters for the B. Pharm degree programme and still having failure grade ('F') in not more than 5 courses (Theory / Practicals), may be permitted to appear for the special examination, which shall be conducted in the summer vacation at the end of the last academic year.

A student having 'F' Grade in more than 5 courses (Theory/practicals) shall not be permitted to appear for the special examination.

CHAPTER - VI SCHEME OF EXAMINATION & EVALUATION

23. Credit Based System

Appropriate letter grades are awarded in each theory and practical subject to only such candidates who have passed in the university examinations. Internal assessment marks and university examination marks put together will be taken into account for the letter grading system in each subject separately.

A candidate registered for the university examination but fails to appear or fails to score the minimum required 40% marks in the university examination will get a grade 'F', indicating failure or grade of incompletion.

Each course is assigned certain number of credits which will depend upon the number of contact hours (lectures & tutorials) per week.

In general, credits are assigned to the courses based on the following contact hours per week per semester.

One credit for each Lecture / Tutorial class of one hour duration.
Two credits for each Practical class of three (or more) hours duration

The curriculum of B. Pharm programme is designed to have a total of 220 credits for the award of B. Pharm degree.

24. Grading System

Based on the student performance during a given semester, a final letter grade will be awarded at the end of the semester in each course. The letter grades and the corresponding grade points are as given in the Table below.

Grades & Grade Points

Grade	Grade points	Absolute Marks
O	10	90 and above
A+	9	80 – 89
A	8	70 – 79
B+	7	60 – 69
B	6	50 – 59
C	5	40 – 49
F	Failed, 0	Less than 40

A student who earns a minimum of 5 grade points (C grade) in a course is declared to have successfully completed the course, and is deemed to have earned the credits assigned to that course. However, a minimum of 28 marks is to be secured at the semester end examination of theory courses in order to pass in the theory course.

25. Grade Point Average

A Grade Point Average (GPA) for the semester will be calculated according to the formula:

$$GPA = \frac{\Sigma [C \times G]}{\Sigma C}$$

Where
C = number of credits for the course,
G = grade points obtained by the student in the course.

Semester Grade Point Average (SGPA) is awarded to those candidates who pass in all the courses of the semester.

To arrive at Cumulative Grade Point Average (CGPA), a similar formula is used considering the student's performance in all the courses taken in all the semesters completed up to the particular point of time.

26. Mode of Evaluation

The theory papers of end-semester examination will be evaluated by an examiner appointed by the University as per the prescribed norms.

The appointment of examiners for evaluation of theory papers will be done by the Vice Chancellor on the recommendations of Director of Evaluation / Controller of Examinations from a panel of examiners approved by the BOS in Pharmacy.

27. Retotalling, Revaluation & Reappearance

Re-totaling of the theory answer script of the end-semester examination is permitted on a request made by the student by paying the prescribed fee within ten days of the announcement of the results.

Revaluation of the theory answer script of the end-semester examination is also permitted on a request made by the student by paying the prescribed fee within fifteen days of the announcement of the results.

A Student who has secured 'F' Grade in any Theory / Practical of any semester shall have to reappear for the semester end examination for the said Theory / Practical as the case may be along with the next regular batch for that particular semester. He /She need not appear at the subjects in which he/she has already obtained pass marks.

A student who has secured 'F' Grade in Project work shall have to improve his report and reappear for viva – voce Examination of project work at the time of special examination to be conducted in the summer vacation after the last academic year.

28. Award of Division / Class/ Distinction

The candidate must have, after passing the qualifying examination pursued a regular course of study for not less than four academic years(three academic years in the case of diploma in Pharmacy holders who are admitted directly in to 3rd semester of B. Pharmacy) and satisfied the academic requirements as prescribed thereafter. The scope of subject matter in each course and periods of study shall be as indicated in the syllabus and the scheme of instruction.

The requirement of CGPA for a student to be declared to have passed on successful completion of the B. Pharmacy programme and for the declaration of the class is as shown in the Table below.

CGPA required for award of Degree

Distinction	**≥ 8.0***
First Class	**≥ 7.0**
Second Class	**≥ 6.0**
Pass	**≥ 5.0**

* In addition to the required CGPA of 8.0, the student must have necessarily passed all the courses of every semester in **first attempt**. First attempt means appearance at the first examinations conducted for the particular batch.

After the results are declared, grade cards will be issued to each student, which will contain the list of subjects for that semester and grades obtained by the student.

Any candidate who carried a backlog at any stage will not be eligible for rank, medal or prizes awarded if any by the University.

29. Practical Training

Every candidate shall undergo practical training for at least one month in a Pharmaceutical industry/ hospital/ allied sector and shall submit a report which shall be evaluated for a total of 100 marks.

30. Eligibility for Award of the B Pharm Degree

Duration of the programme:

A student is ordinarily expected to complete the B Pharm programme in eight semesters of four years. However a student may complete the programme in not more than six years including study period.

A student shall be eligible for award of the B Pharm degree if he / she fulfils all the following conditions.

a) Registered and successfully completed all the courses and projects.
b) Successfully acquired the minimum required credits as specified in the curriculum corresponding to the branch of his/her study within the stipulated time.
c) Has no dues to the Institute, hostels, Libraries, NCC / NSS etc, and
d) No disciplinary action is pending against him / her.

The degree shall be awarded after approval by the Academic Council.

The above regulations wherever required, may be relaxed by the Vice Chancellor in individual cases for cogent and sufficient reasons.

SCHEME OF INSTRUCTION
FOR BACHELOR OF PHARMACY (B. PHARMACY)

Program Code: **PURPH200801**

I semester –Theory

Code No.	Name of the Subject	Prescribed hours		No. of Credits
		L	P	
PURPH 101	Anatomy, Physiology & Health Education	3		3
PURPH 102	Professional Pharmacy	3	--	3
PURPH 103	Pharmaceutical Inorganic Chemistry	3	--	3
PURPH 104	Pharmaceutical Organic Chemistry - I	3	--	3
PURPH 105	Pharmacognosy – I	3	--	3
PURPH 106	Fundamentals of Pharmaceutical Analysis	3	--	3
*PURBI / PURMT107	Remedial Biology/ Mathematics	3	--	NC

* College level examination only.

I semester – Practical

PURPH111	Anatomy, Physiology & Health Education		3	2
PURPH112	Pharmaceutical Inorganic Chemistry		3	2
PURPH 113	Pharmaceutical Organic Chemistry - I		3	2
PURPH114	Pharmacognosy - I		3	2
PURPH115	Fundamentals of Pharmaceutical Analysis		3	2
Total		**21**	**15**	**28**

II semester - Theory

Code No.	Name of the Subject	Prescribed hours		No. of Credits
		L	P	
PURPH201	Human Physiology & Pathophysiology	3	--	3
PURPH 202	Pharmaceutical Microbiology	3	--	3
PURPH 203	Pharmaceutical Organic Chemistry-II	3	--	3
PURPH 204	Physical Pharmacy-I	3	--	3
PURPH 205	Medicinal Biochemistry	3	--	3
PURPH206	Chemical Methods of Analysis	3	--	3
PURPH 207	Community Pharmacy	3	--	3

II semester - Practicals

PURPH211	Pharmaceutical Microbiology		3	2
PURPH212	Pharmaceutical Organic Chemistry-II		3	2
PURPH213	Medicinal Biochemistry		3	2
PURPH214	Physical Pharmacy - I		3	2
PURPH 215	Chemical Methods of Analysis		3	2
Total		**21**	**15**	**31**

III semester - Theory

Code No.	Name of the Subject	Prescribed hours		No. of Credits
		L	P	
PURPH 301	Disinfection , Sterilization & Immunology	3		3
PURPH 302	Computer Applications & Programming	3		3
PURPH 303	Physical Pharmacy-II	3		3
PURPH 304	Medicinal Chemistry-I	3		3
PURPH 305	Pharmacology-I	3		3
PURPH 306	Pharmaceutical Engineering-I	3		3
PURPH 307	Principles of Management	3		3

III semester - Practicals

PURPH 311	Disinfection , Sterilization & Immunology		3	2
PURPH 312	Computer Applications & Programming		3	2
PURPH 313	Physical Pharmacy-II		3	2
PURPH 314	Medicinal Chemistry-I		3	2
PURPH 315	Pharmacology-I		3	2
Total		**21**	**15**	**31**

IV semester - Theory

Code No.	Name of the Subject	Prescribed hours		No. of Credits
		L	P	
PURPH 401	Pharmaceutical Engineering-II	3		3
PURPH 402	Medicinal Chemistry-II	3		3
PURPH 403	Pharmacology-II	3		3
PURPH 404	Pharmacognosy-II	3		3
PURPH 405	Pharmacy Practice-I	3		3
PURPH 406	Biostatistics	3		3
PURPH 407	Accounting & Financial Management	3		3

IV semester - Practicals

PURPH 411	Pharmaceutical Engineering -II		3	2
PURPH 412	Medicinal Chemistry-II		3	2
PURPH 413	Pharmacology-II		3	2
PURPH 414	Pharmacognosy-II		3	2
PURPH 415	Pharmacy Practice-I		3	2
Total		**21**	**15**	**31**

V Semester - Theory

Code No.	Name of the Subject	Prescribed hours		No. of Credits
		L	P	
PURPH 501	Electro Chemical Methods of Analysis	3		3
PURPH 502	Pharmaceutical Technology –I	3		3
PURPH 503	Pharmacology-III	3		3
PURPH 504	Pharmacognosy-III	3		3
PURPH 505	Biological Pharmacy	3		3
PURPH 506	Operations Management	3		3
PURPH 507	Medicinal Chemistry-III	3		3

V semester - Practicals

PURPH 511	Electro Chemical Methods of Analysis		3	2
PURPH 512	Pharmaceutical Technology –I		3	2
PURPH 513	Pharmacology-III		3	2
PURPH 514	Pharmacognosy-III		3	2
PURPH 515	Biological Pharmacy		3	2
Total		**21**	**15**	**31**

VI Semester - Theory

Code No.	Name of the Subject	Prescribed hours		No. of Credits
		L	P	
PURPH 601	Pharmaceutical Technology –II	3		3
PURPH 602	Pharmacognosy – IV	3		3
PURPH 603	Chromatographic Methods of Analysis	3		3
PURPH 604	Pharmaceutical Biotechnology	3		3
PURPH 605	Pharmacology – IV	3		3
PURPH 606	Pharmacotherapeutics-I	3		3
PURPH 607	Marketing Management	3		3

VI semester - Practicals

PURPH 611	Pharmaceutical Technology –II		3	2
PURPH 612	Pharmacognosy – IV		3	2
PURPH 613	Chromatographic Methods of Analysis		3	2
PURPH 614	Pharmaceutical Biotechnology		3	2
PURPH 615	Pharmacology – IV		3	2
Total		**21**	**15**	**31**

VII Semester - Theory

Code No.	Name of the Subject	Prescribed hours		No. of Credits
		L	P	
PURPH 701	Pharmaceutical Technology –III	3		3
PURPH 702	Bioinformatics	3		3
PURPH 703	Elective-I	3		3
PURPH 704	Drug Regulatory Affairs	3		3
PURPH 705	Pharmacotherapeutics-II	3		3
PURPH 706	Pharmaceutical Jurisprudence	3		3
PURPH 707	Instrumental Methods of Analysis	3		3

Elective-I (PURPH 703)

PURPH 703-IA	Advanced Medicinal Chemistry-I
PURPH 703-IB	Labeling and Packaging Of Dosage Forms
PURPH 703-IC	Clinical Studies

VII semester - Practicals

PURPH 711	Pharmaceutical Technology -III		3	2
PURPH 712	Bioinformatics		3	2
PURPH 713	Elective-I (Seminar*)		3	2
PURPH 714	Instrumental Methods of Analysis		3	2
PURPH 715	Project work & Seminar (Literature review)		3	2
Total		**21**	**15**	**31**

ELECTIVE-I (PURPH 713)

PURPH 713-IA	Advanced Medicinal Chemistry-I
PURPH 713-IB	Labeling and Packaging Of Dosage Forms
PURPH 713-IC	Clinical Studies

* PURPH 713: Elective-I (Seminar)

Every candidate shall present two to three seminars covering the topics of each unit of the respective elective paper (Total of atleast 10 seminars shall be presented by each candidate covering the topics of all 5 Units of the respective elective paper). The candidate shall also submit a typed report for each seminar. Each seminar shall be evaluated by the concerned teacher along with the teacher(s) / committee as may be appointed by the Principal as a part of the continuous assessment activity. There shall be no end semester seminar examination for the PURPH 713.

VIII Semester - Theory

Code No.	Name of the Subject	Prescribed hours		No. of Credits
		L	P	
PURPH 801	Pharmaceutical Technology –IV	3		3
PURPH 802	Pharmaceutical Technology –V	3		3
PURPH 803	Elective-II	3		3
PURPH 804	Pharmacy Practice-II	3		3
PURPH 805	Biopharmaceutics & Pharmacokinetics	3		3
PURPH 806	Comprehensive Viva - Voce	0		3

ELECTIVE-II (PURPH 803)

PURPH 803-IA	Advanced Medicinal Chemistry – II
PURPH 803-IB	Cosmetic Technology
PURPH 803-IC	Herbal Drug Technology

VIII semester - Practicals

PURPH 811	Pharmaceutical Technology –IV		3	2
PURPH 812	Pharmaceutical Technology –V		3	2
PURPH 813	Elective-II(Seminar*)		3	2
PURPH 814	Project Work (Practical Work) & Seminar, Viva-Voce Project dissertation (Preface, Objectives General Introduction, Drug profile, Review of Literature, Plan of work, Methodology/ Experimental work and Investigations, , Interpretation and analysis of data, Results and Discussion, Summary & Conclusion)		9	6
PURPH 815	Practical training/ visits		-	6
Total		**15**	**18**	**36**
Grand total		**162**	**123**	**250**

Elective-II (PURPH 813)

PURPH 813-IA	Advanced Medicinal Chemistry – II
PURPH 813-IB	Cosmetic Technology
PURPH 813-IC	Herbal Drug Technology

*** PURPH 813: Elective-II (Seminar)**

Every candidate shall present two to three seminars covering the topics of each unit of the respective elective paper (Total of atleast 10 seminars shall be presented by each candidate covering the topics of all 5 Units of the respective elective paper). The candidate shall also submit a typed report for each seminar. Each seminar shall be evaluated by the concerned teacher along with the teacher(s) / committee as may be appointed by the Principal as a part of the continuous assessment activity. There shall be no end semester seminar examination for the PURPH 813.

SCHEME OF EXAMIANATION
FOR BACHELOR OF PHARMACY (B. PHARMACY)
Program Code: PURPH200801 (w.e.f 2009 Admitted Batch)

I semester –Theory

Code No.	Name of the Subject	Continuous Assessment				End Semester Examination	Grand Total
		Midsem	Attendance	Assignments/ MCQ	Total		
PURPH 101	Anatomy, Physiology & Health Education	20	5	5	30	70	100
PURPH 102	Professional Pharmacy	20	5	5	30	70	100
PURPH 103	Pharmaceutical Inorganic Chemistry	20	5	5	30	70	100
PURPH 104	Pharmaceutical Organic Chemistry - I	20	5	5	30	70	100
PURPH 105	Pharmacognosy – I	20	5	5	30	70	100
PURPH 106	Fundamentals of Pharmaceutical Analysis	20	5	5	30	70	100
*PURBI / PURMT107	Remedial Biology/ Mathematics	20	5	5	30	70	100

* College level examination only.

I semester – Practical

Code No.	Name of the Subject:	Continuous Assessment			End Semester Examination	Grand Total
		Midsem	Day to Day Assessment	Total		
PURPH111	Anatomy, Physiology & Health Education	20	10	30	70	100
PURPH112	Pharmaceutical Inorganic Chemistry	20	10	30	70	100
PURPH 113	Pharmaceutical Organic Chemistry - I	20	10	30	70	100
PURPH114	Pharmacognosy - I	20	10	30	70	100
PURPH115	Fundamentals of Pharmaceutical Analysis	20	10	30	70	100

II semester – Theory

Code No.	Name of the Subject	Continuous Assessment				End Semester Examination	Grand Total
		Midsem	Attendance	Assignments/MCQ	Total		
PURPH201	Human Physiology & Pathophysiology	20	5	5	30	70	100
PURPH 202	Pharmaceutical Microbiology	20	5	5	30	70	100
PURPH 203	Pharmaceutical Organic Chemistry-II	20	5	5	30	70	100
PURPH 204	Physical Pharmacy-I	20	5	5	30	70	100
PURPH 205	Medicinal Biochemistry	20	5	5	30	70	100
PURPH206	Chemical Methods of Analysis	20	5	5	30	70	100
PURPH 207	Community Pharmacy	20	5	5	30	70	100

II semester – Practicals

Code No.	Name of the subject	Continuous Assessment			End Semester Examination	Grand Total
		Midsem	Day to Day Assessment	Total		
PURPH211	Pharmaceutical Microbiology	20	10	30	70	100
PURPH212	Pharmaceutical Organic Chemistry-II	20	10	30	70	100
PURPH213	Medicinal Biochemistry	20	10	30	70	100
PURPH214	Physical Pharmacy - I	20	10	30	70	100
PURPH 215	Chemical Methods of Analysis	20	10	30	70	100

III semester – Theory

Code No.	Name of the Subject:	Continuous Assessment				End Semester Examination	Grand Total
		Midsem	Attendance	Assignments/MCQ	Total		
PURPH 301	Disinfection , Sterilization & Immunology	20	5	5	30	70	100
PURPH 302	Computer Applications & Programming	20	5	5	30	70	100
PURPH 303	Physical Pharmacy-II	20	5	5	30	70	100
PURPH 304	Medicinal Chemistry-I	20	5	5	30	70	100
PURPH 305	Pharmacology-I	20	5	5	30	70	100
PURPH 306	Pharmaceutical Engineering-I	20	5	5	30	70	100
PURPH 307	Principles of Management	20	5	5	30	70	100

III semester - Practicals

Code No.	Name of the Subject:	Continuous Assessment			End Semester Examination	Grand Total
		Midsem	Day to Day Assessment	Total		
PURPH 311	Disinfection , Sterilization & Immunology	20	10	30	70	100
PURPH 312	Computer Applications & Programming	20	10	30	70	100
PURPH 313	Physical Pharmacy-II	20	10	30	70	100
PURPH 314	Medicinal Chemistry-I	20	10	30	70	100
PURPH 315	Pharmacology-I	20	10	30	70	100

IV semester – Theory

Code No.	Name of the Subject	Continuous Assessment				End Semester Examination	Grand Total
		Midsem	Attendance	Assignments/MCQ	Total		
PURPH 401	Pharmaceutical Engineering-II	20	5	5	30	70	100
PURPH 402	Medicinal Chemistry-II	20	5	5	30	70	100
PURPH 403	Pharmacology-II	20	5	5	30	70	100
PURPH 404	Pharmacognosy-II	20	5	5	30	70	100
PURPH 405	Pharmacy Practice-I	20	5	5	30	70	100
PURPH 406	Biostatistics	20	5	5	30	70	100
PURPH 407	Accounting & Financial Management	20	5	5	30	70	100

IV semester - Practicals

Code No.	Name of the Subject	Continuous Assessment			End Semester Examination	Grand Total
		Midsem	Day to Day Assessment	Total		
PURPH 411	Pharmaceutical Engineering -II	20	10	30	70	100
PURPH 412	Medicinal Chemistry-II	20	10	30	70	100
PURPH 413	Pharmacology-II	20	10	30	70	100
PURPH 414	Pharmacognosy-II	20	10	30	70	100
PURPH 415	Pharmacy Practice-I	20	10	30	70	100

V Semester – Theory

Code No.	Name of the Subject	Continuous Assessment				End Semester Examination	Grand Total
		Midsem	Attendance	Assignments/MCQ	Total		
PURPH 501	Electro Chemical Methods of Analysis	20	5	5	30	70	100
PURPH 502	Pharmaceutical Technology –I	20	5	5	30	70	100
PURPH 503	Pharmacology-III	20	5	5	30	70	100
PURPH 504	Pharmacognosy-III	20	5	5	30	70	100
PURPH 505	Biological Pharmacy	20	5	5	30	70	100
PURPH 506	Operations Management	20	5	5	30	70	100
PURPH 507	Medicinal Chemistry-III	20	5	5	30	70	100

V semester - Practicals

Code No.	Name of the Subject	Continuous Assessment			End Semester Examination	Grand Total
		Midsem	Day to Day Assessment	Total		
PURPH 511	Electro Chemical Methods of Analysis	20	10	30	70	100
PURPH 512	Pharmaceutical Technology –I	20	10	30	70	100
PURPH 513	Pharmacology-III	20	10	30	70	100
PURPH 514	Pharmacognosy-III	20	10	30	70	100
PURPH 515	Biological Pharmacy	20	10	30	70	100

VI Semester – Theory

Code No.	Name of the Subject	Continuous Assessment				End Semester Examination	Grand Total
		Midsem	Attendance	Assignments/MCQ	Total		
PURPH 601	Pharmaceutical Technology –II	20	5	5	30	70	100
PURPH 602	Pharmacognosy – IV	20	5	5	30	70	100
PURPH 603	Chromatographic Methods of Analysis	20	5	5	30	70	100
PURPH 604	Pharmaceutical Biotechnology	20	5	5	30	70	100
PURPH 605	Pharmacology – IV	20	5	5	30	70	100
PURPH 606	Pharmacotherapeutics-I	20	5	5	30	70	100
PURPH 607	Marketing Management	20	5	5	30	70	100

VI semester - Practicals

Code No.	Name of the Subject	Continuous Assessment			End Semester Examination	Grand Total
		Midsem	Day to Day Assessment	Total		
PURPH 611	Pharmaceutical Technology –II	20	10	30	70	100
PURPH 612	Pharmacognosy – IV	20	10	30	70	100
PURPH 613	Chromatographic Methods of Analysis	20	10	30	70	100
PURPH 614	Pharmaceutical Biotechnology	20	10	30	70	100
PURPH 615	Pharmacology – IV	20	10	30	70	100

VII Semester – Theory

Code No.	Name of the Subject	Continuous Assessment				End Semester Examination	Grand Total
		Midsem	Attendance	Assignments/MCQ	Total		
PURPH 701	Pharmaceutical Technology –III	20	5	5	30	70	100
PURPH 702	Bioinformatics	20	5	5	30	70	100
PURPH 703	Elective-I	20	5	5	30	70	100
PURPH 704	Drug Regulatory Affairs	20	5	5	30	70	100
PURPH 705	Pharmacotherapeutics-II	20	5	5	30	70	100
PURPH 706	Pharmaceutical Jurisprudence	20	5	5	30	70	100
PURPH 707	Instrumental Methods of Analysis	20	5	5	30	70	100

VII semester - Practicals

Code No.	Name of the Subject	Continuous Assessment			End Semester Examination	Grand Total
		Midsem	Day to Day Assessment	Total		
PURPH 711	Pharmaceutical Technology -III	20	10	30	70	100
PURPH 712	Bioinformatics	20	10	30	70	100
PURPH 713	Elective-I (Seminar*)			100		100
PURPH 714	Instrumental Methods of Analysis	20	10	30	70	100
PURPH 715	Project work & Seminar (Seminar on Proposed Project Work, Literature Survey, Plan of Work, Methodology, etc)	20	10	30	70	100

* PURPH 713: Elective-I (Seminar)

Every candidate shall present two to three seminars covering the topics of each unit of the respective elective paper (Total of atleast 10 seminars shall be presented by each candidate covering the topics of all 5 Units of the respective elective paper). The candidate shall also submit a typed report for each seminar. Each seminar shall be evaluated by the concerned teacher along with the teacher(s) / committee as may be appointed by the Principal as a part of the continuous assessment activity. There shall be no end semester seminar examination for the PURPH 713.

VIII Semester – Theory

Code No.	Name of the Subject	Continuous Assessment				End Semester Examination	Grand Total
		Midsem	Attendance	Assignments/ MCQ	Total		
PURPH 801	Pharmaceutical Technology –IV	20	5	5	30	70	100
PURPH 802	Pharmaceutical Technology –V	20	5	5	30	70	100
PURPH 803	Elective-II	20	5	5	30	70	100
PURPH 804	Pharmacy Practice-II	20	5	5	30	70	100
PURPH 805	Biopharmaceutics & Pharmacokinetics	20	5	5	30	70	100
PURPH 806	Comprehensive Viva - Voce	20	5	5	30	70	100

VIII semester - Practicals

Code No.	Name of the Subject	Continuous Assessment			End Semester Examination	Grand Total
		Midsem	Day to Day Assessment	Total		
PURPH 811	Pharmaceutical Technology –IV	20	10	30	70	100
PURPH 812	Pharmaceutical Technology –V	20	10	30	70	100
PURPH 813	Elective-II(Seminar*)			100		100
PURPH 814	Project Work (Practical Work) & Seminar, Viva-Voce Project dissertation (Preface, Objectives General Introduction, Drug profile, Review of Literature, Plan of work, Methodology/ Experimental work and Investigations, , Interpretation and analysis of data, Results and Discussion, Summary & Conclusion)					100
PURPH 815	Practical training/ visits					100

*** PURPH 813: Elective-II (Seminar)**

Every candidate shall present two to three seminars covering the topics of each unit of the respective elective paper (Total of atleast 10 seminars shall be presented by each candidate covering the topics of all 5 Units of the respective elective paper). The candidate shall also submit a typed report for each seminar. Each seminar shall be evaluated by the concerned teacher along with the teacher(s) / committee as may be appointed by the Principal as a part of the continuous assessment activity. There shall be no end semester seminar examination for the PURPH 813.

Syllabus for Bachelor of Pharmacy (B. Pharm) 1st semester (Theory)

PURPH101: ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION

3 hrs. /week

UNIT – I

Scope of anatomy and physiology, basic terminologies used in this subject (Description of the body as such planes and terminologies)

Structure of cell – its components and their functions.

Elementary tissues of the human body: epithelial, connective, Muscular and nervous tissues-their sub-types and characteristics

a) Osseous system - structure, composition and functions of the Skeleton. (Done in practical classes - 6hrs)

b) Classification of joints, Types of movements of joints and disorders of joints

c) Skeletal muscles

i) Histology

ii) Physiology of Muscle contraction

iii) Physiological properties of skeletal muscle and their disorders

d) Sports physiology

i) Muscles in exercise, Effect of athletic training on muscles and muscle performance,

ii) Respiration in exercise, CVS in exercise, Body heat in exercise, Body fluids and salts in exercise,

iii) Drugs and athletics

Myasthenia gravis, spasticity, tetanus, Osteoporosis, Rickets, Osteomalacia, Arthritis, Gout.

UNIT – II

Haemopoetic System

a) Composition and functions of blood

b) Haemopoesis and disorders of blood components (definition of disorder)

c) Blood groups

d) Clotting factors and mechanism

e) Platelets and disorders of coagulation

Lymphatic System

a) Lymph and lymphatic system, composition, formation and circulation.

b) Spleen: structure and functions, Disorders

c) Disorders of lymphatic system

Anemia, Leukemia, leucopenia, purpura, aggranulocytosis, thrombocytopenia, polycythemia, haemophilia.

UNIT – III

Cardiovascular system

a) Anatomy and functions of heart

b) Blood vessels and circulation (Pulmonary, coronary and systemic circulation)

c) Electrocardiogram (ECG)

d) Cardiac cycle and heart sounds

e) Blood pressure – its maintenance and regulation

f) Definition of the following disorders

Hypertension, Hypotension, Arteriosclerosis, Atherosclerosis, Angina, Myocardial infarction, Congestive heart failure, Cardiac arrhythmias.

UNIT – IV

Respiratory system

a) Anatomy of respiratory organs and functions
b) Mechanism / physiology of respiration and regulation of respiration
c) Transport of respiratory gases
d) Respiratory volumes and capacities, and Definition of: Hypoxia, Asphyxia, Dybarism, Oxygen therapy and resuscitation.

Digestive system

a) Anatomy and physiology of GIT
b) Anatomy and functions of accessory glands of GIT
c) Digestion and absorption
d) Definition of the following disorders

Emesis, pyloric stenosis, hyperacidity, peptic and duodenal ulcer, dyspepsia, colic, constipation diarrhea, piles, jaundice, cirrhosis, asthma, bronchitis, tuberculosis.

UNIT - V

Health Education

a) Concepts of health and disease, causative agent and prevention of disease
b) Demography and family planning: Medical termination of pregnancy
c) Brief outline of communicable diseases, 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, gonorrhea and AIDS)
d) First aid: Emergency treatment of shock, snake bites, burns, poisoning, fractures and resuscitation methods.

Books Recommended:

1. Gerard J. Tortora and Bryan H. Derrickson: "Principles of Anatomy and Physiology", Vol. 1 & 2, 12th edition,John Willey & Sons, Inc.,2009.
2. Waugh and A. Grant Ed.: "Ross and Wilson's Anatomy and Physiology – in Health and Illness", 10th edition (2nd reprint), Churchill Livingstone, Elsevier, Edinburg, 2008.
3. Arthur C. Guyton and John E. Hall: "Text Book of Medical Physiology", 11th edition: Saunders, Elsevier, 2006.
4. C.C. Chatterjee: "Human physiology", Volume 1& 2, 11th edition (7th reprint), Medical Allied Agency, Calcutta, 2004.
5. K. Sembulingam and P. Sembulingam: "Essentials of Medical Physiology", 5th edition, Jaypee Brothers Medical Publishers, 2010.
6. S. K. Chaudhury: " Concise Medical Physiology", 5th edition (1st reprint), New Central Book Agency, Kolkata, 2006
7. W. F. Ganong: "Review of Medical Physiology, 22nd edition, Mc Graw Hill, 2005.
8. "Gray's Anatomy" 39th edition, Churchill Livingstone, London.

PURPH 102: PROFESSIONAL PHARMACY
3 hrs. /week

UNIT – I

Introduction to profession of pharmacy, definition of pharmacy, registered pharmacist, study of Pharmacy Act 1948, Code of ethics for a Pharmacist, career opportunities for Pharmacy graduates.

UNIT – II

History of Pharmacy – Historical background and development of profession of Pharmacy and Pharmaceutical industry in brief. Pharmaceutical education in India.

Introduction to various commissions appointed in relation to pharmacy profession and their recommendations:

- Hathi committee (Jai Sukhlal Hathi) – dealing with fake drugs,
- Drug enquiry committee,
- Bhore committee,
- Mashelkar committee.
- Mysore expert committee, brief idea about other committees for Pharmacy

UNIT – III

Brief introduction to professional societies and various Pharmaceutical associations with Mission, Objectives and salient features including the official publications (Journals, periodicals, if any) of:

a. Indian Pharmaceutical Congress Association
b. Indian Pharmaceutical Association
c. Indian Hospital Pharmacists Association
d. Indian Pharmacy Graduates Association
e. Association of Pharmaceutical Teachers of India
f. The All India Drug Control Officers Confederation
g. Indian Society for Technical Education
h. National Pharmaceutical Pricing Authority
i. Other allied professional societies/ associations

UNIT – IV

Development of Indian Pharmacopoeia and introduction to other Pharmacopoeias such as BP, USP, European Pharmacopoeia, Extra pharmacopoeia, Ayurvedic Pharmacopoeia, Herbal pharmacopoeia and Indian national formulary. Brief introduction about general subheadings under a monograph.

UNIT – V

a. Introduction to dosage forms - classification and definitions, general characteristics of dosage forms, route of administration of drugs, additives used in different dosage forms
b. Prescription: definition, various parts of prescription and their functions, handling of prescription, sources of errors, care required in dispensing procedures including labeling of dispensed products, preliminary knowledge of important Latin terms used in the prescriptions and their translation in to English.

c. Posology: Definition, Factors affecting dose selection. Calculation of children and infant doses.

Books Recommended:

1. Harkishan singh: History of Pharmacy in India and related aspects, volume 1 – Pharmacopoeias and formularies, 1st edition, Vallbh Prakashan, 2005.
2. Harkishan Singh: History of Pharmacy in India and related aspects, volume 2 – Pharmaceutical Education, 1st edition, vallbh prakashan, 2005.
3. Harkishan Singh: History of Pharmacy in India and related aspects,volume 4 – Mahadeva Lal Schroff and the Making of Modern Pharmacy , 1st edition, vallbh prakashan, 2005
4. Professional Pharmacy – M.L. Schroff
5. Indian Pharma Reference Guide 2010", Kong Posh Publiucations Pvt. Ltd. (www.kppub.com).
6. "Indian Pharmacopoeia" Government of India, Ministry of Health & Family Welfare, Controller of Publication, Delhi,1996
7. "Indian Pharmacopoeia" Government of India, Ministry of Health & Family Welfare, the Indian Pharmacopoeia Commision, Ghaziabad, 2007.
8. British Pharmacopoeia, 2009
9. "United States Pharmacopoeia", USP 32 – NF 27, Vol 1 & 2, Asian Edition, 2008.

10. Ayurvedic Pharmacopoeia
11. Herbal Pharmacopoeia
12. International Pharmacopoeia
13. Remington: The Sciences and Practice of Pharmacy", Vol. 1 & 2, 21st edition (1st Indian reprint), Lippincott Williams & Wilkins, 2007.
14. S. J. Carter Ed.: "Cooper and Gunn's Dispensing for Pharmaceutical Students", 12th edition, CBS Publishers & Distributors, New Delhi, 2007.
15. B.M .Mithal "A Text Book of Pharmaceutical Formulation", 6th edition, Vallbh Prakashan, 2008.
16. Introduction to Pharmaceutical dosage forms L. V. Allen, N. G. Popovich & H. C. Ansel: "Ansel's Parmaceutical Dosage Forms and Drug Delivery Systems", 8th edition, Lipincott William & Wilkins, USA, 2005.
17. N.K. Jain & S.N. Sharma: "A Textbook of Professional Pharmac", 5th editon, Vallbh Prakashan, 2009.

PURPH 103: PHARMACEUTICAL INORGANIC CHEMISTRY
3 hrs. /week

UNIT – I

a. Brief introduction to Pharmacopoeia:
   Indian Pharmacopoeia, United States Pharmacopoeia, British Pharmacopoeia and European Pharmacopoeia.
b. Sources of impurities in pharmaceutical substances, their control and tests for purity.
c. Importance of Limit tests, general principles and procedures of limit tests for chloride, sulphate, lead, iron, heavy metals and arsenic with their pharmacopoeial standards.
d. Qualitative tests for anions and cations.

UNIT – II

a. Major intra and extra cellular electrolytes: requirements and functions of the following major physiological ions- -sodium, potassium, calcium, chloride, magnesium, iodine. Electrolytes used in replacement therapy, physiological acid-base balance, electrolyte combination therapy, buffers and antioxidants and their pharmaceutical applications.
b. Essential and trace elements: Transition elements and their compounds. Iron and Haematinics. Mineral supplements.

UNIT – III

Definition, general method of preparation, tests for purity and medicinal uses for the following classes of compounds:

a. Gastro-intestinal agents: 1) Acidifying agents- hydrochloric acid, sodium acid phosphate. 2) Antacids- aluminium hydroxide, sodium bicarbonate, magnesium carbonate, milk of magnesia, magnesium trisilicate, magnesium oxide. 3) Protectives and adsorbents- charcoal, kaolin, bismuth subgallate, bismuth subcarbonate. 4) Saline cathartics- sodium potassium tartrate, magnesium sulphate, sodium phosphate.
b. Dental products: Anti- caries agents, dentifrices and desensitizing agents.
c. Gases and respiratory stimulants: Oxygen, carbon dioxide, helium, nitrogen and nitrous oxide.

UNIT – IV

Definition, general method of preparation, tests for purity and medicinal uses for the following classes of compounds:

a. Topical agents: 1) Protectives- talc, calamine, zinc oxide. 2) Antimicrobial agents- hydrogen peroxide, potassium permanganate, sodium perborate, iodine, boric acid, borax, silver nitrate, silver protein, sulphur, ammoniated mercury, yellow mercuric oxide. 3) Astringents- alum, zinc sulphate.

b. Radiopharmaceuticals: General theory regarding radioactivity, units, radio-activity decay, biological effects of radiation, measurement of radioactivity, radiopharmaceuticals and their pharmaceutical applications, storage and handling of radio pharmaceuticals, radio-opaque contrast media- barium sulfate.

UNIT – V

a. Miscellaneous agents:
   Definition, general method of preparation, tests for purity and medicinal uses for the following classes of compounds:
   - Expectorants and emetics.
   - Sedatives.
   - Poisons and antidotes.
   - Complexing and chelating agents.

b. Preparation and uses of the following reagents:
   - lithium aluminium hydride
   - anhydrous aluminium chloride
   - perchloric acid
   - boron trifluoride
   - ceric ammonium sulphate.

Books Recommended:

1. L. M. Atherden: "Bentley & Driver's Textbook of Pharmaceutical Chemistry", 8th edition, Oxford University Press, Delhi, 2007.
2. G. R. Chatwal: "Pharmaceutical Chemistry – Inorganic", 4th edition, Himalaya Publishing House Pvt. Ltd., Mumbai, 2008.
3. "Indian Pharmacopoeia" Government of India, Ministry of Health & Family Welfare, Controller of Publication, Delhi, 1996.
4. A. H. Beckett & J. B. Stenlake: "Practical Pharmaceutical Chemistry", 4th edition, Part-1, CBS Publishers, New Delhi, 2005.

PURPH 104: PHARMACEUTICAL ORGANIC CHEMISTRY-I
3 hrs. /week

UNIT – I

1. Structures and Physical properties of organic molecules:
   a. Atomic and molecular orbitals, molecular orbital theory, bond formation in organic compounds, hybridization, polarity of bonds, polarity of molecules, Inter molecular forces, influence of structure on physical properties like m.p, b.p, solubility. Homolysis and heterolysis, electron displacement effects, reactive intermediates, types of organic reagents.

   b. Acids and bases, Lowry bronsted and Lewis theories

2. IUPAC nomenclature of organic compound belonging to the following classes Alkanes, Alkenes, Dienes, Alkynes, Alcohols, Aldehydes, Ketones, Amides, Amines, Phenols, Alkyl Halides, Carboxylic Acid, Esters, Acid Chlorides And Cycloalkanes.

UNIT – II

1. Stereochemistry:

Isomerism: Different types of isomerism, their nomenclature and associated physico chemical properties. Structural isomerism: chain isomerism, positional isomerism, functional isomerism and metamerism, keto-enol tautomerism. Conformational isomerism: Conformations of ethane and butane. Geometrical isomerism: cis-trans isomers and E-Z isomers, physical and chemical properties, stability of cis and trans isomers. Optical isomerism:Optical activity, specific rotation, asymmetric carbon, chirality, Fischer projection, enantiomerism, diastereomerism. Specification of configuration: Absolute and relative configuration (D,L system and R,S system). Racemic mixture, racemization, Walden inversion.

2. Alkanes- general methods of preparation, free radical substitution reactions: Mechanism, relative reactivity and stability.

3. Alicyclic compounds: Preparations of cyclo alkanes, ring stabilities of cyclohexane, chair boat conformation, Bayer strain theory, Sachse-Mohr concept of strainless rings.

UNIT – III

1. Electrophillic addition: Reactions at carbon-carbon double bond, hydrogenation, heat of hydrogenation and stability of alkenes, Markovnikoff's rule, addition of hydrogen halides, addition of hydrogen bromide- peroxide effect. Electrophillic addition mechanism, rearrangement, orientation and reactivity, addition of halogen, halohydrin formation, mechanism of free radical additon, mechanism of peroxide initiated addition of hydrogen bromide, orientation of free radical addition, addition of carbene to alkene, cyclo- addition reactions.

2. Carbon-carbon double bond as substituents: Free radical halogenations of alkenes, comparision of free radical substitution with free radical addition, free radical substitution in alkenes.

3. Alkynes: Acidity of 1-alkynes, formation of metal acetylides. Addition of hydrogen halide, addition of water and keto-enol tautomerism.

4. Theory of resonance: Allyl radical as a resonance hybrid, stability, orbital picture, resonance stabilization of allyl radicals, allyl cation as a resonance hybrid, resonance stabilization of allyl cation, hyper conjugation, allylic rearrangement, stability of conjugated dienes, resonance in alkenes, electrophilic addition to conjugated dienes, 1,2 and 1,4- additions with examples, 1,2- versus 1,4-addition, Diel's Alder reaction, orientation and reactivity of free radical addition to conjugated dienes.

UNIT – IV

1. Nucleophilic aliphatic substitution mechanism: Nucleophiles and leaving groups, kinetics of second and first order reactions, mechanism and stereochemistry of SN_2 reactions, mechanism and stereochemistry of SN1 reactions, carbocations and their stability, rearrangement of carbocation, reactivity of alkyl halide in SN1 and SN2, factors affecting SN1 and SN2 reactions, SN2 versus SN1.

2. Dehydrohalogenation of alkyl halides: 1,2 elimination, kinetics, Saytzeff's rule, E2 and E1 mechanism, elimination via carbocation, evidence for E2 mechanism, orientation and reactivity of E1 and E2 reactions, E2 versus E1, elimination versus substitution, dehydration of alcohol and its mechanism, ease of dehydration, acid catalysis.

3. Alcohols: hydrogen bonding, characteristic nucleophilic substitution reactions, elimination reactions, Reimer Tiemann reaction and relative reactivities of primary, secondary and tertiary alcohols, Meerwein Pondorff Verley reduction.
4. Ethers: Williamson's synthesis, action of hydro-iodic acid on ethers(Ziesel's method).

UNIT – V

1. Electrophilic aromatic substitution: Kekule's structure of benzene, bond lengths, heats of hydrogenation and stability,molecular orbital picture of benzene, aromaticity, Huckel's rule, electophilic aromatic substitution, effect of substituent groups, determination of orientation, determination of relative reactivity, classification of substituent group, mechanism of nitration, sulphonation, halogenation, Friedel craft alkylation, Friedel craft acylation, reactivity and orientation, activating and deactivating (O,P,M directing) groups, effect of halogen on electrophilic aromatic substitution in alkyl benzene, side chain halogenation of alkyl benzene, resonance stabilization of benzyl radical.

2. Polynuclear aromatic hydrocarbons: Haworth's synthesis, structure, properties and reactions of naphthalene, phenanthrene and anthracene.
   Structure and medicinal uses of Propranolol, Tolnaftate, Menadione, Naphazoline, Phenindione, Morphine and Codeine.

Books Recommended:

1. R. T. Morrison and R. Boyd: "Organic Chemistry", 6th edition (5th Indian edition), Pearsons Education, Inc., 2004.
2. L. M. Atherden: "Bentley & Driver's Textbook of Pharmaceutical Chemistry", 8th edition, Oxford University Press, Delhi, 2007.
3. L. Finar: "Organic Chemistry, The Fundamental Principles", Vol1&2, Pearsons Education, Inc., 2007.
4. "Indian Pharmacopoeia" Government of India, Ministry of Health & Family Welfare, the Indian Pharmacopoeia Commision, Ghaziabad, 2007.
5. Jerry March: "Advanced Organic Chemistry – Reactions Mechanisms and Structures", John Wiley & Sons, 2005.
6. Solomons and Fryhle: "Organic Chemistry", 8th edition (5th reprint), John Wiley & Sons, 2007.

PURPH 105: PHARMACOGNOSY - I
3 hrs. /week

UNIT – I

a. Introduction, definition, history & scope of Pharmacognosy.
b. Sources of drugs: Biological, marine, mineral and plant tissue culture as sources of drugs.
c. Classification of natural drugs: Alphabetical, morphological, taxonomical, chemical, pharmacological/ therapeutical and chemotaxonomical classification of drugs.

UNIT – II

a. Methodology of cultivation of crude drugs in detail, collection, processing & storage of crude drugs.
b. Pest management and detailed study of natural pesticides and classification of pesticides.
c. Adulteration of crude drugs and their detection by organoleptic, microscopic, physical, chemical and biological methods of evaluation.
d. Plant harmones and their applications.

UNIT – III

Systematic Pharmacognostic study of the following:

a. Carbohydrates and derived products: Acacia, Honey, tragacanth, Isapgol, Pectin, Guar gum, Gum karaya, Starch, Sodium Alginate, Chitin, Agar
b. Lipids: Bees wax, castor oil, Cocoa butter, Cod liver oil, Hydnocarpus Oil, Kokum butter, Lard, Linseed oil, Shark liver oil and wool fat.
c. Proteins: Malt extract, protamine sulphate, Heparin sodium, collagen microfibrillar, Gelatin, Casein, Levodopa, Yeast.

UNIT – IV

Detailed study on source, cultivation, collection, macro, micro & powder microscopy, chemical constituents, identification, standards, adulterants and pharmacological aspects of the following.

i. Leaves: Senna, Aloe, Eucalyptus, Vinca, Datura, Vasaka and Stramonium
ii. Stem: Ephedra
iii. Wood: Quassia
iv. Bark: Cassia, cinnamon, Kurchi, Cinchona and Ashoka

Study of plant fibres used in surgical dressings and related products: Cotton, jute, flax, silk, rayon & wool.

UNIT – V

Vernecular names, macroscopy, microscopy, chemical constituents, standards and pharmacological uses of the following official plants stated in herbal Pharmacopoeia:
(a). Achyranthus aspera (b). Aconitum heterophyllum (c). Adathoda zeylanica (d.) Aegele marmelos (e). Bacopa monnieri (f). Boerhavia diffusa (g). Butea monosperma (h). Cassia fistula

Books Recommended:

1. T.E.Wallis: "Text Book of Pharmacognosy", 5th edition, CBS Publishers & Distributors Pvt. Ltd., 2005.
2. W.C.Evans: "Trease and Evans Pharmacognosy", 15th edition, Saunders, Elsevier, 2007.
3. C.K. Kokate, A. P. Purohit & S. B. Gokhale: "Pharmacognosy", 41st edition, Nirali Prakashan, 2008.
4. J. S. Quadry: "Shah & Qadery Pharmacognosy", 14th edition, B. S. Saha Prakashan, 2009.
5. Ashutosh Kar: "Pharmacognosy and Pharmacobiotechnology", 2nd edition, New Age International Publishers, 2007.

PURPH 106: FUNDAMENTALS OF PHARMACEUTICAL ANALYSIS
3 hrs. /week

UNIT - I

- General introduction to Pharmaceutical Analysis - Types of Analysis, Common techniques, Instrumental methods, other techniques.
- Applications of Chemical Analysis
- Stages of Analysis, Factors affecting the choice of analytical method.
- Interferences-Selective precipitation, masking, selective oxidation, solvent extraction, ion-exchange, chromatography
- Sources of impurities in pharmaceutical chemicals
- Errors-Determinate errors, indeterminate errors, Sources of errors and their minimization

UNIT - II

- Study of various Pharmacopoeias with respect to Pharmaceutical Analysis - Indian Pharmacopoeia, British Pharmacopoeia, United States Pharmacopoeia, European Pharmacopoeia, Chinese Pharmacopoeia, Japanese Pharmacopoeia

- Assay, Identification tests - Physical constants **(** melting point, boiling point, refractive index, weight/millilitre, specific optic rotation,viscosity, specific surface area , swelling power, infrared absorption, sulphated ash, clarity & colour of the solution, heavy metals..,**)**, Various types of tests official in monograph for Quantitative determinations **(**Limits of insoluble matter, limits of soluble matter, limits of moisture, limits of volatile matter, limits of residual solvents, aquametry, limits of non volatile matter, limits of residue on ignition, limits of loss on ignition, ash value, total ash , acid insoluble ash, sulphated ash, water soluble ash**)**

- Sampling procedures for solids, liquids ,gases & vapours

UNIT - III

General aspects of Standardization of Pharmaceutical chemicals and products-primary standards, ideal requirements of primary standards, secondary standards, various standards employed in titrimetric analysis

- Reagents and Standard solutions-reagents, purification of substances, preparation of standard solutions of acids and bases, Storage of standard solutions.
- Calculations used in analytical chemistry, Solutions and their interconversions, Molarity ,Normality , Molality , Equivalents, oxidation numbers, Titre, Chemical stoichiometry
- Accuracy and precision
- Significant figures and Computation of analytical results, Rejection of doubtful values

UNIT - IV

- Balances –Analytical balance, Single pan mechanical balance, electronic balance
- Types of weighing – Weighing by difference, weighing by addition
- Graduated glass ware – Graduated flasks,, pipettes, burettes,graduated cylinders
- Calibration of volumetric apparatus – pipettes, burettes, volumetric flasks
- Desiccators and dry boxes
- Filtration apparatus
- General apparatus used - Plastic ware, metal apparatus, heating apparatus
- Water for pharmaceutical use

UNIT - V

- Theoretical principles of reactions in solutions – Chemical equilibrium, electrolytic dissociation, law of mass action, ionic product of water, hydrogen ion exponent, relative strengths of acids and bases ,hydrolysis of salts, buffer solutions, solubility product, common ion effect, fractional precipitation, complex ions, stability of complexes, factors affecting the stability of complexes, electrode potentials 7 Hr
- Indicators used in chemical analysis – Neutralization indicators,redox indicators, precipitation indicators, complexometric indicators , non-aqueous indicators 2 Hr

Books Recommended:

1. H. Beckett & J. B. Stenlake: "Practical Pharmaceutical Chemistry", 4th edition, Part-1, CBS Publishers, New Delhi, 2005
2. Mendham et al.: "Vogel's Text book of Quantitative Analysis", 6th edition, Pearsons Education Ltd., 2008
3. Ashutosh Kar: "Pharmaceutical Drug Analysis", 2nd editon (Reprint), New Age International Publishers, 2005.
4. K.A.Connors: "A Text Book of Pharmaceutical Analysis", 3rd edition, John Wiley & Sons, 2007.
5. Skoog et al.: "Fundamentals of Analytical Chemistry", 8th edition, Thomson Buisness Information India Pvt. Ltd., 2006.
6. D. C. Garrot: "The Quantitative Analysis of Drugs" 3rd edition, CBS Publishers & Distributors,2005.
7. Gary.D.Christian: "Analytical Chemistry", 6th edition, John Wiley & Sons, 2007.
8. "Indian Pharmacopoeia" Government of India, Ministry of Health & Family Welfare, the Indian Pharmacopoeia Commision, Ghaziabad, 2007.
9. "United States Pharmacopoeia", USP 32 – NF 27, Vol1 & 2, Asian Edition, 2008.
10. British Pharmacopoeia, 2009.
11. European Pharmacopoeia, 2008
12. Chinese Pharmacopoeia,2005

PURMT 107: REMEDIAL MATHEMATICS
3 hrs. /week

UNIT – I

Algebra: Determinants, Matrices
Trigonometry: Sides and angles of a triangle, solution of triangles
Analytical Geometry: Points, Straight line, circle, parabola

UNIT – II

Differential calculus: Limit of a function, Differential calculus, Differentiation of a sum, Product, Quotient Composite, Parametric, exponential, trigonometric and Logarithmic function. Successive differentiation, Leibnitz's theorem, Partial differentiation, Euler's theorem on homogeneous functions of two variables.

UNIT – III

Integral Calculus: Definite integrals, integration by substitution and by parts, Properties of definite integrals.

UNIT – IV

Laplace transform: Definition, Laplace transform of elementary functions, Properties of linearity and shifting.

UNIT – V

Differential equations: Definition, order, degree, variable separable, homogeneous, linear, heterogeneous, linear, differential equation with constant coefficient, simultaneous linear equation of second order.

Books Recommended:

1. Differential calculus By Shantinarayan
2. Text book of Mathematics for second year pre-university by Prof. B.M.Sreenivas
3. Integral calculus By Shanthinarayan
4. Engineering mathematics By B.S.Grewal
5. Trigonometry Part-I By S.L.Loney

PURBI 107: REMEDIAL BIOLOGY
3 hrs. /week

UNIT – I

Introduction, General organization of plant cell and its inclusions, mitosis, meiosis, Plant tissues, Plant kingdom and its classification.

UNIT – II

Morphology of plants, Root, Stem, Leaf and Its modifications, Inflorescence and Pollination of flowers, Morphology of fruits and seeds, Plant physiology

UNIT – III

Plant Taxonomy of Fabaceae, Apocynaceae, Rutaceae, umbelliferae, Solanaceae, Lilliaceae, Zinziberaceae, Rubiaceae.
Study of Fungi, Yeast, Penicillin and Bacteria

UNIT – IV

Study of Animal cell, Study animal tissues, detailed study of frog

UNIT – V

Study of Pisces, Reptiles, Aves, General organization of mammals, Study of poisonous animals

Books Recommended:

1. Text book of Biology by S. B. Gokhale
2. A Text book of Biology by Dr.Thulajappa and Dr. Seetaram.
3. A Text book of Biology by B.V.Sreenivasa Naidu
4. A Text book of Biology by Naidu and Murthy
5. Botany for Degree students By A.C.Dutta.
6. Outlines of Zoology by M.Ekambaranatha ayyer and T.N. Ananthakrishnan.
7. A manual for pharmaceutical biology practical by S.B.Gokhale and C.K.Kokate

Syllabus for Bachelor of Pharmacy (B. Pharm) 1st semester (Practical)
PURPH 111: ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION
(Including Remedial Biology)
3 hrs. /week

General Requirements: Dissection box, Laboratory Napkin, muslin cloth, record, Observation book (100pages), Stationary items, Blood lancet.

List of Experiments:

1. Study of tissues of human body
   (a) Epithelial tissue.
   (b) Muscular tissue.
2. Study of tissues of human body
   (a) Connective tissue.
   (b) Nervous tissue.
3. Study of appliances used in hematological experiments.
4. Determination of W.B.C. count of blood.
5. Determination of R.B.C. count of blood.
6. Determination of differential leucocyte count of blood.
7. Determination of
   (a) Erythrocyte Sedimentation Rate.
   (b) Hemoglobin content of Blood.
   (c) Bleeding time & Clotting time.
8. Determination of
   (a) Blood Pressure.
   (b) Blood group.
   (c) ECG
9. Study of various systems with the help of charts, models & specimens
   (a) Skeleton system part I-axial skeleton.
   (b) Skeleton system part II- appendicular skeleton.
   (c) Cardiovascular system.
   (d) Respiratory system.
   (e) Digestive system.
10. Study of different family planning appliances.
11. Study of appliances used in experimental physiology.
12. To record simple muscle curve using gastrocnemius sciatic nerve preparation.
13. To record simple summation curve using gastrocnemius sciatic nerve preparation.
14. To record simple effect of temperature using gastrocnemius sciatic nerve preparation.
15. To record simple fatigue curve using gastrocnemius sciatic nerve preparation.
16. Detailed study of frog (For students of remedial Biology)

Books Recommended:

1. R. K. Goyal, M.P. Natvar & S.A. Shah: "Practical Anatomy, Physiology and Biochemistry", B.S Shah Prakashan, Ahmedabad.
2. V. G. Ranade, "Text Book of Practical Physiology", PVG, Pune.
3. Anderson Experimental Physiology
4. R. K. Goyal, N. M. Patel "Practical Anatomy And Physiology", 13th edition, B. S. Shah Prakashan, Ahmedabad, 2008.

PURPH 112: PHARMACEUTICAL INORGANIC CHEMISTRY
3 hrs. /week

a. Limit tests (any three):
   Limit test for chloride in sodium citrate.
   Limit test for sulphates in boric acid
   Limit test for sulphates in sodium phosphate.
   Limit test for iron in ammonium chloride.
   Limit test for iron in calcium carbonate.

b. Systematic simple salt analysis of the following inorganic compounds. (any five):
   Sodium chloride
   Calcium chloride
   Sodium acetate
   Zinc sulphate
   Barium sulphate
   Barium chloride
   Lead nitrate
   Aluminium nitrate
   Aluminium sulphate

c. Preparation of the following inorganic pharmaceutical compounds(any five):
   Ferrous sulphate,
   Alum,
   Magnesium carbonate
   Magnesium sulphate
   Zinc stearate
   Sodium salicylate
   Ferric ammonium citrate
   Precipitated calcium carbonate

d. Tests for purity for the following (any two):
   Swelling power in bentonite
   Ammonium salts in potash alum.
   Presence of iodates in KI

Books Recommended:

1. A. H. Beckett & J. B. Stenlake: "Practical Pharmaceutical Chemistry", 4th edition, Part-1, CBS Publishers, New Delhi, 2005.
2. Mendham et al.: "Vogel's Text book of Quantitative Analysis", 6th edition, Pearsons Education Ltd., 2008

PURPH 113: PHARMACEUTICAL ORGANIC CHEMISTRY- I
3 hrs. /week

I. Identification of organic compounds:

Systematic qualitative analysis of monofunctional organic compounds containing-- phenols, amides, amines, carboxylic acids, aldehyde and ketones, alcohols, esters, hydrocarbons, nitrocompounds.

II. Preparation of organic compounds involving a specific organic reaction: (any five)

1. Acetanilde / aspirin (Acetylation)
2. Benzanilide / Phenyl benzoate (Benzoylation)
3. P-bromo acetanilide / 2,4,6 – tribromo aniline (Bromination)
4. Dibenzylidene acetone (Condensation)
5. 1-Phenylazo-2-napthol (Diazotisation and coupling)
6. Benzoic acid / salicylic acid (Hydrolysis of ester)
7. M-dinitro benzene (Nitration)
8. 9, 10 – Antharaquinone (Oxidation of anthracene) / preparation of benzoic acid from toluene or benzaldehyde
9. M-phenylene diamine (Reduction of M-dinitrobenzene) / Aniline from nitrobenzene
10. Benzophenone oxime
11. Nitration of salicylic acid

Books Recommended:

1. Raj.K.Bansal; " Laboratory Manual of Organic Chemistry"; New Age International Pvt. Ltd.
2. Mann and Saunders; "Practical Organic Chemistry"; Orient Longman Pvt. Ltd.
3. Mendham.J; "Vogel's Textbook of Quantitative Chemical Analysis"; 6th edition;Pearson Education Publishers.
4. Vogel; "Qualitative Organic Analysis"; CBS Publishers.

PURPH 114: PHARMACOGNOSY – I
(Including Remedial Biology)
3 hrs. /week

General Requirements: Laboratory Napkin, Observation Book 150 pages, Zero brush, Needle, Blade, Match box.

List of experiments:

1 Introduction to Pharmacognosy laboratory and experiments.
2 Study of cell wall constituents and cell inclusions.
3 Macro, powder and microscopic study of Datura.
4 Macro, powder and microscopic study of Senna.
5 Macro, powder and microscopic study of Cassia.cinnamon.
6 Macro, powder and microscopic study of Cinchona.
7 Macro, powder and microscopic study of Ephedra.
8 Macro, powder and microscopic study of Quassia.
9 Macro, powder and microscopic study of Clove
10 Macro, powder and microscopic study of Fennel.
11 Macro, powder and microscopic study of Coriander.
12 Macro, powder and microscopic study of Isapgol.
13 Macro, powder and microscopic study of Nux vomica.

14 Macro, powder and microscopic study of Rauwolfia.
15 Macro, powder and microscopic study of Liquorice.
16 Macro, powder and microscopic study of Ginger.
17 Macro, powder and microscopic study of Podophyllum.
18 Macro, powder and microscopic study of adathoda
19 Macro, powder and microscopic study of Aconite
20 Macro, powder and microscopic study of Brahmi
21 Macro, powder and microscopic study of Apamarga
22 Macro, powder and microscopic study of Kurchi
23 Determination of Iodine value.
24 Determination of Saponification value and unsaponifiable matter.
25 Determination of ester value.
26 Determination of Acid value.
27 Chemical tests for Acacia.
28 Chemical tests for Tragacanth.
29 Chemical tests for Agar.
30 Chemical tests for Starch.
31 Chemical tests for Lipids.(castor oil, sesame oil, shark liver oil, bees wax)
32 Chemical tests for Gelatin.
33 Microscopical identification of different types of stomata
34 T.L.C profile of the following plants
a. Bacopa monnieri (b) Datura (c) Kalmegh (d) Aloes (e) Tea (f) Senna

For remedial Biology students

1. Introduction of biology experiments
2. Study of cell wall constituents and cell inclusions
3. Study of Stem modifications
4. Study of Root modifications
5. Study of Leaf modifications
6. Identification of Fruits and seeds
7. Preparation of Permanent slides
8. T.S. of Senna, Cassia, Ephedra, Podophyllum.
9. Simple plant physiological experiments
10. Identification of animals
11. Computer based tutorials

PURPH 115: FUNDAMENTALS OF PHARMACEUTICAL ANALYSIS
3 hrs. /week

1. Handling of Analytical balance and electronic balances, Calibration of fractional weights
2. Calibration of pipettes(all types), burettes, volumetric flasks
3. Preparation and Standardization of 0.1M HCl
4. Preparation and Standardization of 0.1N H_2SO_4
5. Preparation and Standardization of 0.1M NaOH
6. Preparation and Standardization of 0.5 N KOH
7. Preparation and Standardization of 0.02M $KMnO_4$
8. Preparation and Standardization of 0.1N $K_2Cr_2O_7$
9. Preparation and Standardization of 0.05M Iodine
10. Preparation and standardization of 0.1M Sodium thiosulphate
11. Preparation and Standardization of 0.05M EDTA
12. Preparation and standardization of 0.1N Silver nitrate
13. Preparation and Standardization of 0.1N Acetous perchloric acid
14. Preparation of Ammonia-Ammonium chloride buffer (IP)

15. Preparation of Acetate buffer pH 4.0 (IP)
16. Preparation of Borate buffer; Boric buffer pH 9.0 (IP)
17. Preparation of starch iodide paper and testing its compliance (IP)
18. Test for chlorides in reagents (USP)
19. Determination of loss on drying of Magnesium citrate (EP)
20. Determination of water in Belladonna herb (Chinese Pharmacopoeia)

Books Recommended:

3. A. H. Beckett & J. B. Stenlake: "Practical Pharmaceutical Chemistry", 4th edition, Part-1, CBS Publishers, New Delhi, 2005.
4. Mendham et al.: "Vogel's Text book of Quantitative Analysis", 6th edition, Pearsons Education Ltd., 2008
5. Ashutosh Kar: "Pharmaceutical Drug Analysis", 2nd editon (Reprint), New Age International Publishers, 2005.
6. Skoog et al.: "Fundamentals of Analytical Chemistry", 8th edition, Thomson Buisness Information India Pvt. Ltd., 2006.
7. Gary.D.Christian: "Analytical Chemistry", 6th edition, John Wiley & Sons, 2007.
8. "Indian Pharmacopoeia" Government of India, Ministry of Health & Family Welfare, the Indian Pharmacopoeia Commision, Ghaziabad, 2007.
9. "United States Pharmacopoeia", USP 32 – NF 27, Vol1 & 2, Asian Edition, 2008.
10. British Pharmacopoeia, 2009.
11. "European Pharmacopoeia", 2008

Syllabus for Bachelor of Pharmacy (B. Pharm) 2nd Semester (Theory)

PURPH 201: HUMAN PHYSIOLOGY AND PATHOPHYSIOLOGY
3 hrs. /week

UNIT - I

Nervous system

a. Definition and classification of nervous system
b. Anatomy, physiology and functional areas of cerebrum
c. Anatomy and physiology of cerebellum
d. Anatomy and physiology of mid brain
e. Thalamus, hypothalamus and Basal Ganglia
f. Spinal cord: Structure & reflexes – mono-poly-planter
g. Cranial nerves – names and functions
h. Reticular activating system, Limbic system and their functions
i. Blood brain barrier, cerebrospinal fluid (CSF) and its circulation
j. Thermoregulation-Pyrexia, EEG. Sleep, Insomnia, Epilepsy, Anxiety, Schizophrenia, Depression, Parkinsonism

UNIT - II

Autonomous nervous system

a. ANS – Anatomy & functions of sympathetic & parasympathetic N.S.
b. Neurotransmitters-chemical transmission
c. Organs of special senses- Eye, Ear, Skin, Tongue & Nose
d. Glaucoma, Mydriasis, Meosis, Conjunctivitis, Deafness

UNIT – III

Endocrine system

a. Pituitary gland
b. Adrenal gland
c. Thyroid and Parathyroid glands
d. Pancreas and gonads
e. Addison's diseases, Cretinism, Goiter, Myxodema, Acromegaly

UNIT - IV

Reproductive system

a. Male and female reproductive system
b. Their hormones – Physiology of menstruation
c. Spermatogenesis & Oogenesis
d. Sex determination (genetic basis)
e. Pregnancy and maintenance and parturition

Urinary system

a. Anatomy and physiology of urinary system
b. Structure of Nephron and Formation of urine
c. Renin Angiotensin system – Juxtaglomerular apparatus - acid base Balance
d. Clearance tests and micturition

UNIT - V

1) Basic principles of cell injury and Adaptation

a. Causes, Pathogenesis and morphology of cell injury
b. Abnormalities in lipoproteinaemia, glycogen infiltration and glycogen storage diseases

2) Inflammation

a) Pathogenesis of acute inflammation, Chemical mediators in inflammation, Types of chronic inflammation
b) Repairs of wounds in the skin, factors influencing healing of wounds

3) Diseases of Immunity

a) Immune systems. Immuno component cells and their development
b) Autoimmune disorders
c) Hypersensitivity

4) Cancer:

a) Differences between benign and malignant tumors
b) Histological diagnosis of malignancy, invasions and metastasis, patterns of spread, disturbances of growth of cells,
c) Classification of tumors, general biology of tumors, etiology and pathogenesis of cancer.

5) Types of shock, mechanisms, stages and management

6) Biological effects of radiation

Books Recommended:

1. Gerard J. Tortora and Bryan H. Derrickson: "Principles of Anatomy and Physiology", Vol. 1 & 2, 12th edition, John Willey & Sons, Inc., 2009.
2. A.Waugh and A. Grant Ed.: "Ross and Wilson's Anatomy and Physiology – in Health and Illness", 10th edition (2nd reprint), Churchill Livingstone, Elsevier, Edinburgh, 2008.
3. Arthur C. Guyton and John E. Hall: "Text Book of Medical Physiology", 11th edition, Saunders, Elsevier, 2006.
4. C. C. Chatterjee: "Human Physiology", Volume 1& 2, 11th edition (7th reprint), Medical Allied Agency, Calcutta, 2004.
5. K. Sembulingam and P. Sembulingam: "Essentials of Medical Physiology", 5th edition, Jaypee Brothers Medical Publishers, 2010.
6. S. K. Chaudhury: "Concise Medical Physiology", 5th edition (1st reprint), New Central Book Agency, Kolkata, 2006
7. W. F. Ganong: "Review of Medical Physiology", 22nd edition, Mc Graw Hill, 2005.
8. "Gray's anatomy" 39th edition, Churchill Livingstone - Elsevier, London,2005.
9. Roger and Walker "Clinical Pharmacy and Therapeutics", 4th edition, Churchill Livingstone Publication, 2007.
10. Cotran, Kumar, Robbins: "Pathologic Basis of Disease", 7th edition, Elsevier India Pvt.Ltd, 2007.
11. Harsh Mohan: "Text book of Pathology"
12. Y.M. Bhinde: "Text book of Pathology"

PURPH 202: PHARMACEUTICAL MICROBIOLOGY
3 hrs. /week

UNIT - I

Introduction to the science of microbiology including the history and scope of microbiology.
Major divisions of microbial world and Relationship among them.
Morphology, functions and detailed study of bacteria, virus, fungi, spirochetes and rickettsiae
Differences between Prokaryotic cell and Eukaryotic cell

UNIT - II

Nutritional requirements, growth and cultivation of bacteria and virus. Study of different important media required for the growth of aerobic and anaerobic bacteria & fungi.
Different techniques used in isolation and maintenance of bacterial cultures
Identification of bacteria with emphasis to different staining techniques and biochemical reactions.
Different methods in counting of bacteria -Total and Viable counting techniques.
Microbial limit tests (Official in I.P)

UNIT - III

Microbial genetics including basis of heredity, nucleic acids information, storage and transfer.
DNA replication, Protein synthesis, transcription and translation.
Introduction to Mutagens along with different types of mutations and their effects.
Microbial transformation, transduction, conjugation and protoplast fusion.

UNIT - IV

Microbiology of foods including food spoilage and food preservation.
Microbiology of Water and Milk.
Industrially significant microbes and microbial enzymes.

UNIT - V

Infection, different types of infections.
Progress, transmission and establishment of disease.
Bacterial Diseases: Diphtheria, Pertusis, Tuberculosis, Anthrax and Gas-gangrene.
Rickettsial disease: Typhus.
Viral Diseases: Pneumotropic, Dermotropic, Viscerotropic and Neurotropic viral diseases along with few examples.
Fungal and sexually transmitted diseases: Candidiasis, dermatomycosis, blastomycosis, gonorrohea and syphilis

Books recommended

1. Prescott, Harley & Klein: "Microbiology", 6th edition, Mc Graw Hill, 2005.
2. Doyle et al.: "Food Microbiology" 2nd edition, ASM Press, 2001.
3. B. S. Nagoba: "Clinical Microbiology" 1st edition (Reprint), B I Publication Pvt. Ltd., 2005.
4. I. E. Alcammo: "Fundamentals of Microbiology", 6th edition, Jones & Bartlett, 2000.
5. "Indian Pharmacopoeia" Government of India, Ministry of Health & Family Welfare, The Indian Pharmacopoeia Commision, Ghaziabad, 2007.
6. David green wood: "Medical Microbiology", 16th edition, Churchill Livingstone, 2006.
7. Jacquelyn G.Black: "Microbiology – Principles and explorations", 5th edition, , John Willey & Sons, 2000.
8. Pelczar et al.: "Microbiology", 5th edition, Tata Mc Graw Hill Publishing Company Ltd., 2007.
9. Ananthanaryanan and J. Paniker: "Text Book of Microbiology" 8th edition, Orient Longman, 2009.

PURPH 203: PHARMACEUTICAL ORGANIC CHEMISTRY - II
3 hrs/ week

UNIT - I

1. Nucleophilic addition reactions, structure versus reactivity of aldehydes and ketones, acidity of alpha hydrogens and carbanion addition reactions, haloform reaction of methyl ketones. Nucleophilic addition reactions in aldehydes and ketones, mechanisms with examples. Mechanisms of Aldol condensation, crossed Aldol condensation, Claisen condensation, Cannizaro reaction, crossed Cannizaro reaction, benzoin reaction, Perkin's reaction, Knoevenagel's reaction and Reformatsky reaction.

2. Oxidation and reduction reactions.

UNIT - II

1. Study of the following official compounds- preparation, test for purity, assay and medicinal uses of Chlorbutol, Dimercaprol, Glyceryl trinitrate, Urea, Ethylene diamine dihyrate, Vanillin, Paraldehyde, Ethylene chloride, Lactic acid, Tartaric acid, citric acid, salicylic acid, aspirin, methyl salicylate, ethyl benzoate, benzyl benzoate, dimethyl pthalate, sodium lauryl sulphate, saccharin sodium, mephensin.

2. Polynuclear hydrocarbons:
   Synthesis(Haworth's and Diel'sAlder), properties and reactions of naphthalene,phenanthrene and anthracene. Structure and medicinal uses of Propranolol, Tolnaftate, Menadione, Naphazoline, Phenindione, Morphine and Codeine.

UNIT - III

1. Heterocyclic chemistry:
   Introduction to heterocyclic systems, nomenclature and numbering of heterocyclic compounds. General methods of preparation and important reactions of five membered and six membered heterocyclic systems—furan, pyrrole, thiophene, pyridine, quinoline, isoquinoline and indole.

2. Acquaintance with the following heterocyclic systems commonly encountered in therapeutic agents with suitable examples.—aziridine, thiadiazole, oxazole, isoxazole, thiazole, imidazole, pyrazole, pyridazine, pyrimidine, piperazine, piperidine, benzothiazole, purine, benzimidazole, indole, benzothiadiazine, pteridine, pthalazine, quinazoline, quinoline, isoquinoline, benzopyran, benzodiazepines, phenothiazines, acridine, thioxanthene.

UNIT - IV

A study of the development of the following classes of drugs including SAR, mechanism of action and synthesis of important compounds:

a) Local anti-infective agents
b) Preservatives
c) Antifungal agents
d) Urinary tract anti-infectives
e) Antitubercular and antileprotic agents
f) Antiprotozoal agents
g) Antimalarial agents
h) Anthelmentics

UNIT - V

1. Sulphonamides and sulphones
2. Antibiotics.

Books recommended

1. J. H. Block and J. M. Beale: "Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry", 11th edition, Lippincott-Williams & Wilkins, Philadelphia, 2004.
2. William et al. "Foye's Principles of Medicinal Chemistry", 6th edition, Lippincott-Williams & Wilkins, Philadelphia, 2008.
3. D. J. Abraham Ed.: "Burger's Medicinal Chemistry & drug Discovery", 6th edition, Vol 1 to 6, John Willey & Sons, Inc., 2007.
4. R. T. Morrison and R. Boyd: "Organic Chemistry", 6th edition (5th Indian edition), Pearsons Education, Inc., 2004.
5. Indian Pharmacopoeia 1985 and 1996. The Controller of Publications, Civil Lines, Delhi - 54.
6. Current Index of Medical Specialities (CIMS) and MIMS India, MIMS, A.E. Morgan Publications (I) Pvt. Ltd, New Delhi-19.

PURPH 204: PHYSICAL PHARMACY – I
3 hrs/week

UNIT - I

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

UNIT – II

Thermodynamics: First, second and third laws, Zeroth law, absolute temperature scale, thermochemical equations, phase equilibria and phase rule.

UNIT - III

Solutions : Ideal and real solutions, Henry's law, solution of gases in liquids, colligative properties, Colligative properties and determination of molecular weight, partition coefficient, Arrhenius theory of electrolytic dissociation, conductance and its measurement. Van't Hoff Theory of Solution, Degree of dissociation,Ionic strength and Debye Huckel theory.

pH, Buffers and Isotonic solution: Sorensen's pH scale, Determination of pH, Application, Common ion effect, pH indicators, Buffer equations and buffer capacity, Buffer action – Mechanism, Buffers in pharmaceutical systems, preparation, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.

UNIT -IV

Surface and Interfacial Phenomenon : Liquid interface, surface and interfacial tensions, surface free energy, measurement of surface and interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, Critical Micelle Concentration, Influence of CMC on the physical properties of surfactant solution, Factors effecting CMC, HLB classification, solubilization, detergency, adsorption at solid interfaces, solid-gas and solid-liquid interfaces, complex films, electrical properties.

Adsorption: Freudlich and Gibbs adsorption isotherms, Langmuir theory of adsorption, BET equation.

UNIT - V

Solubility & Distribution Phenomena: Solubility expression, Solvent- solute interactions, Solubility of gases in liquid, Factors effecting the solubility of gases in liquid, Solubility of liquid in liquid, ideal & real solutions, Ternary systems, Solubility of solids in liquids, Ideal & Non-Ideal solutions, Factors effecting, Nernst's distribution law, its application, Measurement of Partition-Coefficient, Effect of molecular association and ionic association on partition Co-efficient, Application of distribution co-efficient

Books recommended

1. Patrick J. Sinko Ed.: "Martin's Physical Pharmacy and Pharmaceutical Sciences", 5th edition, Lippincott Williams & Wilkins, 2009.
2. E. Shotton: "Physical Pharmaceutics", 1st Indian edition, Oxford University press, London, 2008.
3. CVS Subrahmanyam: "Essentials of Physical Pharmacy", 1st edition (3rd reprint), Vallabh Prakashan, 2007.
4. D. V. Derle: "Essentials of Physical Pharmacy", 1st edition (2nd reprint), PharmaMed Press, 2009.
5. S. P. Agarwal and Rajesh Khanna: "Physical Pharmacy", 1st edition, CBS Publishers & Distributors, 2006.
6. CVS Subrahmanyam: "Text Book of Physical Pharmaceutics", 2nd edition, Vallabh Prakashan, 2008.

PURPH 205: MEDICINAL BIOCHEMISTRY
3 hrs. /week

UNIT - I

Introduction to biochemistry: Cell and its biochemical organization, transport process across the cell membranes. Energy rich compounds; ATP, Cyclic AMP and their biological significance.

Enzymes: Definition; Nomenclature; IUB classification; Factor affecting enzyme activity; Enzyme action; enzyme inhibition. Isoenzymes and their therapeutic and diagnostic applications; Coenzymes and their biochemical role and deficiency diseases.

UNIT - II

Carbohydrate metabolism: Glycolysis, Citric acid cycle (TCA cycle), HMP shunt, Glycogenolysis, gluconeogenesis, glycogenesis. Metabolic disorders of carbohydrate metabolism (diabetes mellitus and glycogen storage diseases); Glucose, Galactose tolerance test and their significance; hormonal regulation of carbohydrate metabolism.

Lipid metabolism: Oxidation of saturated (β-oxidation); Ketogenesis and ketolysis; biosynthesis of fatty acids, lipids; metabolism of cholesterol; Hormonal regulation of lipid metabolism. Defective metabolism of lipids (Atheroslerosis, fatty liver, hypercholesterolemia).

Biological oxidation: Coenzyme system involved in Biological oxidation. Electron transport chain (its mechanism in energy capture; regulation and inhibition); Uncouplers of ETC; Oxidative phosphorylation;

UNIT - III

Protein and amino acid metabolism: protein turn over; nitrogen balance; Catabolism of Amino acids (Transamination, deamination & decarboxylation). Urea cycle and its metabolic disorders; production of bile pigments; hyperbilirubinemia, porphoria, jaundice. Metabolic disorder of Amino acids.

Nucleic acid metabolism: Metabolism of purine and pyrimidine nucleotides; Protein synthesis; Genetic code; inhibition of protein synthesis; mutation and repair mechanism; DNA replication (semiconservative /onion peel models) and DNA repair mechanism.

UNIT - IV

Introduction to clinical chemistry: Cell; composition; malfunction; Roll of the clinical chemistry laboratory.

The kidney function tests: Role of kidney; Laboratory tests for normal function includes-

a) Urine analysis (macroscopic and physical examination, quantitative and semiquantitative tests.)
b) Test for NPN constituents. (Creatinine /urea clearance, determination of blood and urine creatinine, urea and uric acid)
c) Urine concentration test
d) Urinary tract calculi. (stones)

Liver function tests: Physiological role of liver, metabolic, storage, excretory, protective, circulatory functions and function in blood coagulation.

a) Test for hepatic dysfunction-Bile pigments metabolism.
b) Test for hepatic function test- Serum bilirubin, urine bilirubin, and urine urobilinogen.
c) Dye tests of excretory function.
d) Tests based upon abnormalities of serum proteins.
e) Selected enzyme tests.

UNIT - V

Lipid profile tests: Lipoproteins, composition, functions. Determination of serum lipids, total cholesterol, HDL cholesterol, LDL cholesterol and triglycerides.

Immunochemical techniques for determination of hormone levels and protein levels in serum for endocrine diseases and infectious diseases.

Radio immuno assay (RIA) and Enzyme Linked Immuno Sorbent Assay (ELISA)

Electrolytes: Body water, compartments, water balance, and electrolyte distrubution. Determination of sodium, calcium potassium, chlorides, bicarbonates in the body fluids.

Books recommended

1. Harpers review of biochemistry - Martin
2. U. Satyanarayana and U Chakrapani: "Biochemistry", 3rd edition, Books and Allied (P) Ltd., 2008.
3. Text book of clinical chemistry- Alex kaplan &Laverve L.Szabo
4. Principles of biochemistry -- Lehninger
5. Text book of biochemistry -- Ramarao
6. Practical Biochemistry-David T.Plummer.
7. Practical Biochemistry-Pattabhiraman.

PURPH 206: CHEMICAL METHODS OF ANALYSIS
3 Hrs. /Week

UNIT - I

Balances- different types and weighing.

Calibration of analytical equipment used in volumetric analysis

Ionic equations of solutions, stoichometric and analytical problems, determination of normality, percentage purity, molarity, molality and their interconversions.

Computation of analytical results, significant numbers, rejection of doubtful values, Accuracy, Precision, sources of errors and their rectification.

Theoretical basis of quantitative analysis- electrolytic dissociation, Law of mass action and its applications, relative strength of acids and bases, hydrolysis of salts, buffer solutions, common-ion effect, solubility product

UNIT – II

Theoretical consideration and application in drug analysis and quality control of the following techniques

- Acid base titrations
- Oxidation-Reduction titrations
- Precipitation titrations

A study of the principles and method of analysis of the following compounds by different titrimetric methods

- Formaldehyde, Borax, Ammonium chloride (Acid-base)
- Ascorbic acid (with 2,6,DCPIP), Copper sulphate (Redox)
- Sodium chloride, Mercuric oxide (Precipitation)

UNIT - III

Theoretical consideration and application in drug analysis and quality control of the following techniques

- Complexometric titrations
- Non-aqueous titrations
- Gravimetry

A study of the principles and method of analysis of the following compounds by different titrimetric methods

- Magnesium sulphate, Dried Aluminium hydroxide (Complexometry)
- Bisacodyl, Ethosuximide (Non-aqueous)
- Thiamine as silico tungstate, Magnesium as Pyrophosphate (Gravimetry)

UNIT - IV

Miscellaneous methods of analysis- Sodium nitrite titrations, Principle of Kjeldahl method of nitrogen estimation, Determination of moisture content – Drying, Distillation, Karl-Fischer titration, Oxygen flask combustion, Gasometry (Principles of gas analysis), Radioimmunoassay assay

UNIT - V

- Potentiometry-Electric potential, electro chemical cell, reference electrodes, indicator electrodes, measurement of potential and PH, construction and working of electrodes, potentiometric titrations, method of deduction of end- point.
- Conductometry- Introduction, conductivity cell, conductometric titrations, applications.
- Polarography- Instrumentation,DME,residual current, diffusion current and limiting current,polarographic wave, Ilkovic's equation, effect of oxygen on polarographic wave,polarographic maxima and suppressors, applications.
- Amperometry-Introduction, types of electrodes used, reference and indicator electrode, instrumentation, titration procedure, advantages and disadvantages of amperometry over potentiometry, Pharma applications.

Books recommended

1. Mendham et al.: “Vogel’s Text book of Quantitative Analysis”, 6th edition, Pearsons Education Ltd., 2008.
2. A. H. Beckett & J. B. Stenlake: “Practical Pharmaceutical Chemistry”, 4th edition, Part-1, CBS Publishers, New Delhi, 2005.
3. Skoog,West et al.: “Fundamentals of Analytical Chemistry”, 8th edition, Thomson Buisness Information India Pvt. Ltd., 2006.
4. Ashutosh Kar: “Pharmaceutical Drug Analysis”, 2nd editon (Reprint), New Age International Publishers, 2005.
5. Gary.D.Christian: “Analytical Chemistry”, 6th edition, John Wiley & Sons, 2007.
6. “Indian Pharmacopoeia” Government of India, Ministry of Health & Family Welfare, the Indian Pharmacopoeia Commision, Ghaziabad, 2007.
7. Y.Anjaneyulu, K.Chandrasekhar et al ,” A text book of analytical chemistry ” Pharma book syndicate,2006.
8 K.A.Connors , “ A text book of pharmaceutical analysis ”3rd edition, John Wiley& Sons, 2007.
9 L.G.Chatten,”Pharmaceutical Chemistry-Theory and application” Volume 1,1st edition,CBS publishers and distributors

PURPH 207: COMMUNITY PHARMACY
3 hrs. /week

UNIT - I

Definition, scope, of community pharmacy. Roles and responsibilities of Community pharmacist

Community Pharmacy Management

a) Selection of site, Space layout, and design
b) Staff, Materials- coding, stocking
c) Legal requirements
d) Maintenance of various registers
e) Use of Computers: Business and health care soft wares

Prescriptions – parts of prescription, legality & identification of medication related problems like drug interactions.

UNIT - II

Inventory control in community pharmacy

Definition, various methods of Inventory Control
ABC, VED, EOQ, Lead time, safety stock

Pharmaceutical care

Definition and Principles of Pharmaceutical care.
Code of ethics for community pharmacists

UNIT - III

Patient counseling: Definition, outcomes, various stages, barriers, Strategies to overcome barriers, Patient information leaflets- content, design, & layouts, advisory labels

Patient medication adherence: Definition, Factors affecting medication adherence, role of pharmacist in improving the adherence.

UNIT - IV

Health screening services

Definition, importance, methods for screening
Blood pressure/ blood sugar/ lung function and Cholesterol testing

OTC Medication- Definition, OTC medication list & Counseling

UNIT – V

Health Education: WHO Definition of health, and health promotion, care for children, pregnant & breast feeding women, and geriatric patients.
Commonly occurring Communicable Diseases, causative agents, Clinical presentations and prevention of communicable diseases – Tuberculosis, Hepatitis, Typhoid, Amoebiasis, Malaria, Leprosy, Syphilis, Gonorrhea and AIDS
Balance diet, and treatment & prevention of deficiency disorders
Family planning – role of pharmacist

Responding to symptoms of minor ailments: Relevant pathophysiology, common drug therapy to,Pain, GI disturbances (Nausea, Vomiting, Dyspepsia, diarrhea, constipation), Pyrexia, Opthalmic symptoms, worms infestations.

Essential Drugs concept and Rational Drug Therapy. Role of community pharmacist

Books recommended

1. N.S.Parmar: "Health Education and Community Pharmacy", 1st edition, CBS Publishers & Distributors,2008.
2. K. Wiedenmayeret al.: Developing Pharmacy Practrce – A Focus On Patient Care", Handbook – 2006 edition, World Health Organization and International Pharmaceutical Federation, 2006. (www.whqlibdoc.who.int/hq/2006/WHO_PSM_PAR_2006.5_eng.pdf)
3. M. Ali & J. Gupta: "Drug Store & Business Management", 1st edition (Reprint), CBS Publishers & Distributors, 2008.
4. Parthasarathi et al. Ed.: "A Textbook of Clinical Practice – Essential Concepts and Skills", 1st edition (Reprint), Orient Longman Pvt. Ltd., 2007.
5. Leon Shargel et al. Ed.: "Comprehensive Pharmacy Review", 6th edition, Lippincott Williams & Wilkins, 2008.
6. Handbook of pharmacy – health care.Edt. Robin J Harman. The Pharmaceutical press.

Special requirements:

1. Either the college is having model community pharmacy (meeting the schedule N requirement) or sign MoU with at least 4-5 community pharmacies nearby to the college for training the students on dispensing and counselling activities.
2. Special equipments like B.P apparatus, Glucometer, Peak flow meter, and apparatus for cholesterol estimation.

Syllabus for Bachelor of Pharmacy (B. Pharm) 2nd Semester (Practical)

PURPH 211: PHARMACEUTICAL MICROBIOLOGY
3 hrs. /week

Biosafety Methods and Good Laboratory Practices.
Introduction to Microscopy
Preparation of different types of Media
Different inoculation techniques
Effect of physical and chemical agents on bacterial growth.
Study of Motility Characters by using hanging drop method
Methods of isolation of pure culture.
Enumeration of micro- organisms (Total and Viable).
Biochemical tests for identification of micro-organisms
Indole test b) Methyl red test c) Voges-Proskauer test d) Citrate Utilization test
Starch Hydrolysis test and f) Gelatin Liquefaction test.
Oligo-Dynamic action of Heavy metals.
Different Staining techniques – Simple staining, Grams staining, Negative staining and endospore staining.
Identification of Unknown bacteria from infected samples.
Microbiology of Milk and water.
Antibiotic Sensitivity testing.

Books recommended

1. Laboratory Manual in Microbiology – Cappuccino Sherman.
2. Laboratory Manual in General Microbiology: N. Kannan.
3. Laboratory Manual in Microbiology : P.gunasekaran

PURPH 212: PHARMACEUTICAL ORGANIC CHEMISTRY - II
3 hrs. /week

Systematic analysis of multifunctional organic compounds.(any five)
Binary mixture analysis (any five mixtures).
Preparation of organic compounds like:
- Methyl orange
- Picric acid
- m-dinitro benzene
- 2,4,6-tribromo aniline

Books recommended

1. Raj.K.Bansal; "Laboratory Manual of Organic Chemistry"; New Age International pvt. Ltd.
2. Mann and Saunders; "Practical Organic Chemistry"; Orient Longman pvt. Ltd.
3. Mendham.J; "Vogel's Textbook of Quantitative Chemical Analysis"; 6th edition; Pearson Education Publishers.
4. Vogel; "Qualitative Organic Analysis"; CBS Publishers.

PURPH 213: MEDICINAL BIOCHEMISTRY (PRACTICAL)
3 hrs. /week

Title of the Experiment:

1 Qualitative analysis of normal constituents of urine.*
2 Qualitative analysis of abnormal constituents of urine.*
3 Quantitative estimation of urine sugar by Benedict's reagent method.**
4 Quantitative estimation of urine chlorides by Volhard's method.**
5 Quantitative estimation of urine creatinine by Jaffe's method.**
6 Quantitative estimation of urine calcium by precipitation method.**
7 Quantitative estimation of serum cholesterol by Libermann Burchard's method.**
8 Preparation of Folin Wu filtrate from blood.*
9 Quantitative estimation of blood creatinine.**
10 Quantitative estimation of blood sugar Folin-Wu tube method.**
11 Estimation of SGOT in serum.**
12 Estimation of SGPT in serum.**
13 Estimation of Urea in Serum.**
14 Estimation of Proteins in Serum.**
15 Determination of serum bilirubin**
16 Determination of Glucose by means of Glucoseoxidase.**
17 Enzymatic hydrolysis of Glycogen/Starch by Amylases.**
18 Study of factors affecting Enzyme activity. (pH & Temp.)**
19 Preparation of standard buffer solutions and its pH measurements (any two)*
20 Experiment on lipid profile tests**
21 Determination of sodium,calcium and potassium in serum.**

** indicate major experiments & * indicate minor experiments

PURPH 214: PHYSICAL PHARMACY – I
3 hrs. /week

1) Determination of Dissociation Constant (pK_a)
2) Preparation and testing of Buffer Capacity
3) Determination of Specific gravity
4) Determination of Density
5) Determination of Bulk density of powder
6) To study the effect of salt (NaCl) in different concentration on the density of water at room temperature
7) Determination of Partition Co-efficient of Iodine between Carbon Tetrachloride and Distilled Water, effect of additives
8) Determination of Distribution Co-efficient involving Association
9) Determination of Spreading coefficient
10) Construction of Phase diagram of Phenol-Water system, effect of impurities
11) Construction of Ternary phase diagram
12) Determination of Surface and Interfacial Tension using Stalagometer
13) Measurement of CMC of a surfactant
14) Determination of Hydrophilic- Lipophilic number
15) Determination of Kraft point and Cloud point
16) Effect of co-solvent on Solubility
17) Effect of temperature on solubility of solid in liquid
18) Determination of Freundlich Adsorption Isotherm constant
19) Determination of Molecular Weight of a substance by Rast- Camphor method
20) Determination of Molecular Weight of a volatile substance by Victor- Mayer method

PURPH 215: CHEMICAL METHODS OF ANALYSIS
3 hrs. /week

1. Calibration of analytical weights
2. Acid-base titrations
   - Standardization of HCl, H_2SO_4, NaOH
   - Assay of Sodium bicarbonate
   - Assay of Boric acid
   - Assay of Borax
   - Assay of Aspirin
   - Assay of Zinc oxide
3. Redox titrations
   - Standardization of $KMnO_4$, Iodine
   - Assay of Ferrous sulphate
   - Assay of Sodium nitrite
   - Assay of Analgin tablets
   - Assay of Sodium meta bisulphite
4. Precipitation titrations
   - Standardization of Silver nitrate
   - Assay of Potassium chloride
   - Assay of Ammonium thiocynate
5. Complexometric titrations
   - Standardization of EDTA
   - Determination of hardness of water
   - Assay of Calcium gluconate injection

6. Non-Aqueous titrations
    - Standardization of Perchloric acid
    - Assay of Thiamine hydrochloride
    - Assay of Metronidazole
7. Gravimetry
    - Determination of Sulphate as Barium sulphate
    - Determination of Chloride as Silver chloride
8. Determination of water content by Karl Fischer electrometric titration method
9. Potentiometric analysis
    - Determination of pH of two solutions
    - Titration of a strong acid against a strong base
    - Titration of a strong base against a weak acid
    - Potentiometric assay of any two formulations from IP
10. Conductometric determination of equivalent point of titration of HCl with NaOH

Books recommended

1. K.A.Connors , " A text book of pharmaceutical analysis "3rd edition, John Wiley& Sons, 2007
2. Mendham et al.: "Vogel's Text book of Quantitative Analysis", 6th edition, Pearsons Education Ltd., 2008
3. Ashutosh Kar: "Pharmaceutical Drug Analysis", 2nd editon (Reprint), New Age International Publishers, 2005.
4. A. H. Beckett & J. B. Stenlake: "Practical Pharmaceutical Chemistry", 4th edition, Part-1, CBS Publishers, New Delhi, 2005
5. Gary.D.Christian: "Analytical Chemistry", 6th edition, John Wiley & Sons, 2007.
6. "Indian Pharmacopoeia" Government of India, Ministry of Health & Family Welfare, the Indian Pharmacopoeia Commision, Ghaziabad, 2007

Syllabus for Bachelor of Pharmacy (B. Pharm) 3rd Semester (Theory)

PURPH 301: DISINFECTION, STERILIZATION & IMMUNOLOGY
3 hrs. /week

UNIT - I

Sterilization: Detailed study of different methods of sterilization including merits and demerits.

1) Different Sterilization methods for all Pharmaceutical products
2) Sterility testing of different Pharmaceutical products and brief information on Validation
3) Concept of asepsis and maintenance of aseptic conditions.

UNIT - II

Disinfection: Study of disinfectants, antiseptics, fungicidal, virucidal agents

1) Factors affecting their activation & mechanism of action
2) Dynamics and Evaluation of disinfectants
3) Evaluation of Preservatives in Pharmaceutical preparations

UNIT - III

Immunology: Immunity, definition, classification, general Principles of Natural Immunity

1) Phagocytosis, acquired immunity(active and passive)
2) Antigens and its chemical nature
3) Structure and formation of antibodies
4) Antigen-Antibody reactions and hypersensitive reactions
5) Bacterial exotoxins and endotoxins
6) Significance of toxoids in active immunity
7) Immunization programme and importance of booster dose

UNIT - IV

Diagnostic tests: Shicks test, Elisa test, western blot test, southern blot test, PCR Widal test, QBC, Mantaux Peripheral Smear test and study of Malarial Parasite.

UNIT - V

Immunotechnological Techniques: Introduction to Auto immune disease

1) Role of lymphokines and cytokines
2) Hybridoma technology
3) Bone marrow transplantation
4) Separation and identification of Protein or Antigen

Books recommended

1. Ananthanaryanan and J. Paniker: "Text Book of Microbiology" 8th edition, Orient Longman, 2009.
2. Pelczar et al.: "Microbiology", 5th edition, Tata Mc Graw Hill Publishing Company Ltd., 2007.
3. Medical Immunology by Tristram
4. Immunology clinical Laboratory Manual Series BY Juanita Smith
5. Indian Pharmacopoeia, Govt. of India, 1996, 2007
6. A Bentley's text book of Pharmaceutics, Rawlins E.A.
7. A text book of Microbiology, Prescott L.M.
8. Disinfection,Sterilisation and Preservation, Seymour S Block
9. Clinical Aspects of Immunology , Lacman
10. Immunology and Immunotechnology, Ashim K.Chakravarty

PURPH 302: COMPUTER APPLICATIONS & PROGRAMMING
3 hrs. /week

UNIT - I

Introduction: Characteristics and Evolution of Computers, The Computer Generations.
Basic Computer Organization: Input Unit, Output Unit, Storage Unit, Arithmetic Logic Unit, Control Unit, Central Processing Unit, The System Concept- Secondary Storage Devices

Learning the Internet – What is Internet?– Scope of Internet – Surfing the Net – Creating Icon of ISP on Desktop – Connecting to the Internet – Sending, Receiving, Replying, Closing Emails using Outlook Express - Browsing the WWW – Opening an Email account – Email with Attachment – Sending, Viewing– Internet Relay Chat – Instant Messenger – Downloading from the Internet – Online shopping – Steps for Online Shopping – Wireless Internet
Computer Virus – Antivirus Software –General Virus Types – Practice Safe Computing to Avoid Virus Attack – Disconnecting from the Internet – Other Internet Connection Services – List of Popular Websites – Conclusion – Demonstration of sites of pharmaceutical interest such as http.//www.fda.goweder, http://www.phyarmpro.com, http://www.pharmacy.org etc

UNIT – II

Variables and Expressions: Introduction – Character Set – Identifiers and Keywords – Variables – Displaying Variables – Characters and Character Strings – Qualifiers – Types of Statement – Promotion and Typecasting – Value initialized Variables – Constants – Const Qualifier – Operators and Expressions – Operators and Precedence and Associativity – Programming Examples .

Basic Input-Output: Introduction – Single Character Input –output – String Input and Output- General Output – General Input – Types of Characters in Format Strings – scanf Width Specifier – Search Sets – The Assignments Suppressions Characters – Format Specifies for scanf – Input fields for Scanf – When Scanf Stops Scanning.

UNIT – III

Control Structures: Introduction – if Statement – if-else Statement – Multi –way Decisions – Compound Statements – Loops – for Loop – while Loop – do-while Loop – break Statement – switch Statement – continue Statement – go to Statement – Programming Examples

Arrays and Strings: Introduction – How Arrays are Useful – Multidimensional Arrays – Strings – Arrays of Strings – Functions in String h – programming Examples.

UNIT – IV

Functions: Introduction – Function Main – Where are Functions Useful? – Functions Accepting More Than One Parameter – User Defined and Library Functions – Concepts Associated With Functions – Function Parameters – Return Values – Recursion – Comparison of Iteration and Recursion – Variable length Argument Lists – Programming Examples.

UNIT – V

Pointers: Introduction- Definition and use of pointers- Address Operator- Pointer variables- Memory Models in DOS- Pointers to Pointers- Pointers and Arrays- Passing arrays to functions- pointers and functions- Accessing arrays inside functions.

Books recommended

1. Computer Fundamentals; Pradeep .K.Sinha : BPB Publications 4th Edition
2. Programming with C; K R Venugopal, Sudeep R Prasad, Sixteenth reprint 2004
3. Computer Fundamentals; Rajaraman V.
4. Introduction To Computers; Peter Norton
5. Programming in C; E. Balaguruswamy

PURPH 303: PHYSICAL PHARMACY – II
3 hrs. /week

UNIT – I

Kinetics: Rate and order of a reaction, mathematical concept of zero order, first order, and seudo-first order reactions; determination of order; half-life, shelf-life and their usefulness; factors ffecting rate of reactions; decomposition & stabilization of medicinal agents; accelerated stability analysis; application of chemical kinetics; simple numerical problems.

UNIT - II

Rheology: Newtonian & non-Newtonian systems; thixotropy & measurement of thixotropy; rheopexy, viscoelasticity, psychorheology; determinatrion of rheological properties; application to pharmacy.

Micromeretics & powder rheology

Particle size & size distribution; methods of determining particle size; particle shape & surface area, method of determining surface area; derived properties of powders: porosity, density, compressibility, bulkiness; flow properties of powders; simple numerical problems; importance of particle size & size distribution in pharmacy.

UNIT - III

Diffusion and dissolution: Introduction; types of diffusion, laws of diffusion, concept of steady state, diffusion study, pH partition hypothesis in drug diffusion; dissolution studies, dissolution testing, official apparatus used for dissolution testing, drug release from polymer matrix & granular polymer ,matrix, Hixon-Crowell cube root law, factors effecting dissolution.

Colloids

Definitions, classification of dispersion systems, types of colloidal system, method of preparation of colloids, purification of colloids, properties of colloids (optical, kinetic, electrical), interaction of colloids, stability of colloidal system, Schultz-Hardy rule, Gold Number, DLVO theory, lyotropic series, Donnan membrane effect, pharmaceutical application of colloids.

UNIT - IV

Coarse Dispersions:

Suspension: Introduction, interfacial properties of suspended particles, flocculation & deflocculation in suspension, settling in suspension, sedimentation parameters, formulation of suspensions (wetting, controlled flocculation & controlled flocculation in structured vehicles), rheological considerations, preparation of suspension, physical stability of suspension, evaluation of suspension.

Emulsion: Definition, types of emulsion, identification of emulsion system, theories of emulsification, emulsifying agents & their mechanism of action, physical stability of emulsion, preservation of emulsions, micro emulsions, multiple emulsions, rheology of emulsion, pharmaceutical applications.

UNIT - V

Complexation and protein binding: Introduction, classification of complexes, metal ion complexes, organic molecular complexes, inclusion complexes, method of analysis of complexes, job's method of constant variation, pH titration method, distribution method, solubility method, spectroscopic method; protein binding & binding equilibrium, experimental methods for determining protein binding, factors effecting Complexation & protein binding, thermodynamic treatment of stability constant.

Books recommended

1. Patrick J. Sinko Ed.: "Martin's Physical Pharmacy and Pharmaceutical Sciences", 5th edition, Lippincott Williams & Wilkins, 2009.
2. E. Shotton: "Physical Pharmaceutics", 1st Indian edition, Oxford University press, London, 2008.
3. CVS Subrahmanyam: "Essentials of Physical Pharmacy", 1st edition (3rd reprint), Vallabh Prakashan, 2007.
4. D. V. Derle: "Essentials of Physical Pharmacy", 1st edition (2nd reprint), PharmaMed Press, 2009.
5. S. P. Agarwal and Rajesh Khanna: "Physical Pharmacy", 1st edition, CBS Publishers & Distributors, 2006.
6. CVS Subrahmanyam: "Text Book of Physical Pharmaceutics", 2nd edition, Vallabh Prakashan, 2008.

PURPH 304: MEDICINAL CHEMISTRY – I

3 hrs. /week

UNIT - I

a. History and development of medicinal chemistry, definition and fundamental principles of drug therapy.
b. Effects of the following physicochemical properties of drug molecules on biological activity: solubility, partition coefficient, hydrogen bonding, protein binding, chelation, geometrical and optical isomers, ionization and surface activity.
c. General principles of drug action and drug receptor interactions.
d. Drug metabolism: General pathways of drug metabolism, sites of drug biotransformation, oxidative biotransformation, oxidative, reductive, hydrolytic and conjugative reactions. Factors affecting drug metabolism.

A study of the development of the following classes of drugs including SAR, classification, mechanism of action and synthesis of important compounds in unit II to V.

UNIT - II

a. General anaesthetics- inhalation anaesthetics, ultra short acting barbiturates, dissociative anaesthetics.
b. Anxiolytics, sedative and hypnotic agents- barbiturates, benzodiazepines, amides and imides, alcohols and their carbamate derivatives, aldehydes and their derivatives.
c. Centrally acting skeletal muscle relaxants, drugs used in spasticity.
d. Antipsychotics- phenothiazines, thioxanthenes, butyrophenones, dibenzazepines, Dihydroindolenes,diphenylbutylpiperidines, benzamides, benzoquinolizines.
e. Anticonvulsants- barbiturates, hydantoins, oxazolidine diones, succinimides, urea and monoacyl ureas, benzodiazepines and miscellaneous agents.

UNIT - III

a. Analeptics
b. Antidepressants- MAO inhibitors, tricyclic antidepressants.
c. Adrenergic neurotransmitters: function, structure, physicochemical properties, biosynthesis and metabolism of noradrenaline.
d. Adrenergic receptors: alpha and beta adrenergic receptors, their distribution in the human body.
e. Sympathomimetic agents-direct acting agents, indirect acting agents, alpha adrenergic receptor agonists, beta adrenergic receptor agonists, aliphatic amines, imidazoline derivatives.
f. Adrenergic blocking agents-neuronal blocking agents (alpha adrenergic blocking agents), beta haloalkyl amines, imidazolines, beta adrenergic blocking agents.

UNIT - IV

a. Cholinergic agents:
   Cholinergic neurotransmitter: function, structure, physicochemical properties, biosynthesis and metabolism of acetyl choline.
   Cholinergic receptors: muscarinic and nicotinic receptors, their distribution in the human body.
b. Indirectly acting cholinergic agonists: cholinestrase inhibitors, irreversible inhibitors.
c. Cholinergic blocking agents: parasympathetic post ganglionic blocking agents, synthetic cholinergic blocking agents, neuromuscular blocking agents

UNIT - V

a. Local anaesthetics: historical development, mechanism of action of local anaesthetics. Benzoic acid derivatives, amino benzoic acid derivatives, lidocaine derivatives (anilides), miscellaneous agents.
b. Diagnostic agents, Radio opaque substances.

Books recommended

1. J. H. Block and J. M. Beale: "Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry", 11th edition, Lippincott-Williams & Wilkins, Philadelphia, 2004.
2. William et al. "Foye's Principles of Medicinal Chemistry", 6th edition, Lippincott-Williams & Wilkins, Philadelphia, 2008.
3. D. J. Abraham Ed.: "Burger's Medicinal Chemistry & drug Discovery", 6th edition, Vol 1 to 6, John Willey & Sons, Inc., 2007.
4. Surendra N. Pandeya: "A Text Book of Medicinal Chemistry" Vol. I and II, S.G. Publisher, Varanasi.
5. Indian Pharmacopoeia 1985 and 1996. The Controller of Publications, Civil Lines, Delhi - 54.
6. Current Index of Medical Specialities (CIMS) and MIMS India, MIMS, A.E. Morgan Publications (I) Pvt. Ltd, New Delhi-19.
7. H. J. Roth and A. Kleemann: "Pharmaceutical Chemistry Drug Synthesis", Vol. I and II
8. Remington: "The Science and Practice of Pharmacy", Vol. 1 and 2, MACK Publishing Company, Easton, Pennsylvania.

PURPH 305: PHARMACOLOGY-I
3 hrs. /week

UNIT - I

General Pharmacology

a) Introduction, definition and scope of Pharmacology
b) Routes of administration of drugs
c) Pharmacokinetics (Absorption, Distribution, Metabolism and Elimination)
d) Pharmacodynamics-receptor and nonreceptor mediated mechanism of drug, receptor drug interactions and adverse drug reactions
e) Factors modifying drug effects

UNIT - II

Pharmacology of Drugs acting on CNS

a) Alcohol
b) General anaesthetics
c) Sedatives and hypnotics
d) Anticonvulsants

Local anaesthetics

UNIT - III

Pharmacology of Drugs acting on CNS

a) Analgesics and anti-inflammatory agents
b) Opioid analgesic and antagonists
c) Neurotransmitters in CNS
d) CNS stimulants and Analeptics

UNIT - IV

Psychopharmacological Agents

a) Neuroleptics
b) Antidepressants
c) Anxiolytics
d) Hallucinogens
e) Habit forming drugs and drugs of addiction

UNIT - V

Pharmacology of Drugs acting on ANS

a) Adrenergic and anti adrenergic drugs
b) Cholinergic and anti cholinergic drugs
c) Ganglionic blockers
d) Drugs used in myasthenia gravis
e) Drugs used in parkinsonism

Books recommended

1. K. D. Tripathi: "Essentials of Medical Pharmacology", 4th edition, Jaypee Publication, Delhi, 1999.
2. R. S. Satoskar & S. D. Bhadarkar: "Pharmacology and Pharmacotherapeutics", 20st edition (single volume), Popular Publication, Dubai, 2009.
3. H. P. Rang & M. M. Dale, "Pharmacology" 4th edition, Churchill Livingstone, 1999.
4. T. W. A. Rall, A. I. S. Nies & P. Taylor "Goodman and Gilman's The pharmacological Basis of Therapeutics" 9th Edn, Mc Graw Hill, Pergamon Press, 1996.
5. B. G. Katzung: "Basic and Clinical Pharmacology" 9th edition. Prentice Hall, Int., 2004.
6. Shargel and Leon: "Applied Biopharmaceutics and Pharmacokinetics", 6th edition, Prentice Hall, London2008.
7. Richard A.Harvey "pharmacology" 4th edition ,Wolters Kluwer (India) Pvt.Ltd.,New Delhi,2006
8. David E.Golan "principals of pharmacology" lippincott Williams & wilkins ,USA,2005.

PURPH 306: PHARMACEUTICAL ENGINEERING - I
3 hrs. /week

UNIT - I

Stoichiometry: Introduction, Basic Laws, Unit operation processes, Material & Energy balance, Molecular Unit, Mole Fraction, Gas law, Mole Volume, Primary & secondary Quantities, Equilibrium State, Rate Process, Steady & unsteady State, Dimensionless equation, Dimensionless Formula, Dimensionless group, Units & their Conversion, Different type of Graphic Representation, Mathematical Problems

Fluid Flow:

Fluid Statics - Hydrostatic Pressure, Definition of head, Manometers

Fluid Dynamics - Types of Flow, Mechanism of Fluid Flow, Reynolds's experiment, Viscosity, Concept of boundary layer, Basic equation of fluid flow, Bernoulli's Theorem & its Application, Flow meters- Orifice meter, Venturi Meter, Pitot Tube, Rotameter

Valves, Measurement of flow & pressure, Energy losses in flowing fluids in pipes, Solution to simple numerical problems

UNIT - II

Material Handling System

Liquid Handling - Pipe Fittings & Valves, Pumping Equipments, Reciprocating Pump, Diaphragm Pump, Centrifugal Pump, Rotary Pump

Gas Handling - Various types of fans, Blowers & compressors, Air lift pump, Screw pump, Mono pump, Peristaltic Pump

Solid Handling - Construction & working of Belt conveyer, Screw conveyer, Pneumatic conveyer, Cycloidal conveyer, Chain conveyer, Bins, Bunkers

Heat Transfer: Introduction, Sources of Heat, Steam & Electricity as heating media, Mechanism of heat transfer, Conduction, Fourier's law & its application, Conduction through flat wall, cylindrical surfaces & compound resistances, Forced & Natural convection, Overall surface co-efficient, Heat transfer through condensing vapors, Drop-wise & film type condensation, Boiling liquids, Heat exchangers- parallel & counter current flow, Heat interchangers, Heat conservation & Insulation, Radiation, Stepan-Boltzmann's equation, Kirchhoff's law, Physical nature of surfaces, Mathematical problems on heat transfer.

UNIT - III

Evaporation: General principle, Basic concept of phase equilibrium, Factors effecting evaporation, Methods of supply of heat, Evaporators: Jacketed evaporator, Film evaporator, forced circulation evaporator, Multiple effect evaporator- Principle, Capacity, Economy, Evaporator accessories---wet & dry condenser, vacuum pump gauze, steam trap, entrainment, Mathematical problem.

Distillation: Theory applied to binary mixture, Raoult' law, Boiling point & Phase diagram, Volatility, Constant boiling mixture, Simple steam & flash distillation, Principle of rectification, Calculation of number of theoretical plates (Mc Cabe Thiel method), Azeotropic & extractive Distillation, Molecular distillation & its application, Equilibrium distillation, Differential distillation, Mathematical problems.

UNIT - IV

Filtration & Centrifugation: Theory of centrifugation & Kozeny's equation, Filter aid & filter media, Classification of industrial filters, Construction & working of Filter press, Rotary filter, Edge filter, Meta filter, Filter leaf, Candle filter, Sterile filtration of liquids, Air filters, Effect of pressure & temp on rate of filtration, Compressibility of filter cake, Optimum cleaning cycle in batch filters, Mathematical problems, Theory & principle of Centrifugation, Classification of Industrial centrifuges, Basket, Tubular bowl, conical disc, Semi continuous & continuous horizontal centrifuge, Centrifugal sediments

UNIT - V

Material of Plant Construction: General study of composition, Consideration of mechanical property, Iron, Stainless Steel, glass, aluminum, Rubber & Plastics as construction material, Properties & application of materials of construction with special reference to Stainless Steel & Glass, Factors effecting choice, Materials of pharmaceutical packaging

Corrosion: Classification & mechanism of corrosion, Factors, prevention & control

Industrial Establishment & Hazard: Layout, Location, services, Mechanical, Chemical, Electrical, Fire & Dusty hazards, Safety requirements, Industrial Dermatitis, Accidental records

Books Recommended :

1. Badger & Banchero: "Introduction to Chemical Engineering," 5th Reprint, McGraw, 1997
2. Sambamurthy: "Pharmaceutical Engineering," New Age Int. Pvt. Ltd., 1998.
3. CVS Subrahmanyam: "Pharmaceutical Engineering- Principles & Applications, 1st edition, Vallabh Prakashan, , 2007
4. Carter, Ed.: "Cooper & Gunn's Tutorial Pharmacy," 6th edition., CBS Publishers, 1972.

PURPH 307: PRINCIPLES OF MANAGEMENT
3 hrs. /week

UNIT– I

Introduction to Management- Management Thought – Functions and Principles of Management; Corporate social responsibility.

UNIT- II

Planning- Planning Premises, Types and Steps in Planning - Decision making and forecasting, Steps in Decision making - Management by objectives (MBO) and Decision Tree Analysis.

UNIT- III

Organizing- Structure, Types of Organisations, Principles of Organising, Delegation, and Decentralisation of Authority - Line and Staff functions.

UNIT- IV

Leading- Leadership, Styles of leadership, Theories of Leadership - Blake and Mouton's Managerial Grid - Motivation, Process, Maslow's, McGregor and Hertzberg Theories of Motivation.

UNIT- V

Controlling- Importance, Process of Controlling - Making controlling effective – Techniques of Controlling.

Case Study

Books recommended:

1. Harold Koontz & Heinz Weirich: "Management, a Global and Entrepreneurial Perspective", Tata McGraw -Hill Publishing Company, New Delhi, 2008.
2. N. Balasubrahmanian: "Management Perspectives", Mac Millan India Ltd., New Delhi, 2007.
3. Burton Gene & Thakur Manab, "Management Today – Principles and Practice", TMH, New Delhi, 2004.
4. Charles Hill & Steven McShane: "Principles of Management", TMH, New Delhi 2008.
5. McShane Hill, "Principles of Management", TMH, New Delhi 2007.
6. Luis Gomez Mejia, David B Balkin, Boulder, Robert Cardy: "Management", TMH, New Delhi 2008
7. Sherlakar: "Principles and Practice of Management", Himalaya Publishing House Ltd., New Delhi, 2007.
8. Stoner, Freeman and Gilbert: "Management", Princtice Hall of India Pvt.Ltd, New Delhi, 2007
9. Terry and Franklin, "Principles of Management", AITBS Publishers, New Delhi, 2007.
10. Thomas S Bateman, Scott A Snell: "Management", TMH, New Delhi, 2008.
11. Tim Hannagan: "Management Concepts and Practices", Mac Millan India Ltd., New Delhi, 2007.

Syllabus for Bachelor of Pharmacy (B. Pharm) 3rd Semester (Practical)

PURPH 311: STERILIZATION, DISINFECTION AND IMMUNOLOGY
3 hrs. /week

1) Introduction to autoclaving and Laminar air flow techniques
2) Sterilization by autoclaving and test for sterility
3) Sterilization by dry heat and test for its sterility
4) Sterilisation by radiation and test for its sterility
5) Sterilization by filtration and test for its sterility
6) Test for sterlity I.P.1996 for Pharmaceutical Powders
7) Test for sterlity I.P.1996 for Pharmaceutical Liquids
8) Test for sterlity I.P.1996 for Parentrals

9) Phenol coefficient test
10) Evaluation of Disinfectants
11) Minimum Inhibitory Concentration of Phenol
12) Microbiological assay of Antimicrobial agents and construction of standard curve
13) Immobilization Techniques of enzymes
14) Microbiological assay by turbidiometric assay
15) Estimation of Bacterial D.N.A by Spectrophotometer

Books recommended

1) Microbiology : A Laboratory Manual , Cappuccino Sherman
2) Dr T.Sundar Raj: "Microbiology Laboratory Manual", University of Madras
3) N.Kannan: "Laboratory Manual in Microbiology" ,
4) K.R.Aneja: "Experiments in Microbiology, Plant Pathology and Biotechnology",

PURPH 312: COMPUTER APPLICATIONS & PROGRAMMING
3 Hrs./Week

1. E-mail, creating of account, drafting, sending, attachments.
2. Information retrieval from pharmaceutical web sites
3. Study of simple C programmes as follows:

- Addition, Subtraction, Multiplication of 2 Nos.
- Find the given Number is even or odd.
- Read a student name and Print it.
- Get a character and display the same using getchar ( ) and putchar ( )
- Printing the reverse of an integer
- Printing the odd and even series of N numbers
- Get a string and convert the lowercase to uppercase and vice-versa using getchar ( ) and Putchar ( )
- Finding the occurrence of a particular character in a string
- Accept N words and make it as a sentence by inserting blank spaces and a full stop at the end
- Finding the first N terms of Fibonacci sequence
- Printing and Multiplication tables of 2 matrices
- Converting a hexadecimal number into its binary equivalent.
- Sum of all elements in an array
- Find the trace of a given matrix
- Find the sqrt of a numbers using functions
- Perform the addition of 2 matrices using functions
- Write a program to swap two numbers using pointers
- Write a program to find out the smallest number in the array using pointers

PURPH 313: PHYSICAL PHARMACY – II
3 hrs. /week

1. To determine the particle size and size distribution of powder by sieving method
2. To determine the particle size and size distribution in disperse medium by microscopic method
3. To determine the globule size of emulsion by microscopic method
4. To determine the true density of given powder by:
   i. Solvent displacement method
   ii. Compression powder method
5. Determination of bulk density of given powder
6. Determination of granule density of given sample

7. Determinations of porosity, intra-patricle porosity, interspaces and void porosity and total porosity of powder
8. Determination of specific surface area
9. Determination of flow properties of powder by angle of repose
10. Determination of flow properties of powder by Carr's Index
11. Effect of glidant on flow properties of powder
12. Determination of compressibility index of powder
13. Determination of viscosity of liquid using Ostwald viscometer
14. To study the effect of temperature on viscosity
15. To study the effect of concentration on viscosity
16. To study the effect of impurities on viscosity
17. To study the effect of mono-valent, di-valent, tri-valent ions on magnesium chloride sol
18. To study the protective action of hydrophilic colloid on the precipitation of a hydrophobic colloid
19. Determination of optimum ratio for precipitation
20. Physical stability of suspension
21. Physical stability of emulsion
22. Determination of wet-point & flow point of an indiffusible solid (medicaments)
23. Determination of rate constant
24. Accelerated stability testing

PURPH 314: MEDICINAL CHEMISTRY- I

3 hrs. /week

A. Assay of medicinally useful compounds
   1. Ibuprofen by alkalimetry.
   2. Diclofenac by alkalimetry.
   3. Analgin by iodimetry
   4. Lidocaine HCl by nonaqueous titrimetry
   5. Metronidazole by nonaqueous titrimetry

B. Preparation of medicinally useful compounds
   1. Benzimidazole from O-phenyline diamine
   2. Benzotriazole from O-phenyline diamine
   3. PAS from p-nitro salicylic acid
   4. Chlorbutol
   5. Benzil from benzoin
   6. Phenytoin from benzil
   7. Benzocaine from p-amino benzoic acid

C. Monograph analysis of important drugs.

Books recommended

1. Indian Pharmacopoeia 1985 and 1996. The Controller of Publications, Civil Lines, Delhi
2. Ashuthosh Kar: "Advanced Practical Medicinal Chemistry", New Age International Pvt. Ltd.
3. Anees Ahmed Siddiqui: "Experimental Pharmaceutical Chemistry", CBS Publishers

PURPH 315: PHARMACOLOGY - I

3 hrs. /week

LIST OF EXPERIMENTS

1) Study of laboratory animals and their handling
2) Study of physiological salt solutions used in experimental pharmacology
3) Study of laboratory appliances used in experimental pharmacology
4) Drug action on the eye of the rabbit-miotics and mydriatics
5) Dose response curve (DRC)with acetylcholine on frog rectus abdominis muscle preparation
6) To study the effects of the drugs on intestinal motility using frog's esophagus model
7) Potentiation of acetylcholine response by Eserine on frog rectus abdominis muscle preparation
8) Inhibition of acetylcholine response by Curare/Procaine/Quinidine/ Pethidine on frog rectus abdominis muscle preparation
9) Study of use of Anaesthetics in Laboratory Animals
10) Study of routes of administration of drugs in animals.
    Study of principle, procedure involved and interpretation of results for the following experiments
11) Analgesic property of the drug using Anlgesiometer
12) Anti-inflammatory effect of drugs using Rat –paw oedema method
13) Anticonvulsant property of the drugs using maximal electro shock and Pentylene tetrazole methods
14) Antidepressant activity of the drugs using pole climbing apparatus and Phenobarbitone induced sleeping time method
15) Locomotor activity evaluation of the drugs using Actophotometer and Rotorod

Books recommended

1. S. K. Kulkarni, and P. C. Dandia: "Hand Book of Experimental Pharmacology", Latest edition, Vallabh Prakashan, Delhi.
2. L.J. Macleod: "Pharmacological Experiments on Intact Preparations", Latest edition, Churchill livingstone.

Syllabus for Bachelor of Pharmacy (B. Pharm) 4th Semester (Theory)

PURPH 401: PHARMACEUTICAL ENGINEERING - II
3 hrs. /week

UNIT - I

Drying: Moisture content and mechanism of drying, Factors effecting drying, Calculation of rate of drying and time of drying, EMC, CMC, LOD, Classification and types of dryers, dryers used in pharmaceutical industries and special drying methods, Construction & Working of Tray dryer, Drum dryer, Fluidized bed dryer, Spay dryer, Vacuum dryer, Freeze dryer and Mathematical problems.

Crystallization:

Characteristics of crystals like-purity, size, shape, geometry, habit, form size and factors affecting them, Solubility curves and calculation of yield, Material and heat balances around Swenson-Walker crystallizer, Super-saturation theory, nucleation mechanism, crystal growth, Study of various types of crystallizers - tank, agitated batch, Swenson – Walker, Vacuum crystallizer, Krystal crystallizer, Caking of crystal and its prevention, and Numerical problems on yield.

UNIT- II

Size Reduction: Definition, objectives of size reduction, factors affecting size reduction, Mechanism of size reduction, Choice of degree of size reduction (from the view point of extraction), Laws governing energy & power requirement of size reduction, Classification of size reduction equipments, operation and energy aspects of various types of crushing and grinding machinery used in pharmaceutical industry such as ball mill, hammer mill, Fluid energy mill, Edge Runner mill, End Runner mill, Selection of equipment, and Mathematical problems.

Size Separation: Screen, standard screen, different techniques of size separation, screen analysis, material balances, over all screen effectiveness, Types of screening equipments, selection of screening equipments, Classifiers - Laws of settling, sedimentation, principles of centrifugal sedimentation, centrifugal settling process, and Equipments used in solid-gas, solid-liquid and liquid-liquid systems.

UNIT- III

Mixing: Theory of mixing, Mechanism of Solid-solid, solid-liquid and liquid-liquid mixing, mixing devices-Propeller, Turbine, Paddles, Baffles, Vortex formation & prevention, mixing equipments from each class

Bioreactors:

Fundamentals of bioreactor design for pharmaceutical operation.

UNIT- IV

Dehumidification and Humidity Control: Basic concepts and definition, wet bulb and adiabatic saturation temperature, Psychrometric chart and measurement of humidity, application of humidity measurement in pharmacy, Mechanism of dehumidification, Equipments for dehumidification operation, and related mathematical problems.

Refrigeration and Air Conditioning: Principles, Mechanism and applications of –Refrigeration and Air conditioning.

UNIT- V

Mass Transfer: Absorption: Gases in liquid, Henry's law, gas - absorption equipments, Numerical problems.

Liquid-Liquid Extraction: Distribution law, principles of extraction, extraction equipments, selection of solvents for extraction, and Numerical problems.

Solid-liquid extraction: Principle, methods of extraction, equipments

Automated Process - Control System: Fundamentals of Automatic Process Control System, computer aided manufacturing (CAM)

Books Recommended :

1. MaCabe & Smith: "Unit Operations of Chemical Engineering," McGraw Hill, 1993.
2. Badger & Banchero: "Introduction to Chemical Engineering," 5th Reprint, McGraw Hill, 1997.
3. Sambamurthy: "Pharmaceutical Engineering," New Age Int. Pvt. Ltd., 1998.
4. Aulton, Ed.: "Pharmaceutics- The Science of Dosage Form Design," ELBS, 1990.
5. Carter, Ed.: "Cooper & Gunn's Tutorial Pharmacy," 6th ed., CBS Publishers, 1972.

PURPH 402: MEDICINAL CHEMISTRY – II

3 hrs. /week

UNIT- I

1. Analgesic agents: Structure and uses of morphine and related compounds. Synthetic derivatives of morphine, narcotic antagonists, antitussive agents.
2. Anti-inflammatory agents: Salicylic acid derivatives, N-aryl anthranilic acid derivatives, aryl acetic acid derivatives, aniline and p-amino phenol derivatives, propionic acid derivatives, pyrazolone and pyrazolidine derivatives.

UNIT- II

a. Anti-anginal agents and vasodilators.
b. Anti-arrhythmic drugs: membrane depressant drugs, beta adrenergic blocking agents, repolarization prolongators, calcium channel blockers.
c. Anti-hypertensive agents: beta blockers, ACE inhibitors, diuretics, calcium channel blockers, alpha1 antagonists, alpha2 agonists, miscellaneous agents.
d. Anti-hyperlipidemics.
e. Coagulants and anti-coagulants.

UNIT- III

a. Hypoglycemic agents: Biguanides, sulphonyl ureas, miscellaneous.
b. Thyroid hormones and antithyroid agents.
c. Steroidal hormones and adrenocorticoids.
d. Diuretics: Carbonic anhydrase inhibitors, thiazide and thiazide like diuretics, high ceiling or loop diuretics, potassium sparing diuretics, miscellaneous agents.

UNIT- IV

a. Histamine and anti-histaminic agents: amino alkyl ethers, ethylene diamines, propyl amine derivatives, phenothiazine derivatives, piperazine derivatives, miscellaneous agents.
b. Gastro-intestinal agents: antacids, antiulcer agents, appetizers, digestants, emetics, antidiarrhoeals and laxatives.

UNIT- V

Proteins, enzymes and peptide hormones: Protein hydrolysates, aminoacid solutions, protein and proteinlike compounds, enzymes, hormones and blood proteins. Commercial production of proteins, peptides and enzymes as pharmaceutical products.

Books recommended

1. J. H. Block and J. M. Beale: "Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry", 11th edition, Lippincott-Williams & Wilkins, Philadelphia, 2004.
2. William et al. "Foye's Principles of Medicinal Chemistry", 6th edition, Lippincott-Williams & Wilkins, Philadelphia, 2008.
3. J. Abraham Ed.: "Burger's Medicinal Chemistry & drug Discovery", 6th edition, Vol 1 to 6, John Willey & Sons, Inc., 2007.
4. Surendra N. Pandeya: "A Text Book of Medicinal Chemistry" Vol. I and II, S.G. Publisher, Varanasi.
5. Indian Pharmacopoeia 1985 and 1996. The Controller of Publications, Civil Lines, Delhi - 54.
6. Current Index of Medical Specialities (CIMS) and MIMS India, MIMS, A.E. Morgan Publications (I) Pvt. Ltd, New Delhi-19.

PURPH 403: PHARMACOLOGY – II
3 hours/ week

UNIT – I

Pharmacology of Drugs acting on renal system

a) Diuretics
b) Antidiuertics
c) Drugs useful in urinary tract infections

UNIT –II

Pharmacology of Drugs acting on CVS

a) Antihypertensive agents
b) Vasodilators
c) Antianginal agents
d) Antiarrhythmics
e) Cardiotonics
f) Antihyperlipedemic agents

UNIT –III

Pharmacology of Drugs acting on blood and blood forming organs

a) Coagulants and Anticoagulants
b) Thrombolytics and Anti platelet drugs
c) Plasma substitutes
d) Haemopoietics

Drugs acting on immune system

e) Immuno suppressants
f) Immuno stimulants

UNIT – IV

Pharmacology of Autacoids and their antagonists

a) histamines and antihistaminics
b) 5-Hydroxy Tryptamine and its antagonists
c) Lipid derived autacoids and platelet activating factor
d) Drugs used for the therapy of inflammation
e) Drugs used for the therapy of allergy

UNIT – V

Biological assays

a) Principles of biological assays
b) Fundamentals of biometric analysis
c) Detailed study of the official bioassay methods for Adrenaline, Posterior pituitary hormones, Insulin, Gonadotrophic hormones, Cholera vaccine, Diphtheria antitoxin
d) Test for pyrogens-LAL Test, Rabbit method

Books recommended

1. K. D. Tripathi: “Essentials of Medical Pharmacology”, 4th edition, Jaypee Publication, Delhi, 1999.
2. R. S. Satoskar & S. D. Bhadarkar: “Pharmacology and Pharmacotherapeutics”, 20st edition (single volume), Popular Publication, Dubai, 2009.
3. H. P. Rang & M. M. Dale, “Pharmacology” 4th edition, Churchill Livingstone, 1999.
4. T. W. A. Rall, A. I. S. Nies & P. Taylor “Goodman and Gilman’s The pharmacological Basis of Therapeutics” 9th Edn, Mc Graw Hill, Pergamon Press, 1996.
5. B. G. Katzung: “Basic and Clinical Pharmacology” 9th edition. Prentice Hall, Int., 2004.

6. Shargel and Leon: “Applied Biopharmaceutics and Pharmacokinetics”, 6th edition, Prentice Hall, London2008.
7. Richard A.Harvey “pharmacology” 4th edition ,Wolters Kluwer (India) Pvt.Ltd.,New Delhi,2006
8. David E.Golan “principals of pharmacology” lippincott Williams & wilkins ,USA,2005.

PURPH 404: PHARMACOGNOSY – II
3 hours/ week

UNIT- I

Introduction to Preliminary Phytochemical Screening of Natural Products, Preliminary Phytochemical tests for the detection of Carbohydrates, tannins, Glycosides, Steroids, terpenes, flavonoids, alkaloids, glycosides and Saponins.

Source, Chemical constituents, identification and economical importance of the following Resins: Benzoin, Clophony, Myrrh, Tolubalsm and Perubalsm, Asafoetida, guggul and prepared storax

UNIT- II

Powders of Natural Occurrence and its Significance: (Lycopodium, Pollen, Kamala, Lupulin, Cowhage and Araroba).

Drugs from Mineral Origin including fossil organisms and shells (Diatomite and cuttle fish shell).

Sources, Collection, Preparation, description, constituents, storage and uses of remedial agents from entire Animal Organism. (Leech, Cantharides and Cochineal).

UNIT- III

Allergens: Definition of allergens, types of allergens, its Skin tests, treatment and case history.

Biologically active Compounds from Marine Organisms: Antiviral, Antiparasitic, Anticoagulants and Prostaglandins

Natural enzymes and its economical Importance: Esterases, Carbohydrases, Nucleases, deaminases and Proteolyses (Pepsin, Pancreatin, Papain, bromelian, streptokinase and urokinase).

UNIT- IV

BiologicalSource,geographical Source, Cultivation, Collection,Macroscopy, Microscopy, Chemical Constituents, identification, standards, adulterants and Pharmacological uses of the following:

a) Seeds: Nuxvomica, Nutmeg and Linseed
b) Bulbs: Diascorea
c) Fruits: Fennel, Pepper, Cardamom, Capsicum and Psorela fruits.
d) Flowers: Pyrethrum
e) Rhizome and Root: Liquorice,Ginseng,Coleus and Rawolfia

UNIT- V

Vernecular names, Macroscopy, Microscopy, Chemical Constituents, standards and Pharmacological Uses of the following official Plants

1) Curcuma longa
2) Mentha piperata
3) Eclipta alba
4) Tinospora glabra
5) Nardostachys jatamansi

Books recommended

1. Brady and E. Tyler: "A Text Book of Pharmacognosy",
2. W.C.Evans: "Trease and Evans Pharmacognosy", 15th edition, Saunders, Elsevier, 2007.
3. T.E.Wallis: "Text Book of Pharmacognosy", 5th edition, CBS Publishers & Distributors Pvt. Ltd., 2005.
4. C.K. Kokate, A. P. Purohit & S. B. Gokhale: "Pharmacognosy", 41st edition, Nirali Prakashan, 2008.
5. Kalia: "A Text Book of Industrial Pharmacognosy", 1st edition, CBS Publishing House

PURPH 405: PHARMACY PRACTICE – I (DISPENSING & HOSPITAL PHARMACY)

3 hours/ week

UNIT –I

General Dispensing Procedures, Prescription: definition, various parts of prescription and their functions, handling of prescription, preliminary knowledge of important Latin terms used in the prescriptions and their translation in to English. Labeling of dispensed products, Containers, Closures & Packaging products used in dispensing.

UNIT-II

Pharmaceutical Calculations in Dispensing Pharmacy(Weights & Measures in Metric System only), Percentage calculation, Proportion calculation & Methods of Allegation, Proof Strength, Adjustment of Tonicity, Displacement value

Posology: Definition, Factors affecting dose selection. Calculation of pediatrics, infant and geriatric doses.

UNIT-III

Incompatibilities– definition, types, Physical, Chemical &Therapeutic, steps to overcome the incompatibility

UNIT-IV

Principles involved & Procedures adopted in Compounding and Dispensing of the following classes of extemporaneous pharmaceutical Preparations:

Solid Dosage Forms– Powders, Granules, Tablet Triturates.

Liquid Dosage Forms- Mixtures, Emulsions (no details of emulsifiers & stability), Lotions, Liniments, Applications, Throat Paints, Eye Drops & Lotions, Ear Drops, Gargles & Mouthwashes.

Galenicals: Definition, like infusion, Decoction, Maceration and Percolation, methods of preparation of spirits, tinctures and extracts

Semi- Solid Dosage Forms- Ointments & Creams, Pastes & Jellies, Suppositories & Pessaries.

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UNIT-V

- Sources of errors- Dispensing errors & Medication errors (Examples, Causes & safety systems to prevent occurrences of errors)
- Patient Counseling – General considerations, Important steps & Procedures involved

Books recommended

1. S.J. Cartar Ed.: "Cooper & Gunn's Dispensing for Pharmaceutical Students", 12th edition, CBS Publisher, New Delhi, 1987.
2. S.J. Cartar Ed.: "Cooper & Gunn's Tutorial Pharmacy", 6th edition, CBS Publisher, New Delhi, 1972.
1. "Indian Pharmacopoeia" Government of India, Ministry of Health & Family Welfare, the Indian Pharmacopoeia Commision, Ghaziabad, 2007British Pharmacopoeia, Vol. III, 2009.
3. "United States Pharmacopoeia", USP 32 – NF 27, Vol1 & 2, Asian Edition, 2008.

4. Walter Lund Ed.: "The Pharmaceutical Codex – Principle and Practice of Pharmaceutics", 12th edition, CBS Publishers (India) & The Pharmaceutical Press (London), 2009.
5. M. E. Aulton: "Pharmaceutics – The Science of Dosage Form Design", 2nd edition, Churchill Livingstone, 2002.

PURPH 406: BIOSTATISTICS

3 hrs. /week

Unit – I

Introduction to Biostatistics, Frequency distribution, graphical representation of data, measures of cenrtral tendency: mean, median, mode. Measures of dispersion: range, mean deviation, quartile deviation, standard deviation, coefficient of variation.

UNIT – II

Skewness, moments and kurtosis

Skewness, definition of skeweness, difference between dispersion and skewness, measures of skewress, relative measures, Karl pearson's coefficient of skewness, Bowely's coefficient of skewnwss, Kelly's measures of skewness, coefficient of skewness based on moments.

UNIT – III

Correlation and regression analysis, curve fitting

Correlation, covariance, calculation of covariance, correlation analysis, correlation coefficient calculated from ungrouped data, Spearson's rank correlation coefficient, Scatter diagram, regression analysis, regression coefficients, properties of regression coefficients, standard error of estimate or prediction, linear regression line or equation, curve fitting-straight-line, 2nd degree parabola.

UNIT – IV

Probability and Baye's theorem, Probability distribution: binominal, poisson and normal distributions, Pharmaceutical applications of binominal, poisson, normal distributions.

UNIT – V

Sampling and test of significance: Pharmaceutical applications of students t-test, F-test, chi-square test and analysis of variance (one way classification).

Books recommended

1. P.N. Arora, P.K. Malhan: "Biostatistics", Himalaya Publishers
2. N.P. Bali, P.N. Gupta, C.P. Gandhi: "A Text Book of Pharmaceutical Mathematics (Advanced Mathematics)" Vol – II, Lakshmi Publications.
3. Dr. Qazi Shorf Ahmad, Dr. Mohd. Vaseem Ismail, Shadaf Ahmad Khan: "Biostatostics" Lakshmi Publications Pvt. Ltd.

PURPH 407: ACCOUNTING AND FINANCIAL MANAGEMENT

3 hrs. /week

UNIT – I

Introduction - Meaning – Nature – Objectives – Scope – Functions of Financial Management.- Financial Planning – Financial Forecasting – Financial Analysis -Funds Flow Analysis – Cash Flow Analysis – Ratio Analysis .- Time Value of Money - Financial Environment in India.

UNIT – II

Financing Decision -Source of Finance-Optimum Capital Structure-Cost of Different Sources of Finance-Cost of Debt-Cost of Preference Capital-Cost of Equity Share Capital-Cost of Retained Earnings-Weighted Average Cost of Capital - Leverages – Financial and Operational Leverage.

UNIT – III

Investment Decisions: -Meaning – Importance – Process-Evaluation of Long Term investment Proposals- Traditional Techniques -Pay Back Period-ARR - Discounted Cash Flow Techniques:- NPV, IRR, Profitability Index - Investment Appraisal Practices in India.

UNIT – IV

Working Capital Management: Concept – Importance – Determinants of Working Capital - Operating Cycle-Working Capital Management-Cash Management-inventory Management-Receivable Management.

UNIT – V

Dividend Decisions: Introduction - Dividend Policy Practices-Factors affecting Dividend Decisions-Forms of Dividends-Bonus Shares-Stock Splits.

Books recommended

1. Hanif and Mukarjee: "Financial Accounting", Tata Mcgraw Hills Ltd, New Delhi, 2007.
2. Jawahar Lal: "Accounting for Managers", Himalaya Publishers, New Delhi, 2007.
3. P.C.Tulsian: "Financial Accounting", Vol. I, Pearson Education, New Delhi. 2006.
4. Finance India, Indian Institute of Finance, New Delhi.
5. GITAM Journal of Management, GIM, GITAM University, Visakhapatnam.
6. ICFAI Journal of Accounting Research, ICFAI University Press, Hyderabad
7. Journal of Accounting and Finance, Jaipur
8. Journal of Management and Accounting Research, ICAI, New Delhi.

Syllabus for Bachelor of Pharmacy (B. Pharm) 4th Semester (Practical)

PURPH 411: PHARMACEUTICAL ENGINEERING – II

3 hrs. /week

1. Determination of radiation constant of Iron cylinder, Brass, Copper, Painted & non-Painted Glass
2. Evaluation of filter media, Determination of rate of filtration and Study of factors affecting filtration.
3. Determination of porosity of different pharmaceuticals.
4. Studies on grinding equipments, and testing the validity of Laws governing energy and power requirements of size reduction.
5. Experiment designed on screen analysis to determine particle-size distribution.
6. Experiment on determination of various parameters related to sedimentation.
7. Study of relative viscosity determination of liquid mixtures of various compositions & plotting of graph (Ostwald viscometer).
8. Determination of flow behavior and Reynolds number.
9. Measurement of rate of flow of fluids.
10. Determination of friction loss
11. Determination of rate of drying, free moisture content and bound moisture of solids of Pharmaceutical interest.
12. Experiments to illustrate the effects various parameters on rate of drying.

13. Distillation study and Boiling point diagram.
14. Determination of calorific value of Solids.
15. Determination of calorific value of Laboratory Gases.
16. Determination of flash point of Oils and Solvents.
17. Determination of overall heat-transfer coefficient.

PURPH 412: MEDICINAL CHEMISTRY – II
3 hours/ week

1. Preparation of the following synthetic drugs involving two or three steps
   Benzocaine, Barbituric acid, Phenolphthalein, Cinchophen, Sulphanilamide, Sulphacetamide
2. Assay of the following compounds:
   Metronidazole, Chloroquine, Dapsone, Tolbutamide, Isoniazid, Sulpha drugs, Pentobarbitone
3. Identification tests of drugs as per the syllabus.

Books recommended

1. Indian Pharmacopoeia 1985 and 1996. The Controller of Publications, Civil Lines, Delhi
2. Ashuthosh Kar: "Advanced Practical Medicinal Chemistry", New Age International Pvt. Ltd.
3. Anees Ahmed Siddiqui: "Experimental Pharmaceutical Chemistry", CBS Publishers

PURPH 413: PHARMACOLOGY – II
3 hours/ week

LIST OF EXPERIMENTS

1. Bioassay of acetylcholine using isolated ileum/rectus abdominis muscle preparation by interpolation method
2. Bioassay of acetylcholine using isolated ileum/rectus abdominis muscle preparation by three point method
3. Dose response curve of histamine using isolated guinea pig ileum preparation
4. Bio assay of histamine using guinea pig ileum preparation by interpolation method
5. Bio assay of histamine using guinea pig ileum preparation by three point method
6. Action of histamine and anti histamines on isolated smooth muscle(Receptor antagonism)
7. Action of the drugs adrenaline, acetylcholine on isolated smooth muscle (physiological antagonism)
8. Test for pyrogens (Rabbit method)
9. Insulin hypoglycaemic action in rabbits or rats
10. Cardiotonic activity of drugs using isolated frog heart

Books recommended

1. S. K. Kulkarni and P. C. Dandia: "Hand Book of Experimental Pharmacology", 3rd edition, Vallabh Publisher, Delhi, 2005.
2. L.J. Macleod: "Pharmacological Experiments on Intact Preparations", Latest edition, Churchill Livingstone.
3. L.J. Macleod: "Pharmacological Experiments on Isolated Preparations", Latest edition, Churchill Livingstone.
4. M.N. Ghosh: "Fundamentals of Experimental Pharmacology". Latest edition, Scientific Book Agency, Kolkata.
5. Ian Kitchen: "Textbook of in Vitro Practical Pharmacology", Latest edition, Black well Scientific.
6. S. K. Kulkarni: "Hand Book of Experimental Pharmacology", 3rd edition, Vallbh Prakashan, 2005.
7. R.K Goyal "practicals in pharmacology" 4th edition, B.S.Shah Prakashan publisher, Ahmedabad, 2003.

PURPH 414: Pharmacognosy – II

3 hours/ week

1. Introduction to Ratio Values: Stomatal Index, Stomatal number, Vein Islet number, Vein termination number and Palaside ratio.
2. Different Methods of extraction (Macceration, soxhlation and Microwave assisted extraction).
3. Powder Microscopy(Including Mixture analysis) of the drugs studied in theory
4. Preliminary Phytochemical Screening of some selected Crude drugs and extracts.
5. Determination of Starch grains using lycopodium spore method.
6. Study of Morphology of drugs included in the theory.
7. Extraction and Isolation of Phytopharmaceuticals
6. Hesperidin & Pectin from Orange Peel
7. Aloin from Aloes
8. Piperine from Black pepper
9. Eugenol from Cinnamon leaf oil
8. Qualitative Identification of vegetable fibers and Resins.
9. T.L.C Profiles of the following:

1) Curcuma longa 2) Emblica Officinalis 3) Pepper.

Books recommended

1. M.A.,Iyengar: “Study of Crude Drugs”, Manipal Power Press,Manipal
2. C.K.Kokate: “Practical Pharmacognosy”,
3. Pulok.K.mukherjee: “Quality Control of Herbal Drugs”.

PURPH 415: PHARMACY PRACTICE – I

3 hours/ week

List of Experiments:

1. Syrups

a. Simple Syrup I.P
b. Syrup of Ephedrine HCl NF
c. Syrup Vasaka IP
d. Syrup of ferrous Phosphate IP
e. Orange Syrup

2. Elixir

a. Piperizine citrate elixir BP
b. Cascara elixir BPC
c. Paracetamol elixir BPC

3. Linctus

a. Simple Linctus BPC
b. Pediatric simple Linctus BPC

4. Solutions

a. Solution of cresol with soap IP
b. Strong solution of Ferric Chloride BPC
c. Aqueous Iodine Solution IP
d. Strong Solution of Iodine IP
e. Strong Solution of ammonium acetate IP

5. Liniments

a. Liniment of turpentine IP*
b. Liniment of camphor IP

6. Suspensions*

a. Calamine lotion
b. Magnesium Hydroxide mixture BP

7. Emulsions*

a. Cod liver oil emulsion

b. Liquid paraffin emulsion

8. Powders♣

a. Eutectic powder
b. Explosive powder
c. Dusting powder
d. Insufflations

9. Suppositories♣

a. Boric acid suppositories
b. Chloral suppositories

10. Incompatibilities

a. Mixtures with Physical
b. Chemical & Therapeutic incompatibilities

***** colourless bottles required for dispensing **♣** Paper envelope (white), butter paper and white paper required for dispensing.

Books recommended

1. S.J. Cartar Ed.: "Cooper & Gunn's Dispensing for Pharmaceutical Students", 12th edition, CBS Publishers, New Delhi, 1987.
2. S.J. Cartar Ed.: "Cooper & Gunn's Tutorial Pharmacy", 6th edition, CBS Publishers, New Delhi, 1972.
3. "Indian Pharmacopoeia" Government of India, Ministry of Health & Family Welfare, the Indian Pharmacopoeia Commision, Ghaziabad, 2007.
4. A. P. Powar: "Theory & Practice of Pharmaceutics – I", 1st edition, Carrier Publication, 2006.
5. British Pharmacopoeia, Vol. III, 2009
6. "United States Pharmacopoeia", USP 32 – NF 27, Vol1 & 2, Asian Edition, 2008.
7. Walter Lund Ed.: "The Pharmaceutical Codex – Principle and Practice of Pharmaceutics", 12th edition, CBS Publishers (India) & The Pharmaceutical Press (London), 2009.
8. M. E. Aulton: "Pharmaceutics – The Science of Dosage Form Design", 2nd edition, Churchill Livingstone, 2002.

Syllabus for Bachelor of Pharmacy (B. Pharm) 5th Semester (Theory)

PURPH 501: ELECTRO CHEMICAL METHODS OF ANALYSIS
3 hours/ week

UNIT – I

Miscellaneous methods of analysis –

- Sodium nitrite titrations
- Determination of moisture content -Drying, Distillation, Karl Fisher titration
- Estimation of Nitrogen by Kjeldahl method
- Oxygen Flask combustion
- Gasometry
- Oil and Fat analysis- Introduction to fats and oils ,Acid value , Acetyl value,Saponification value, Ester value, Iodine value

UNIT – II

Solvent extraction methods-

- Introduction
- Solvent extraction systems-chelate extraction , extraction by solvation, ion pair formation extraction ,synergic extraction
- Mechanism of extraction
- Techniques of extraction-batch extraction ,continuous extraction , counter current extraction
- Solid liquid extraction-Soxhlet apparatus
- Determination of lead by dithizone method

UNIT – III

Food Analysis –

- Introduction
- Analysis of moisture or water content in various foods like butter and ghee, vegetable oils, honey
- Dry ashing-ash of honey, total ash of spices
- Analysis of fat in butter, Analysis of protein in milk, Analysis of carbohydrates in honey
- Adulterants in food-adulteration of vanaspathi ghee in pure desi ghee, adulteration of invert - sugar in honey, adulteration of tea seed oil in the given sample of vegetable oil, adulteration of coal tar dyes in food

ELECTRO CHEMICAL ANALYSIS

UNIT – IV

Potentiometry-

- Electric potential, electro chemical cell
- Reference electrodes, indicator electrodes
- Measurement of potential and PH
- Construction and working of electrodes
- Potentiometric titrations
- Method of deduction of end- point.

Conductometry-

- Introduction
- Conductivity cell
- Conductometric titrations
- Applications.

UNIT – V

Polarography-

- Instrumentation
- Dropping Mercury Electrode (DME)
- Residual current, diffusion current and limiting current, polarographic wave
- Ilkovic's equation,
- Effect of oxygen on polarographic wave, polarographic maxima and suppressors, Applications.

Amperometry-

- Introduction
- Types of electrodes used,reference and indicator electrode
- Instrumentation
- Titration procedure
- Advantages and disadvantages of amperometry over potentiometry,
- Pharma applications.

Books recommended

1. H. Beckett & J. B. Stenlake: "Practical Pharmaceutical Chemistry", 4th edition, Part-1, CBS Publishers, New Delhi, 2005.
2. Mendham et al.: "Vogel's Text book of Quantitative Analysis", 6th edition, Pearsons Education Ltd., 2008.
3. Ashutosh Kar: "Pharmaceutical Drug Analysis", 2nd editon (Reprint), New Age International Publishers, 2005.
4. K.A.Connors: "A Text Book of Pharmaceutical Analysis", 3rd edition, John Wiley & Sons, 2007.
5. P. C. Kamboj: "Pharmaceutical Analysis", 2nd edition, Vol-I, Vallabh Prakashan, 2007.
6. Morris B Jacobs,"The Chemical Analysis Of Foods And Food Products"3rd edition,CBS publishers
7. Skoog et al.: "Fundamentals of Analytical Chemistry", 8th edition, Thomson Buisness Information India Pvt. Ltd., 2006.
8. Gary.D.Christian: "Analytical Chemistry", 6th edition, John Wiley & Sons, 2007.
9. Chatwal & Anand: "Instrumental Methods of Analysis", 5th edition,Himalaya publishing house, 2008
10. L.G.Chatten,"Pharmaceutical Chemistry-Theory and application" Volume 1,1st edition,CBS publishers and distributors
11. T.Riley,C.Tomlinson,"Principles of Electroanalytical methods", John Wiley &Sons.
12. Alun Evans,"Potentiometry and Ion Selective Electrodes", John Wiley &Sons,2008
13. Tom Riley&Arthur Watson,"Polarography and other Voltammetric Methods", John Wiley &Sons,2008
14. "Indian Pharmacopoeia" Government of India, Ministry of Health & Family Welfare, the Indian Pharmacopoeia Commision, Ghaziabad, 2007.
15. "United States Pharmacopoeia", USP 32 – NF 27, Vol1 & 2, Asian Edition, 2008.
16. "British Pharmacopoeia", British Pharmacopoeia commision, The Stationary Office,6th edition, 2009.

PURPH 502: PHARMACEUTICAL TECHNOLOGY – I (SOLID DOSAGE FORMS)
3 hours/ week

UNIT - I

Powders and Granules: Introduction to powders and granules as dosage form, Preparation technique of powder dosage forms-Particle size and analysis, Comminution of drugs, Blending powders, Medicated powders- Aerosol powders, Insufflations, Bulk and Divided powders, Preparation requiring further treatment at time of dispensing, Types of granules- Bulk, Divided granules and Effervescent granulated salt, Manufacturing of granules

UNIT - II

Tablets: Introduction, Formulation of tablet, Tablet type, Tablet manufacturing: Stages in tablet formulation, Tablet presses, Technical problems during tabletting, tablet production via granulation & direct compression, Tablet testing (evaluation) & Standards.

UNIT - III

Tablet Coating: Introduction, Reasons for coating tablets, Types of tablet coating: Ideal characteristics, Formulation , Process details & Equipments used in film coating, Sugar coating & Press coating, Defaults in coating, Functional coatings (controlled release & enteric coating), Standards for coated tablets.

UNIT - IV

Hard Gelatin Capsule: Introduction, Raw materials required in manufacturing of empty capsule shell & their properties, Capsule filling & Machines used in filling, filling of Powder, Pellet, Semisolid & Liquid into empty shell, Formulation of capsule, Formulation optimization, and Evaluation of capsules.

UNIT - V

Soft Gelatin Capsule: Introduction to soft gelatin capsule dosage form, Rationale for the selection of softgels as a dosage form, Manufacture of soft gels, Formulation of Softgels, Properties of soft gelatin shell, Types of softgel fill materials, Product quality consideration

Books recommended

1. Leon Lachman, H. A. Lieberman & J. L. Kanig : "The Theory and Practice of Indusrtrial Pharmacy", 3rd edition, Varghese Publishing House, Bombay, 1991.
2. M. E. Aulton: "Pharmaceutics – The Science of Dosage Form Design", 2nd edition, Churchill Livingstone, 2002.
3. L. V. Allen, N. G. & Popovich H. C. Ansel: "Ansel's Parmaceutical Dosage Forms and Drug Delivery Systems", 8th edition, Lipincott William & Wilkins, USA, 2005
4. Rawlins, Ed.: "Remington's The Science and Practice of Pharmacy", 20th edition, Lippincott William & Wilkins, USA, 2000.
5. H. A. Lieberman, Leon Lachman, J. B. Schwartz Ed.: "Parmaceutical Dosage Forms: Tablets", 2nd edition (Revised and Expanded), Vol. 1, 2 & 3, Marcel Dekker Inc.,Vol – 1, 2 & 3, New York, 2008.
6. Walter Lund Ed.: "The Pharmaceutical Codex – Principle and Practice of Pharmaceutics", 12th edition, CBS Publishers (India) & The Pharmaceutical Press (London), 2009.

PURPH 503: PHARMACOLOGY - III

3 hours/ week

UNIT - I

Pharmacology of Drugs acting on gastrointestinal tract

a) Digestants
b) Antispasmodics
c) Anti-diarrhoeal agents
d) Cathartics
e) Emetics-anti emetics
f) Drugs used in inflammatory bowel syndrome
g) Antacids and drugs used in peptic ulcers

Pharmacology of Drugs acting on respiratory system

a) Drugs used in asthma
b) Cough suppressants

UNIT - II

Pharmacology of hormones and hormone antagonists

a) Thyroid and anti thyroid drugs
b) Insulin ,insulin analogues and oral hypoglycaemic agents
c) Sex hormones and oral contraceptives
d) Oxytocin and other stimulants and relaxants

UNIT - III

Chemotherapy

a) Introduction
b) Sulphonamides
c) Antibiotics including
Penicillin's, Cephalosporin's, Tetracycline, Chloemphenicol, Macrolides, Amino Glycosides, Polyene and Polypeptide antibiotics
d) Quinolines and fluroquinolines
e) Antifungal agents
f) Antiviral agents

UNIT - IV

Pharmacology of Drugs used in

a) Tuberculosis
b) Leprosy
c) Malaria
d) Amoebiasis
e) Pharmacology of antihelmintic drugs
f) Chemotherapy of cancer

UNIT - V

Clinical Toxicology

General principles involved in the management of poisoning
Clinical symptoms and management of acute poisoning with the following agents –

a) Pesticide poisoning: organophosphorous compounds, carbamates, organochlorines, pyrethroids.
b) Opiates overdose.
c) Antidepressants
d) Barbiturates and benzodiazepines.
e) Alcohol: ethanol, methanol.
f) Paracetamol and salicylates.
g) Radiation poisoning
h) Heavy metals: Arsenic, lead, mercury, iron, copper

Books recommended:

1. H. P. Rang & M. M. Dale, "Pharmacology", 6th edition, Churchill Livingstone, 2007.
2. T. W. A. Rall, A. I. S. Nies & P. Taylor: "Goodman and Gilman's The Pharmacological Basis of Therapeutics", 11th edition, Mc Graw Hill, Pergamon Press, 2006.
3. B. G. Katzung: "Basic and Clinical Pharmacology", 9th edition, Mc Graw Hill, Singapore, 2004.
4. David E.Golan: "Principals of Pharmacology", Lippincott Williams & Wilkins, USA, 2005.
5. Richard A. Harvey: "Pharmacology" 4th edition, Wolters Kluwer (India) Pvt. Ltd., New Delhi, 2006.
6. R. S. Satoskar and S. D. Bhadarkar: "Pharmacology and Pharmacotherapeutics", 21st edition (single volume), Popular Prakashan Publication, Dubai, 2009.
7. K. D. Tripathi: "Essentials of Medical Pharmacology", 6th edition, Jaypee Brothers Medical Publication, Delhi, 2008.
8. Shargel and Leon: "Applied Biopharmaceutics and Pharmacokinetics", 6th Prentice Hall, London, 2008.
9. Mutschler, H. Derendorf "Drug Actions" Medpharm Scientific Publishers, Germany, 1995.
10. Matthew J. Ellenhorn: "Ellenhorn's Medical Toxicology – Diagnosis and Treatment of Poisoning", 2nd edition. Williams and Willkins Publication, London.
11. V. V. Pillay: "Handbook of Forensic Medicine and Toxicology", 13th edition, Paras Publication, Hyderabad, 2003.

PURPH 504: PHARMACOGNOSY - III (PHYTOMEDICINE)

3 hours/ week

UNIT – I

Definition of Phytopharmacy and its role in Herbal Drug Industry.
Global regulatory status of Phytomedicine
National and International trade and commerce of Herbal drugs or Phytopharmaceuticals
Definition of Standardization and W.H.O Guidelines for standardization of Herbal drugs
W.H.O Herbal Monographs and its Importance
Good Manufacturing Practices(G.M.P) for production of Phytopharmaceuticals

UNIT – II

Plant Tissue Culture: Introduction and Laboratory requirements for Tissue culture, Different types of Tissue Culture Media, Different Methods of Tissue culture techniques, Industrial applications of tissue culture, Definition of Bioreactor, different types of Bioreactors and Importance of bioreactors in production of secondary metabolites.

UNIT – III

Dietary Supplements, Nutraceuticals and Herbal cosmceuticals
Herbal Immuno Modulators.
Traditional System of Medicine(Ayurveda, Siddha, Unani systems of Medicine Including Homeopathy, Introduction to Traditional Chinese Medicine and Aromatherapy, Indian Herbal Pharmacopoeia and Chinese Pharmacopoeia including Importance of *Materia medica*

UNIT – IV

Importance of Chromatography and Spectroscopy in Quality Control of Herbal Drugs
Different Chromatographic and spectroscopic methods for analysis of Herbal Drugs
High performance Thin Layer Chromatography(HPTLC) and High Performance Liquid Chromatography, Column Chromatography and Gas Chromatography.

UNIT – V

High throughput Screening and importance of Lead molecules
Role of Biological and HPTLC Markers in Plant drug analysis.
Stability and Toxicity Studies of Phytomedicine

Books recommended

1. N.Kalia: “A text Book of Industrial Pharmacognosy”, 1st edition, CBS Publishers.
2. W.C.Evans: “Trease and Evans Pharmacognosy”, 15th edition, Saunders, Elsevier, 2007.
3. Poucher: “A Text Book of Cosmetics”,
4. Phillipa.Grubb: “Plants for Chemicals,Pharmaceuticals and Biotechnology”,
5. C.K.kokate: “A Text Book of Industrial Pharmacognosy”,
6. Wallis: “A Text Book of Industrial Pharmacognosy”,
7. Quadry and Shah: “A Text Book of Industrial Pharmacognosy”,
8. Formulary of Ayurvedic medicine, IMPCOPS Ltd.
9. Formulary of Siddha medicine, IMPCOPS Ltd.
10. Formulary of Unani medicine ,IMPCOPS Ltd

PURPH 505: BIOLOGICAL PHARMACY

3 hours/ week

UNIT – I

Hormonal Preparations: Introduction to Scope of Biological Pharmacy, Manufacture, storage and Standardization of the following glandular and Animal Products 1.Insulin and Its modified Forms 2.Chronic Gonodotrophin (CGT) and Gonodotrophin Hormones 3.Anterior and Posterior Pituitary Products 4.Thyroid Preparations 5.Liquid Extract of Liver preparations 6.Prostaglandins Importance and Urokinase

UNIT – II

Vaccines And Sera: Introduction, General Method of Preparation, Standardization, Labelling and Packing of following vaccines : Diptheria, Perutisis and Tetanus(DPT),Thyphoid and Parathyphoid A and B, Small Pox, Polio Myelitis , B.C.G Vaccine and anti toxins like Gas gangrene antitoxin, Anti Rabies serum ,Anti venom serum and Interferon

UNIT – III

Microbial Assay:

I. Antibiotics: Assay Design, Cylindrical and cup plate method, types of assay media as Per Indian Pharmacopoeia (I.P)
II. Viatamins: Assessment of validity of microbial assay and method of computation and assay of riboflavin ,Nicotinic acid, Vitamin B1 And Vitamin B12
III. Amino Acids: General introduction ,Phenomena of antagonism of amino acids and assay of Tryptophan and Glutamic acid

UNIT – IV

Blood Products: General requirements for blood collection, preparation, standards, labeling and storage of the following products**:** Whole human blood, Human plasma and dried human plasma, dried human serum, human Gama globulins, concentrated human R.B.C, Plasma protein Fraction,

I) Absorbable Haemostatics: Absorbable gelatin Sponges, Oxidised cellulose, calcium alginate, Absorbale dressings
II) Plasma Substitutes (Plasma Expanders):Ideal qualities of plasma substituents, PVP, Dextran 40 And 100, Industrial production of Clinical dextran

UNIT – V

Microbial Limit Tests: Various media, microbial counts, Primary and secondary tests for *E. coli*, Salmonella, Pseudomonas and *Staphylococcus aureus*

Radio Immuno Assay: Reagents in RIA, Setting up in RIA and Estimation of Insulin in blood by RIA

Surgical Dressings: Ideal properties, sterilization, standards and tests for sterility of surgical dressings

Ligatures And Sutures: absorbable and non absorbable, preparation standards and tests for sterility of surgicals and problems involved in sterilization of Catgut

Books recommended

1. EC Barton-Wright: “The Microbial Assay of Vitamin –B Complex and Amino Acids”, Sir Isaac Pitman and sons limited ,London
2. Kavarrgh: “Analytical Microbiology”, Academic press
3. S.J. Cartar Ed.: “Cooper & Gunn’s Tutorial Pharmacy”, 6th edition, CBS Publisher, New Delhi, 1972
4. Bandarkar,S.D and MRA Pilli: “Radio Immuno Assay – A Laboratory Manual”,
5. M.L Schroff: “Biological Pharmacy”, Part 2 ,National Book Centre, Calcutta

PURPH 506: OPERATIONS MANAGEMENT

3 hours/ week

UNIT- I

Production and Operations management -Scope of Production and Operations management- Evolutionary Milestones- Types of Manufacturing systems- Services operations.

UNIT- II

Production planning and control(PPC) -Stages in PPC- Aggregate planning –Project Management- Concept of Maintenance Management and Industrial Safety

UNIT- III

Plant Location and Layout Planning- Plant Location -Factors affecting Plant location- Plant capacity - Supply chain Management -Types of Layouts.

UNIT – IV

Productivity- Basic concepts of Productivity- Work Study- Method Study- Work Measurement.

UNIT- V

Materials Management & Quality Management –Introduction to Materials Management- Costs associated with Inventory- Economic Ordering Quantity- ABC Analysis, Basic concepts of Total Quality Management(TQM)-Acceptance Sampling- Control Charts, JIT Production systems.

Books recommended

1. R. Panner Selvam: "Production and Operation Management", Prentice-Hall of India (P) Ltd, New Delhi, 2007
2. Adam, E, Everette, Ebert, J, Ronald, Jr, Production and Operation Management, Prentice Hall of India Pvt Ltd., New Delhi, 2007
3. Buffa, S.Elewood, Sarin, K, Rakesh,, "Modern Production", John Wiley & Sons, 2006
4. Gaither, Norman, "Production and Operation Management", The Dryden Press, Chicag, 2006.
5. K.Aswathappa & K.Sridhara Bhat, "Production and Operations Management", Himalaya Publishing House, New Delhi, 2006
6. Alan Mhulemann, John Oakland, Keith Lockery: "Production and Operation Management", Macmillan India Ltd., 2007.
7. N.G.Nair: "Production and Operation Management", Tata Mc-Graw Hill, New Delhi, 2007.
8. S. N. Chary: "Production and Operations Management", Tata Mc-Graw Hill Publishing Co Ltd , 2007.

PURPH 507: MEDICINAL CHEMISTRY – III

3 hours/ week

UNIT - I

Cancer and Chemotherapy

a. Molecular biology of cancer
b. Anticancer Drugs : Chlorambucil, busulphan, procarbazine, carmustine, 5-flurouracil, 5-mercaptopurine, methotrexate, vinca alkaloids – vinblastin, vincristine.
c. Radiosensitizers and Radioprotective agents, Synthetic anticarcinogenic agents.
d. Selective Toxicity, Drug resistance in cancer therapy

UNIT - II

a. Antiviral Agents
b. DNA antiviral agents, RNA & Orthopoxviruses, Anti HIV Drugs

UNIT - III

a. Vitamins and Organ transplant drugs
b. SNPs Single Nucleotide Polymorphisms and pharmacogenomics

UNIT - IV

QSAR and Drug Design

Physicochemical properties and biological activity, Free-wilson approach and Hansch analysis, Molecular and Quantum mechanics, Conformational Analysis, Molecular dynamics, 3DQSAR, Concept of Pharmacophore, Docking and Denovo design

UNIT - V

Combinatorial Chemistry:

a. Combination synthesis: Introduction, the drug discovery process.
b. Solid phase, liquid phase combinatorial synthesis.
c. Applications of combinatorial chemistry in drug discovery.

Books recommended

1. J. H. Block and J. M. Beale: "Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry", 11th edition, Lippincott-Williams & Wilkins, Philadelphia, 2004.
2. William et al. "Foye's Principles of Medicinal Chemistry", 6th edition, Lippincott-Williams & Wilkins, Philadelphia, 2008.
3. J. Abraham Ed.: "Burger's Medicinal Chemistry & drug Discovery", 6th edition, Vol 1 to 6, John Willey & Sons, Inc., 2007.
4. Surendra N. Pandeya: "A Text Book of Medicinal Chemistry" Vol. I and II, S.G. Publisher, Varanasi.
5. Indian Pharmacopoeia 1985 and 1996. The Controller of Publications, Civil Lines, Delhi - 54.
6. Current Index of Medical Specialities (CIMS) and MIMS India, MIMS, A.E. Morgan Publications (I) Pvt. Ltd, New Delhi-19.

Syllabus for Bachelor of Pharmacy (B. Pharm) 5th Semester (Practical)

PURPH 511: ELECTRO CHEMICAL METHODS OF ANALYSIS

3 hours/ week

1. Potentiometric determination of pH of two solutions
2. Potentiometric titration of a strong acid against a strong base
3. Potentiometric titration of a strong base against a weak acid
4. Potentiometric titration of a mixture of acids against a weak base
5. Potentiometric titration of ferrous sulphate with potassium permanganate
6. Potentiometric assay of any two formulations from IP (Amoxicillin sodium, Propanollol HCl, Nalidixic acid)
7. Determination of water content by Karl Fischer electrometric titration method
8. Conductometric determination of equivalence point of titration of HCl and NaOH
9. Polarograhic determination of Nitrobenzene in solutions
10. Determination of acid neutralizing capacity of antacids by pH meter
11. Determination of Acid value of the given oil sample
12. Determination of Saponification value of the given oil sample
13. Determination of Iodine value of the given oil sample
14. Determination of Ester value of the given oil sample
15. Determination of moisture in vegetable oils
16. Determination of moisture in honey by refractometer method
17. Analysis of fat in butter
18. Analysis of carbohydrates in honey
19. Detection of adulteration of vanaspathi ghee in pure desi ghee
20. Detection of adulteration of Rhodamine B color in the chilly powder

Books recommended

1. H. Beckett and J. B. Stenlake: "Practical Pharmaceutical Chemistry", Vol I&II,1st edition,CBS Publishers , 2005
2. C. Garatt: "Quantitative Analysis of Drugs", 3rd edition, CBS Publishers,2005
3. T. Higuchi & E.B. Hanssen, "Text Book of Pharmaceutical Analysis", 1st edition, A Wiley Inter Science Publications,2005
4. P. C. Kamboj: "Pharmaceutical Analysis", 2nd edition, Vol-I, Vallabh Prakashan, 2007.
5. "Indian Pharmacopoeia" Government of India, Ministry of Health & Family Welfare, the Indian Pharmacopoeia Commission, Ghaziabad, 2007
6. "United States Pharmacopoeia", USP 32 – NF 27, Vol1 & 2, Asian Edition, 2008
7. British Pharmacopoeia , 2009

PURPH 512: PHARMACEUTICAL TECHNOLOGY – I (SOLID DOSAGE FORMS)
3 hours/ week

1. Preparation & Evaluation of Medicated Powders
2. Preparation & Evaluation granules loaded with Active Pharmaceutical Ingredients
3. Preparation & Evaluation of Tablet by:
   i. Wet granulation method
   ii. Dry granulation method
   iii. Direct compression
4. Preparation & Evaluation of Film Coated Tablets
5. Preparation & Evaluation of Capsules
   i. Powder filled
   ii. Granule filled

PURPH 513: PHARMACOLOGY-III
3 Hours/ week

1. Calculation of dose ration (EC50) of acetylcholine in presence and absence of physostigmine using isolated ileum/rectus abdominis muscle preparation
2. Calculation of dose ration (EC50) of acetylcholine in presence and absence of pancuronium using isolated ileum/rectus abdominis muscle preparation
3. Calculation of pa_2 value for tubocurarine using acetylcholine as agonist employing frog rectus abdominis muscle.
4. Calculation of pa_2 value for atropine using acetylcholine as agonist employing guinea pig ileum preparation.
5. Evaluation of Antispasmodic Drugs
6. Evaluation of Antidiarrhoeal Drugs
7. Evaluation of Antifungal agents
8. Evaluation of Antiinflammatory drugs
9. Determination of the LD_{50} value of a given drug

Books recommended

1. S. K. Kulkarni and P. C. Dandia: "Hand Book of Experimental Pharmacology", 3rd edition, Vallabh Publisher, Delhi, 2005.
2. L.J. Macleod: "Pharmacological Experiments on Intact Preparations", Latest edition, Churchill Livingstone.
3. L.J. Macleod: "Pharmacological Experiments on Isolated Preparations", Latest edition, Churchill Livingstone.
4. M.N. Ghosh: "Fundamentals of Experimental Pharmacology". Latest edition, Scientific Book Agency, Kolkata.

5. Ian Kitchen: “Textbook of in Vitro Practical Pharmacology”, Latest edition, Black well Scientific.
6. S.K.Kulkarni: “Hand Book of Experimental Pharmacology”, 3rd edition, 2005.
7. R.K Goyal ”practicals in pharmacology” 4th edition, B.S.Shah Prakashan publisher, Ahmedabad, 2003

PURPH 514: PHARMACOGNOSY-III
3 hours/ week

1. Microscopical Identification of Powder mixtures
2. Preparation of Some Ayurvedic dosage forms which are possible inhome
3. Determination of volatile oil content of a crude drug by using Clavengers apparatus
4. Determination of Swelling Index of Isaphagol and Linseed
5. Determination of Mucilage Content in Isapagol
6. Evaluation of Glychrizic acid in Liquorice root
7. Extraction of Tannic acid from Myrobalans and its TLC
8. Resin from Podophyllum and its TLC
9. Lawsone from Henna and its TLC
10. Preparation of Tissue culture medium (Murashige and Skoogs Medium) and a practical demo on Plant tissue culture
11. Preparation of any two Herbal cosmetics and Their Standardisation
12. Identification and Preliminary tests of the following:
    Colophony, Aloes, Shellac, Asafoetida, Talc, Bentonite, Kaolin and Chalk

Books recommended

1. A Practical Pharmacognosy -Dr.C.K.KOKATE.

PURPH 515: BIOLOGICAL PHARMACY
3 hours/ week

1. Sterilization by Dry Heat and tests for its sterility
2. Sterilization of Autoclaving and tests for its sterility
3. Sterilization by heating with Bactericide and tests for its sterility
4. Sterilization of surgical dressing and tests for its sterility
5. Sterilization by Gas and tests for its sterility
6. Tests for sterility of Commercial Dextrose injection I.P
7. Tests for sterility of a Preparation Containing Sulphanilamide
8. Preparation and Standardization of bacterial vaccine
9. Microbial counting in Pharmaceutical preparation
10. Primary and Secondary Tests for Salmonella

Books recommended

1. Pelczar et al. “Microbiology”, 5th edition, Tata Mc Graw Hills Publishing Company Ltd., 2007.
2. S.J. Cartar Ed.: “Cooper & Gunn’s Tutorial Pharmacy”, 6th edition, CBS Publishers, New Delhi, 1972
3. S.P.Vyas and Dixit: “Pharmaceutical Biotechnology”, 6th edition, CBS Publishers and Distributors
4. “Indian Pharmacopeia” Government of Ministry and Family Welfare 2007,1996,Addendum 2005
5. Rawlins, Ed.: “Remington’s The Science and Practice of Pharmacy”, 20th edition, Lippincott William & Wilkins, USA, 2000

Syllabus for Bachelor of Pharmacy (B. Pharm) 6th Semester (Theory)

PURPH 601: PHARMACEUTICAL TECHNOLOGY –II
(ORAL LIQUIDS AND SEMI SOLID DOSAGE FORMS)
3 hrs. /week

UNIT - I

Preformulation: Bulk characterization, Solubility analysis, Stability analysis

UNIT - II

Solution: Introduction, Advantages & Disadvantages of solution as an oral dosage form
Choice of solvents: aqueous & non-aqueous, Formulation additives: buffers, density modifiers, isotonicity modifiers, viscosity enhancers, preservatives, reducing & anti-oxidant agents, sweetening agents, flavors & perfumes, colors
Types of preparations:-Liquids for cutaneous application: Lotions, Liniments, Paints, Collodions; Ear drops, Eye preparations, Irrigations, Mouth washes & Gargles, Nasal products, Oral liquids: Elixir, Linctuses, Mixtures & Draughts, Rectal preparations
Intermediate products: - Aromatic waters & Spirits, extracts, Infusions & Tinctures, Syrups
Stability of solutions, Manufacture of solutions

UNIT - III

Suspension: Introduction, Physical properties, Pharmaceutical application, Formulation of suspension, Manufacture of suspension, Preservation of suspension, Physical stability of suspension

UNIT - IV

Emulsion: Introduction, Physical properties, Types, Formulation of emulsion, Types of emulsifying agents, Preservation of emulsions, Physical stability of emulsion, Manufacture of emulsion

UNIT - V

Semisolid: Introduction, Anatomy of skin, Routes of penetration, Raw materials, Types of vehicles, Types of semisolid preparation (Pastes, Gels, Ointments and creams),
Study on cosmetic preparations like Shampoos, Cold Cream, Vanishing Cream, Face powders, Tooth pastes, Tooth powder, Mouth wash, Calamine lotion

Books recommended

1. Leon Lachman, H. A. Lieberman & J. L. Kanig: "The Theory and Practice of Indusrtrial Pharmacy", 3rd edition, Varghese Publishing House, Bombay, 1991.
2. M. E. Aulton: "Pharmaceutics – The Science of Dosage Form Design", 2nd edition, Churchill Livingstone, 2002.
3. L. V. Allen, N. G. & Popovich H. C. Ansel: "Ansel's Parmaceutical Dosage Forms and Drug Delivery Systems", 8th edition, Lipincott William & Wilkins, USA, 2005.
4. "Remington: The Science and Practice of Pharmacy", 21st edition, Vol. 1 & 2, Lippincott William & Wilkins, USA, 2006.
5. H. A. Lieberman, M. M. Rieger and G. S. Banker Ed.: "Parmaceutical Dosage Forms: Disperse System", 2nd edition (Revised and Expanded), Vol. 1, 2 & 3, Marcel Dekker Inc.,Vol – 1, 2 & 3, New York, 2005.

PURPH – 602: PHARMACOGNOSY – IV
(CHEMISTRY OF NATURAL PRODUCTS)
3 hrs. /week

UNIT - I

Chemical and spectral approaches to simple molecules of natural origin. Application of IR, NMR and Mass Spectroscopy in the structural elucidation of organic compounds.

Concept of stereoisomerism taking examples of natural products (citral, menthol, camphor, ephedrine and atropine).

UNIT - II

Terpenes : Classification, General methods of extraction and separation (Mono and sesquiterpenes), special isoprene rule and Structural elucidation of citral carvone, menthol & camphor

UNIT – III

Cardiac Glycosides: Source, structures, Pharmacological properties and study of interrelationship between cardinolides and bufadienolides (Chemistry of digoxin & digitoxin). Introduction to Scillaren A and Ouabein

Flavonoids: Classification, pharmacological properties and chemistry of quercetin

UNIT – IV

Alkaloids : Classification, isolation, structural elucidation of atropine, ephedrine, reserpine and morphine, papaverine, quinine

UNIT - V

Vitamins: Classification, Chemistry of vitamin A, B_1, Folic acid and vitamin C.

Antibiotics: Chemistry and therapeutic activity of penicillin (includes structural elucidation), streptomycin and tetracyclines.

Books recommended

1. O.P. Agarwal: “Chemistry of Organic Natural Products” Vol.-1 & 2,
2. Gurdeep Chatwal: “Organic Chemistry of Natural Products” Vol.-1 & 2,
3. I.L. Finar: “Organic Chemistry” Vol.-2,

PURPH 603: CHROMATOGRAPHIC METHODS OF ANALYSIS
3 hrs. /week

UNIT - I

Introduction to chromatographic techniques- History, classification , separation techniques, choice of methods

Column chromatography

a. Adsorption column chromatography- development technique, frontal analysis and elution analysis, factors affecting column efficiency, applications

b. Partition column chromatography

UNIT - II

a. **Ion Exchange chromatography**-introduction, principles, types of ion exchange synthetic resins, physical properties, factors affecting ion exchange, methodology and applications.
b. **Paper chromatography**- introduction, principles, types of paper chromatography – ascending paper chromatography, descending paper chromatography, radial paper chromatography, development techniques, operational techniques, applications.

UNIT - III

a. **TLC**- introduction ,principles, techniques, R_f values, applications
b. **HPTLC**- introduction ,theory ,instrumentation, applications

UNIT IV

a. **HPLC**- introduction, theory, instrumentation, solvent treatment systems; pumps- reciprocating and displacement pumps;columns, detectors - UV detectors, fluorimetric detectors, refractive index detectors ,applications
b. **Gas chromatography**- introduction ,theory ,instrumentation, carrier gases, stationary phases in GLC and GSC,detectors -flame ionization detectors , electron capture detectors, thermal conductivity detectors, typical gas chromatogram, derivitisation techniques, programmed temperature gas chromatography, applications.

UNIT - V

a. **Electrophoresis**- Scope, principles of separation different types, applications.
b. **Gel filtration and Affinity chromatography**- introduction , techniques , applications.

Books recommended

1. H. Beckett and J. B. Stenlake: "Practical Pharmaceutical Chemistry", Vol- II 4th edition, CBS publishers,2005
2. B. K. Sharma: "Instrumental and Chemical Analysis", Goel Publishers
3. Chatwal & Anand: "Instrumental Methods of Analysis", 5th edition,Himalaya publishing house, 2008
4. Mendham et al.: "Vogel's Text book of Quantitative Analysis", 6th edition, Pearsons Education Ltd., 2008
5. K.A.Connors: "A Text Book of Pharmaceutical Analysis", 3rd edition, John Wiley & Sons, 2007.
6. P. D. Sethi: "High Performance Liquid Chromatography" CBS publishers
7. P. D. Sethi: "High Performance Thin Layer Chromatography", CBS publishers
8. Snyder ,"Practical HPLC Method Development" John Wiley&Sons, Canada
9. Egon Stahl: "Thin Layer chromatography",2nd edition, Springer publications
10. Richard & Shiela: "Thin Layer Chromatography" John Wiley & Sons, 2008.
11. Robert.D.Brown: "Introduction to Instrumental Analysis", Pharma Book Syndicate, 2006
12. Gary.D.Christian: "Analytical Chemistry", 6th edition, John Wiley & Sons, 2007.
13. D.A.Skoog, F.J.Holler,T.A.Nieman "Principles of instrumental analy*sis*",5th edition Thomson,Brooks/Cole,2005
14. Willard, Meritt, Dean, etal: "Instrumental Method of Analysis", 7th edition**,** CBS publishers
15. "Indian Pharmacopoeia" Government of India, Ministry of Health & Family Welfare, the Indian Pharmacopoeia Commision, Ghaziabad, 2007.
16. "United States Pharmacopoeia", USP 32 – NF 27, Vol1 & 2, Asian Edition, 2008.
17. British Pharmacopoeia, 2009

PURPH – 604: PHARMACEUTICAL BIOTECHNOLOGY

3 hrs. /week

UNIT – I

Fermentation Technology

Basic Principles in Fermentation and Application: Intoduction to Fermentation. Screening of Industrially important microbes-primary and secondary screening, Maintenance of stock culture, Strain improvement for increased yield

1. Study of design and working of bioreactor, fermentation media, anaerobic and aerobic fermentation
2. Types of reactors- CSTR, Tower, airlift, bubble column, packed bed-configuration and application

UNIT – II

Bioprocessing of the following industrially important microbial metabolites

- Organic solvent : Alcohol
- Organic acids : Citric acid, Lactic acid
- Antibiotics : Penicillin, Streptomycin, Griseofulvin, Cephalosporins
- Vitamins : Vitamin B_{12}, Riboflavin
- Amino acid: Glutamic acid, Lysine
- Nucleotides: Cyclic AMP and GMP

UNIT – III

Scale up of Fermentation and Down Stream Processing

1. HTST Sterilization, Thermal death kinetics , Downstream processing-Solid liquid separation, Release of intracellular products, concentration, Purification, Formulation.
2. Enzymes – Source, classification, properties, general methods of preparation and purification, application in pharmaceutical industry, therapeutics and clinical analysis.
3. Immobilization of enzymes, methods, advantages and disadvantages
4. Microbial transformation of steroids, general methods employed for transformation, application

UNIT – IV

Microbial Genetics: Genetic organization of prokaryotic and eukaryotic cells, mutation :spontaneous and induced, different types of mutants, classification and different type of mutagenic agents

1. Transformation, Conjugation, Transduction
2. Fundamentals of genetic engineering: Introduction to gene manipulation basic techniques: agarose gel electrophoresis, southern blotting and northern blotting
3. Cutting DNA molecules- restriction endonucleases, joining DNA molecules- DNA ligase, adapters, double linkers and homopolymer tailing
4. Plasmids as cloning vectors: isolation and purification of plasmid, plasmids as cloning vectors, natural and artificial plasmid, pBR 322 plasmid.

UNIT – V

Application of Genetic Engineering:

1. Pharmaceutical production of human insulin, interferon, somatostatin, hepatitis vaccine.
2. Recombinant probes for diagnosis of genetic diseases
3. Protoplast fusion and applications
4. Biodegradation of xenobiotics, chemical and industrial wastes
5. Genetic engineering –patents, moral and ethical values

Books recommended

1. L.E Cassida: "Industrial Microbiology", John Willey and sons, India
2. S. C. Prescott and C. G. Dunn: "Industrial Microbiology", 3rd & 4th edition, McGraw Hill Book Company,
3. Under Koflar and Hickey: "Industrial Fermentation", Vol 1 & 2
4. Biochemistry of Industrial microorganism by Rainbow and Rose
5. Kesav Trehan: "Biotechnology", 1st edition, New Age International (P) Ltd., 2006.
6. Primrose SB and Old Rw,Blackwell: "Principles of Gene Manipulation" Scientific Publications
7. H.D Kumar: "Nucleic Acids and Biotechnology", Vikas Publishing and Company
8. David Freifelder: "Microbial Genetics"
9. Lewin Benjamin: "Genes"
10. P.Stanbury: :Industrial Microbiology",

PURPH – 605: PHARMACOLOGY – IV
(PHARMACOLOGICAL METHODS OF SCREENING)
3 hrs. /week

UNIT – I

Basic principles of screening of drugs for pharmacological activities. Organization of screening for the pharmacological activities of the new substances with emphasis on the evaluation of

a) CNS activities
b) Anti-ulcer
c) Hepatoprotective

UNIT – II

Organization of screening for the pharmacological activities of the new substances with emphasis on the evaluation of

a) Local anesthetics
b) Analgesics
c) Anticonvulsants

UNIT – III

Organization of screening for the pharmacological activities of the new substances with emphasis on the evaluation of

a) Anti inflammatory agents
b) Anti histaminic
c) Antipyretics

UNIT – IV

Organization of screening for the pharmacological activities of the new substances with emphasis on the evaluation of

a) Antifibrilatory agents
b) Cardiotonic agents
c) Diuretics

UNIT – V

a) Cell culture techniques for pharmacological techniques.
b) Toxicity tests: Determination of LD50, acute, sub acute and chronic toxicities studies. Tests for undue toxicity of drugs. International guidelines (ICH recommendations).

Books recommended

1. R. A Turner: "Screening Methods in Pharmacology", Academic Press, London1965
2. H. G. Vogel: "Drug Discovery and Evaluation", 2nd edition ,Springer, Germany,2002.
3. A.Goodman Gilman, T. W. Rall, A.I.S. Nies, and P. Taylor: "Goodman and Gilman's The pharmacological Basis of Therapeutics", 11th Edition, Mc Graw Hill, Pergamon Press 2006.
4. R. Lawrence and A. L. Bacharach: "Evaluation of Drug Activities: Pharmacometrics", Academy Press, London.
5. Nodine Siegler, Animal and Clinical Pharmacological Techniques in DrugEvaluation.
6. Goldsteine: "Principles of Drug Action", John Wiley and Sons, New York

PURPH – 606: PHARMACOTHERAPEUTICS - I

3 hrs. /week

UNIT- I

Cardiovascular system: Hypertension, Congestive cardiac failure, Angina Pectoris, Myocardial infarction, Hyperlipidaemias, Electrophysiology of heart and Arrhythmias

UNIT- II

Musculoskeletal disorders

Rheumatoid arthritis, Osteoarthritis, Gout, Spondylitis, Systemic lupus erythematosus.

Renal system

Acute Renal Failure, Chronic Renal Failure, Renal Dialysis, Drug induced renal disorders

UNIT- III

Nervous system: Epilepsy, Parkinsonism, Stroke, Alzheimer's disease.Pain management including Pain pathways, neuralgias, headaches.

UNIT- IV

Psychiatry disorders: Schizophrenia, Affective disorders, Anxiety disorders, Sleep disorders, Obsessive Compulsive disorders

UNIT- V

Drug interactions: Drug-drug interaction and food drug interaction

Books recommended

1. Roger and Walker: “Clinical Pharmacy and Therapeutics”, Churchill Livingstone Publication.
2. Joseph T. Dipiro et al: “Pharmacotherapy – A Pathophysiologic Approach”, Appleton & Lange.
3. S. L. Robins: ”Pathologic Basis of Disease” W. B. Saunders Publication.
4. Green and Harris: “Pathology and Therapeutics for Pharmacists – A Basis for Clinical Pharmacy Practice”, Chapman and Hall Publication.
5. Eric T. Herfindal: “Clinical Pharmacy and Therapeutics”, Williams and Wilkins Publication.
6. Lloyd Young and Koda: “Applied Therapeutics – The Clinical Use of Drugs”, -Kimble MA
7. Avery’s Drug Treatment, 4th Edn, 1997, Adis International Limited.

PURPH 607: MARKETING MANAGEMENT

3 hrs. /week

UNIT- I Introduction to Marketing:

Definition, Functions & Importance of Marketing, Marketing mix, outlines of marketing information system and its importance, outlines of product life cycle, brief review of Indian Pharmaceutical Industry

UNIT- II Introduction to Advertising

Definition, Problem areas in advertising, types of advertising, systematic advertising - Planning of advertising, media selection, Advertising budget, sales promotion, co-ordination with other marketing tools

UNIT- III Introduction to Management of sales force – detail men

Introduction to personal selling with reference to detailing, selection of the sales force, training of salesman, compensation and motivation of sales force, controlling of sales force.

UNIT- IV Introduction to Channels of Distribution

Definition, distribution of channels, factors determining choice of particular channel, physical distribution costs.

UNIT- V Introduction to Marketing Research

Definition, scope, role and importance of marketing research, types of marketing research, steps involved in marketing research.

Books recommended

1. Philip Kotler & Kevin Lane Keller: "Marketing Management", 12th edition, Prentice Hall of India , New Delhi, 2007.
2. S. A. Sherlekar: "Marketing Management", 14th edition, Himalaya Publishing House, Mumbai, 2008.
3. Rustom S. Davar: "Modern Marketing Management", 7th edition, Universal Book Stall
4. Indian Pharma Reference Guide 2010", kong Posh Publiucations Pvt. Ltd. (www.kppub.com).
5. Subba Rao Chaganti: "Pharmaceutical marketing in India", 1st edition, PharmaMed Press, 2008.

Syllabus for Bachelor of Pharmacy (B. Pharm) 6th Semester (Practical)

PURPH 611: PHARMACEUTICAL TECHNOLOGY – II
(ORAL LIQUIDS AND SEMI SOLID DOSAGE FORMS)
3 hrs. /week

Preparation, evaluation and packaging of

1. Solutions
2. Suspensions
3. Emulsions
4. Ointments
5. Gels
6. Suppositories
7. Eye drops
8. Eye ointments
9. Preparation of selected cosmetic preparations representing the following classes:
   Shampoos
   Cold Cream, Vanishing Cream
   Face powders
   Tooth pastes
   Tooth powder
   Mouth wash
   Calamine lotion

PURPH 612: Pharmacognosy – IV
(Chemistry of Natural Products)
3 hrs. /week

1. Analysis of fixed oils including acid value, saponification value, iodine value.
2. Determination of hydroxyl compounds (phenolic and alcoholic).
3. Isolation of active principles from natural sources (at least four).
   a. Piperine from black pepper
   b. Caffeine from tea
   c. Hesperidine from orange peel

d. citric acid from lemon
4. Determination of aldehydes and ketones in essential oils.
5. Exercises on paper and thin layer chromotographic evaluations of herbal drug constituents

PURPH 613: CHROMATOGRAPHIC METHODS OF ANALYSIS
3 hrs. /week

1. Separation and identification of amino acids by Paper chromatography
2. Preparation of Silica gel TLC plates
3. Separation and identification of amino acids by Thin layer chromatography
4. Separation and identification of sulphonamides by Paper chromatography
5. Separation and identification of sulphonamides by Thin layer chromatography
6. Separation of a mixture of amino acids by Thin layer chromatography
7. Assay of Paracetamol using HPLC

Books Recommended

1. H. Beckett and J. B. Stenlake: "Practical Pharmaceutical Chemistry", Vol- II, 4th edition, CBS publishers,2005
2. Willard, Meritt, Dean, Settle, Wadworth,New York Instrumental method of Analysis, 7 th edition CBS publishers ,New delhi
3. C. Garatt: "Quantitative Analysis of Drugs", 3rd edition, CBS Publishers,2005
4. T. Higuchi & E.B. Hanssen, "Text Book of Pharmaceutical Analysis", 1st edition, A Wiley Inter Science Publications,2005
5. "Indian Pharmacopoeia" Government of India, Ministry of Health & Family Welfare, the Indian Pharmacopoeia Commision, Ghaziabad, 2007.
6. "United States Pharmacopoeia", USP 32 – NF 27, Vol1 & 2, Asian Edition, 2008.
7. British Pharmacopoeia, 2009.

PURPH 614: PHARMACEUTICAL BIOTECHNOLOGY
3 hrs. /week

1. Replica plating
2. Bioutography
3. Determination of MIC by gradient plate method
4. Thermal death kinetics
5. Isolation of bacterial genomic DNA
6. Microbial assay of antibiotic (one level & two level)
7. Isolation of bacterial genomic DNA
8. Isolation of genomic RNA from cauliflower
9. Agarose gel electrophoresis
10. Separation of protein by SDS page
11. Citric acid production
12. Production of wine
13. Purification of enzymes
14. Amylase production in batch culture by immobilization
15. Estimation of protein by lowrys method

Books recommended

1. Microbiology a laboratory manual - 7th edition by Cappuccino, Sherman
2. Published by Dorling Kindersley (india) Pvt .Ltd.
3. Laboratory experiments in microbiology by M.Gopal Reddy ,M.N.Reddy.Himalaya publishing house.
4. Laboratory manual in microbiology by P. Gunasekaran New age international (p) Ltd.
5. Laboratory manual in general microbiology by N.Kannan, Panima publishing corporation.

PURPH 615: PHARMACOLOGY – IV
(PHARMACOLOGICAL METHODS OF SCREENING)
3 hrs. /week

1. Methods of handling experimental animal
2. Standard techniques for injection of drugs, collection of blood samples and feeding of animals
3. Use of anesthetics and cannulation of veins, arteries and trachea.
4. Study of ciliary movement of frog's esophagus
5. Study of local anesthetics by conduction block method
6. Study of local anesthetics by plexus anesthesia method
7. Study of local anesthetics by surface anesthesia method using rabbit cornea
8. Study of local anesthetics by infiltration of anesthesia in guinea pigs.
9. Experiments based on screening methods of various categories of drugs.
   a) CNS stimulant and CNS depressants
   b) Anticonvulsants
   c) Antidepressants
   d) Antiinflamatory
   e) Analgesics
   f) Anti histaminics
   g) Anti pyretics
   h) Diuretics

Books recommended:

1. Nodine Siegler: "Animal and Clinical Pharmacological Techniques in Drug Evaluation".
2. Turner RA: "Screening Methods in Pharmacology", Academic Press, London 1965
3. S. K. Kulkarni & P. C. Dandia: "Hand Book of Experimental Pharmacology", 3rd edition, Vallab Publisher Delhi. 2005.
4. S. K. Kulkarni: "Hand Book of Experimental Pharmacology", 3rd edition, Vallabh Prakashan Publisher, Delhi, 1999.

Syllabus for Bachelor of Pharmacy (B. Pharm) 7th Semester (Theory)

PURPH 701: PHARMACEUTICAL TECHNOLOGY –III (NDDS)
3 hrs. /week

UNIT – I

Targeted Drug Delivery Systems

Introduction to novel drug delivery systems, terminology of drug delivery, Fundamentals & applications, formulation & evaluation of different dosage forms (approaches) for novel drug delivery: liposomes,Niosomes resealed erythrocyes & nanoparticles, microsheres, prodrugs, implant systems, multiple emulsions

UNIT – II

Oral Controlled Drug Delivery Systems

Fundamentals, dissolution controlled, diffusion controlled, ion exchange resins, osmotic based system, pH independent systems & altered density systems

Mucoadhesive Drug Delivery Systems

Mechanism of bioadhesion, mucoadhesive materials, formulation & evaluation of mucoadhesive systems

UNIT – III

Transdermal Drug Delivery Systems

Introduction, types of TDDS, materials employed, evaluation of TDDS

UNIT – IV

Occular Drug Delivery Systems

Approaches of topical occular drug delivery, intraoccular drug delivery

UNIT – V

Nasal & Pulmonary Drug Delivery Systems

Introduction, factors effecting drug delivery (physiological & formulation, mechanical), technologies for nasal & pulmonary drug delivery,

Books recommended

1. Y. W. Chien: “Novel Drug Delivery System”, 2nd edition (Revised and Expanded), vol. 50, Drugs & the Pharmaceutical Sciences, Marcel Dekker, New York, 2007.
2. N. K. Jain: “Advances in Controlled and Novel Drug Delivery”, 1st edition, CBS Publishers & Distributors, New Delhi,
3. S. P. Vyas & R. K. Khar: “Targeted & Controlled Drug Delivery – Novel Carrier Systems”, 1st edition, CBS Publishers & Distributors, New Delhi, 2007.
4. L. V. Allen, N. G. & Popovich H. C. Ansel: “Ansel’s Parmaceutical Dosage Forms and Drug Delivery Systems”, 8th edition, Lipincott William & Wilkins, USA, 2005.
5. J. R. Robinson and V. H. Lee Ed.: “Controlled Drug Delivery – Fundamentals and Applications” 2nd edition (Revised and Expanded), vol. 29, Drugs & the Pharmaceutical Sciences, Marcel Dekker, New York, 2005.

PURPH 702: BIOINFORMATICS
3 hrs. /week

UNIT- I

What are drugs, Drug discovery methods, requirements of a drug: binding, delivery (absorption, distribution), stability (metabolisation, elimination), toxicity and synthesizability. Applications of drug discovery.

UNIT - II

First generation of drug designing: QSAR, pharmacopore patterns, ADME properties, Objective of QSAR, Development of Hansh QSAR equation, QSAR descriptors, Regression analysis, Use of genetic algorithms in QSAR equation, Basic component analysis in QSAR, Methods and achievements in protein engineering and design, MFA, 3-D QSAR.

Second generation of drug designing: Rational drug designing – Target identification, lead identification, lead optimization, Toxicology studies, Preclinical trials, Clinical trails, FDA registration.

UNIT - III

CADD - Computer aided drug development and use of 3 D pharmacopore models, Pharmacopore properties, Receptors – Structure, function, and pharmacology, Ion channels – Structure, function, and pharmacology, Enzymes and enzymes inhibitors, Hydropathy, hydrogen bond, molecular shapes, the practices and limitations of computer assisted drug discovery process.

UNIT - IV

Docking – Principles and methods for Docking, Docking problem, 3-D database search approaches, Methods and tools for study of ligand – receptor binding, rigid body and flexible docking; denovo ligand design; design and use of combinatorial libraries, Finding new drug targets to treat diseases.

UNIT – V

The legal and socioeconomic impacts of biotechnology; public education of the process of the processes of biotechnology involved in generating new forms of life for informed decision making.

Biosafety regulation and national and international guidelines, DNA guidelines, Experimental protocol approval, levels of containment Environmental aspects of biotechnology applications, Use of genetically modified organism and their release in environment, Special procedures for DNA based product production.

Books recommended

1. Andrew R. Leach, “Molecular Modeling – Principles and Applications”, 2nd edition, Prentice Hall.
2. Fenniri.H., “Combinatorial Chemistry – A practical approach”, 1st edition, Oxford University Press.
3. Lednicer, D., “Strategies for Organic Drug Discovery Synthesis and Design”, 1st edition, Wiley International Publishers.
4. Gordon, E.M. and Kerwin, J.F., Wiley “Combinatorial chemistry and molecular diversity in drug discovery”, 1st edition, Liss Publishers.
5. Swatz, M.E., “Analytical techniques in Combinatorial Chemistry”, 1st edition, Marcel Dekker Publishers.
6. Sasson, A., “Biotechnologies and Development”, UNESCO Publications.
7. Sasson, A., “Biotechnologies in developing countries present and future”, UNESCO Publishers.

PURPH 703: ELECTIVE – I
3 hrs. /week

The candidate has to opt for any one of the following electives. The elective in a particular subject shall be offered based on the number of candidates opting for the same.

PURPH 703 -IA: ADVANCED MEDICINAL CHEMISTRY – I
3 hrs. /week

UNIT – I

General Aspects of Medicinal Chemistry

a) A brief history of drugs: from plant extracts to DNA technology.
b) Medicinal Chemistry: definition and objectives, the three main phases of drug activity, drug and disease classification.
c) Drug targets: molecular mechanisms of drug action.

UNIT – II

Lead Compound Discovery Strategies.

a) Strategies in the search for new lead compounds or original working hypotheses.
b) Natural products as pharmaceuticals and sources for lead structures.
c) The contribution of molecular biology to drug discovery.
d) Electronic screening: lead finding from database mining.
e) High speed chemistry libraries: assessment of drug-likeness.

UNIT – III

Primary Exploration of Structure-Activity Relationship

a) Molecular variations in homology series: vinylogues and benzologues
b) Molecular variations based on isosteric replacements.
c) Conformational restrictions and/or steric hindrance in medicinal chemistry.
d) Identical and non-identical twin drugs.
e) Optical isomerism in drugs.
f) Application strategies for the primary structure - activity relationship exploration.

UNIT – IV

Substituents and Functions: Qualitative and Quantitative Aspects of Structure-Activity Relationship

a) Specific substituent groups.
b) The role of functional groups in drug receptor interactions.
c) Compound properties and drug quality.
d) Quantitative approaches to structure-activity relationship**.**

UNIT – V

Combinatorial Chemistry

Introduction, combinatorial approaches, chemical Peptide and small molecule libraries, applications, methodology, combinatorial organic synthesis, assays and screening of combinatorial libraries, introduction to High Throughput Screening.

Reference Books:

1. J. H. Block and J. M. Beale: “Wilson and Gisvold’s Text book of Organic Medicinal and Pharmaceutical Chemistry”, 11th edition, Lippincott-Williams & Wilkins, Philadelphia, 2004.
2. William et al. “Foye’s Principles of Medicinal Chemistry”, 6th edition, Lippincott-Williams & Wilkins, Philadelphia, 2008.
3. D. J. Abraham Ed.: “Burger’s Medicinal Chemistry & drug Discovery”, 6th edition, Vol 1 to 6, John Willey & Sons, Inc., 2007.

4. Andrew R. Leach, "Molecular Modeling – Principles and Applications", 2nd edition, Prentice Hall.
5. Fenniri.H., "Combinatorial Chemistry – A practical approach", 1st edition, Oxford University Press.
6. Lednicer, D., "Strategies for Organic Drug Discovery Synthesis and Design", 1st edition, Wiley International Publishers.
7. Gordon, E.M. and Kerwin, J.F., Wiley "Combinatorial chemistry and molecular diversity in drug discovery", 1st edition, Liss Publishers.
8. Swatz, M.E., "Analytical techniques in Combinatorial Chemistry", 1st edition, Marcel Dekker Publishers.

PURPH 703 -IB: LABELING AND PACKAGING OF DOSAGE FORMS

3 hrs. /week

UNIT – I

Introduction to labelling & Packaging , specifications of packaging, types of packaging materials, factors effecting selection of containers, materials used for containers & closures, drug-container considerations, quality control tests for packaging materials

UNIT – II

FDA Packaging configuration: Film wrappers, Blister package, Strip package, Bubble pack, shrink seals & bands, Foil, paper & plastic pouches, Bottle seals, Tape seals, Breakable caps, Sealed tubes, aerosol containers, sealed cartoons.

UNIT – III

Packaging of solid dosage forms: Packaging and evaluation of powders, granules, tablets, pills & capsules

Packaging of semi-solid dosage forms: Labelling specifications & packaging of ointments, pastes, jels & creams

UNIT – IV

Packaging of liquid dosage forms: Labelling & packaging of oral liquids – solutions, suspensions, emulsions, lotions, gargles, syrups,; parenterals – small volumes & large volumes; ophthalmic preparations – eye drops & eye ointments etc.

UNIT – V

Packaging of aerosols: Components of aerosol packages, material used for containers, components of the valve used in aerosol package,types of actuatuors, stability testing of aerosol container, quality control of aerosol containers

Books recommended:

1. Dean, Evans and Hall Ed. "Pharmaceutical Packaging Technology", 1st edition (1st Indian Reprint), Taylor & Francis, 2006.
2. Leon Lachman, H. A. Lieberman & J. L. Kanig : "The Theory and Practice of Indusrtrial Pharmacy", 3rd edition, Varghese Publishing House, Bombay, 1991.
3. M. E. Aulton: "Pharmaceutics – The Science of Dosage Form Design", 2nd edition, Churchill Livingstone, 2002.
4. G. S. Banker and C.T. Rhodes Ed.: "Modern Pharmaceutics", 4th edition (Revised and Expanded), Drugs and The Pharmaceutical Sciences, Vol. 121, Informa healthcare USA, Inc., 2009.

PURPH 703 -IC: CLINICAL STUDIES

3 hrs. /week

UNIT – I

Drug Development Process:

Introduction

Various Approaches to drug discovery

1. Pharmacological
2. Toxicological
3. IND Application
4. Drug characterization
5. Dosage form

UNIT – II

Clinical Development of Drug:

1. Introduction to Clinical trials
2. Various phases of clinical trial
3. Methods of post marketing surveillance
4. Abbreviated New Drug Application submission
5. Good Clinical Practice – ICH, GCP, Central drug standard control organisation (CDSCO) guidelines

UNIT – III

1. Challenges in the implementation of guidelines
2. Ethical guidelines in Clinical Research
3. Composition, responsibilities, procedures of IRB / IEC
4. Overview of regulatory environment in USA, Europe and India

UNIT – IV

Role and responsibilities of clinical trial personnel as per ICH GCP

a. Sponsor
b. Investigators
c. Clinical research associate
d. Auditors
e. Contract research coordinators
f. Regulatory authority

UNIT – V

1. Designing of clinical study documents (protocol, CRF, ICF, PIC with assignment)
2. Informed consent Process
3. Data management and its components
4. Safety monitoring in clinical trials.

Books recommended:

1. Central Drugs Standard Control Organization. Good Clinical Practices-Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health; 2001.
2. International Conference on Harmonisation of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonised Tripartite Guideline. Guideline for Good Clinical Practice.E6; May 1996.
3. Ethical Guidelines for Biomedical Research on Human Subjects 2000. Indian Council of Medical Research, New Delhi.
4. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March 2005, John Wiley and Sons.

5. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.
6. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.
7. Goodman & Gilman: JG Hardman, LE Limbard, 10th Edn. McGraw Hill Publications, 2001.
8. Chi Jen lee, Lucia H Lee, et.al. , "Clinical Trials of Drugs And Biopharmaceutical" 1st edition, 1996, CRC Taylor & Francis group broken sound parkway, NW, Suite.
9. David machin et.al. "Textbook of clinical trials" 1stedition , 2005,Jonh Wiley & sons td ,Chichester, England .
10. Julia Lloyed , Ann Raven, "Hand Book Of Clinical Research" 2nd edition 2006,Churchill livingstone Edinburgh, London, Tokyo

PURPH 704: DRUG REGULATORY AFFAIRS
3 hrs. /week

UNIT – I

Good Manufacturing practices: GMP and cGMP and salient features of Drugs & Cosmetics Act & Rules with reference to manufacture of drugs in India

Pharmaceutical Validation: Validation of Water systems for sterile & Non Sterile products, cleaning validation, process validation, Equipment validation, Analytical method validation

UNIT – II

Quality Assurance with reference to organization, personnel, Building & facility equipment, Product Control, ware housing, Returned goods & reprocessing

Documentation: Importance, Statutory requirements, Procedure for documentation, critical examination of documents.

UNIT – III

Harmonization of Regulatory Requirements: International Conference on harmonization – History, Process, Stability testing protocol

Intellectual Property Right: Introduction, Objectives, History, Patent Laws in India- Indian Patent act 1970, Indian Patent Act 2005

UNIT – IV

Drug Regulatory agencies: Organization, Regulatory Programme, History of Indian CDSCO, USFDA

Introduction to SOP, TQM, ISO

UNIT – V

Clinical Trials: Phase-I, Phase-II, Phase-III & Phase-IV, Filing of INDA, NDA and ANDA for approval & registration

Books recommended

1. Ira R.Berry, Robert A.Nash: "Pharmaceutical Process Validations"
2. P.P.Sharma: "GMP"
3. D.H.Shab: "Quality Assurance Manual", Business Hortzons
4. Quality Assurance for Pharmaceuticals – Vol-I&II-Pharma Book Syndicate
5. SOP Guidelines – D.H.Shab – Business Horizons

PURPH 705: PHARMACOTHERAPEUTICS-II

3 hrs. /week

UNIT – I

Gastrointestinal system: Peptic ulcer disease, Gastro Esophageal Reflux Disease, Inflammatory bowel disease, Liver disorders - Alcoholic liver disease, viral hepatitis including jaundice, and Drug induced liver disorders.

Ophthalmology: Glaucoma, Conjunctivitis- viral & bacterial

UNIT – II

Endocrine system: Diabetes, Thyroid diseases, Oral contraceptives, Hormone replacement therapy, Osteoporosis

UNIT – III

Dermatology: Psoriasis, Scabies, Eczema, Impetigo

Respiratory system : Introduction to Pulmonary function test, Asthma, Chronic obstructive airways disease, Drug induced pulmonary diseases

UNIT – IV

Oncology: Basic principles of Cancer therapy, General introduction to cancer chemotherapeutic agents, Chemotherapy of breast cancer, leukemia. Management of chemotherapy nausea and emesis

UNIT – V

Infectious disease: Guidelines for the rational use of antibiotics and surgical Prophylaxis, Tuberculosis, Meningitis, Respiratory tract infections, Gastroenteritis, Endocarditis, Septicemia, Urinary tract infections, Protozoal infection, Malaria, HIV & Opportunistic infections, Fungal infections, Viral infections, Gonarrhoea and Syphillis

Text Books:

a. Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone publication.
b. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange.

Books recommended

1. Roger and Walker "Clinical Pharmacy and Therapeutics "4th edition, Churchill Livingstone publication, 2007.
2. Joseph T. Dipiro et al: "Pharmacotherapy – A Pathophysiologic Approach", Appleton & Lange.
3. S. L. Robins:"Pathologic Basis of Disease" W. B. Saunders Publication.
4. Green and Harris: "Pathology and Therapeutics for Pharmacists – A Basis for Clinical Pharmacy Practice", Chapman and Hall Publication.
5. Eric T. Herfindal: "Clinical Pharmacy and Therapeutics", Williams and Wilkins Publication.
6. Lloyd Young and Koda: "Applied Therapeutics – The Clinical Use of Drugs", -Kimble MA
7. Avery's Drug Treatment, 4th Edn, 1997, Adis International Limited.
8. Relevant review articles from recent medical and pharmaceutical literature.

PURPH – 706: PHARMACEUTICAL JURISPRUDENCE

3 hrs. /week

UNIT – I

Pharmacy Act 1948

UNIT –II

Drug & Cosmetic Act 1940 & Rules 1945

UNIT –III

Medicinal & Toilet Preparations (Excise Duties) Act 1955
Narcotic Drugs & Psychotropic Substances Act 1985
Drugs & Magic Remedies (Objectionable Advertisements) Act 1954 & Rules 1955

UNIT – IV

Prevention & Cruelty to Animal Act 1960
Medical Termination of Pregnancy Act 1971
Drugs (Price Control Order) Act 1995
Poisons Act 1919

UNIT – V

Code of Ethics

Books recommended

1. B. M. Mithal: "A Text Book of Forensic Pharmacy", 10th edition (11th reprint), Vallabh Prakashan, 2009.
2. N. K. Jain: "A Text Book of Forensic Pharmacy", 7th edition, Vallabh Prakashan, 2008.
3. Kokate and Gokhale: "Text Book of Forensic Pharmacy" 1st edition, Pharma Book Syndicate, 2006.
4. Drug & Cosmetic Act & Rules Published by Government of India
5. Pharmacy Act Published by Government of India

PURPH 707: INSTRUMENTAL METHODS OF ANALYSIS

3 hrs. /week

UNIT - I

- Absorption spectroscopy- theory of electronic , atomic and molecular spectra ,Beer Lambert's law applications and its derivatives, limitations of beer's law, applications of beer's law to single component and multi component systems, chromophores, auxochromes, bathochromic shift, hypsochromic shift, hyperchromic and hypochromic effects, effect of solvent on absorption spectra, molecular structure and infrared spectra.

- UV-Visible spectroscopy- instrumentation and working, sources of radiation, wavelength selectors-filters, prisms and gratings(monochromators), sample cells, detectors-photocell, barrier layer cell, phototube, diode array, construction of single beam and double beam spectrophotometers ,applications of UV-Visible spectroscopy in pharmacy and spectrophotometric titrations.

UNIT - II

- Infra red spectroscopy-Vibrational transitions, frequency structure correlations , infra red absorption bands , instrumentation –IR spectrometer , sources of IR, collimating systems, monochromators , sample cells, sample handling methods, detectors-thermocouple, golay cells, thermistor, bolometer , pyroelectric detector, instrumentation

- Nephalometry and Turbidimetry-general principles involved , instrumentation, applications in pharmacy.

UNIT - III

- Fluorimetric analysis-theory, concept of singlet and triplet electronic states, internal and external conversions, intersystem crossing , factors affecting fluorescence, quenching, instrumentation- study of fluorimeter, spectrofluorimeter, applications.

- Polarimetry(introduction only)- introduction to optical rotatory dispersion, circular dichorism, polarimeter.

- Flame photometry-theory, nebulization, flame, flame temperatures, interferences, flame spectrometric techniques and instrumentation, pharmaceutical applications.

- Atomic absorption spectrometry- introduction ,theory ,instrumentation, applications.

UNIT – IV

- Nuclear magnetic resonance(NMR)- basic principle, instrumentation, applications
- Mass spectroscopy- basic principle, instrumentation, applications

UNIT – V

- Thermal methods of analysis- DSC, DTA,TGA- introduction ,instrumentation, applications
- Radio immuno assay and ELISA

Books recommended

1. H. Beckett & J. B. Stenlake: "Practical Pharmaceutical Chemistry", 4th edition, Part-2, CBS Publishers, New Delhi, 2005.
2. B.K.Sharma, Instrumental and Chemical Analysis, Goelpublishers
3. Chatwal & Anand: "Instrumental Methods of Analysis", 5th edition,Himalaya publishing house, 2008
4. Mendham et al.: "Vogel's Text book of Quantitative Analysis", 6th edition, Pearsons Education Ltd., 2008.
5. K.A.Connors: "A Text Book of Pharmaceutical Analysis", 3rd edition, John Wiley & Sons, 2007.
6. Robert.D.Brown: "Introduction to Instrumental Analysis", Pharma Book Syndicate, 2006
7. Gary.D.Christian: "Analytical Chemistry", 6th edition, John Wiley & Sons, 2007.
8. D..A.Skoog, ,F.J.Holler:,T.A.Nieman "Principles of instrumental analy*sis*",5th edition Thomson,Brooks/Cole,2005
9. Willard, Meritt, Dean, Settle, Wadworth,New York Instrumental method of Analysis, 7 th edition , CBS publishers ,New delhi
10. Indian Pharmacopoeia" Government of India, Ministry of Health & Family Welfare, the Indian Pharmacopoeia Commision, Ghaziabad, 2007.
11. "United States Pharmacopoeia", USP 32 – NF 27, Vol 1 & 2, Asian Edition, 2008.
12. British Pharmacopoeia",British Pharmacopoeia commision, The Stationary Office,6th edition, 2009.
13. Y.R.Sharma, "Elementary Organic Absorption Spectroscopy", S.Chand&Co.., New Delhi
14. R.M.Silverstein & G.C.Bassler, "Spectrometric identification of organic compounds",John Wiley& sons

Syllabus for Bachelor of Pharmacy (B. Pharm) 7th Semester (Practical)

PURPH 711: PHARMACEUTICAL TECHNOLOGY –III

3 hrs. /week

1. Preparation & Evaluation of Microspheres
2. Preparation & Evaluation of Matrix Tablets
3. Formulation & Evaluation of Film Coated Tablets
4. Formulation & Evaluation of Enteric Coated Tablets
5. Evaluation of Marketed SR Formulation
6. Formulation & Evaluation of Mucoadhesive Drug Delivery System

PURPH 712: BIOINFORMATICS

3 hrs. /week

1. QSAR
2. 3D-QSAR.
3. Docking of polypeptide ligand into a protein.
4. Evaluation of synthesizability and ease of formulation.
5. Modeling of signal transduction pathways and networks.
6. KEGG pathway databases.
7. To carry out energy minimization in a protein/nucliec acid/carbohydrate.

PURPH 713: ELECTIVE-I

PURPH 713 -IA: ADVANCED MEDICINAL CHEMISTRY-I

3 hours/week

***PURPH 713: Elective-I (Seminar)**

Every candidate shall present two to three seminars covering the topics of each unit of the respective elective paper (Total of atleast 10 seminars shall be presented by each candidate covering the topics of all 5 Units of the respective elective paper). The candidate shall also submit a typed report for each seminar. Each seminar shall be evaluated by the concerned teacher along with the teacher(s) / committee as may be appointed by the Principal as a part of the continuous assessment activity. There shall be no end semester seminar examination for the PURPH 713 – IA.

PURPH 713 -IB: LABELING AND PACKAGING OF DOSAGE FORMS

3 hours/week

***PURPH 713: Elective-I (Seminar)**

Every candidate shall present two to three seminars covering the topics of each unit of the respective elective paper (Total of atleast 10 seminars shall be presented by each candidate covering the topics of all 5 Units of the respective elective paper). The candidate shall also submit a typed report for each seminar. Each seminar shall be evaluated by the concerned teacher along with the teacher(s) / committee as may be appointed by the Principal as a part of the continuous assessment activity. There shall be no end semester seminar examination for the PURPH 713 – IB.

PURPH 713–IC: CLINICAL STUDIES

3 hours/week

*** PURPH 713: Elective-I (Seminar)**

Every candidate shall present two to three seminars covering the topics of each unit of the respective elective paper (Total of atleast 10 seminars shall be presented by each candidate covering the topics of all 5 Units of the respective elective paper). The candidate shall also submit a typed report for each seminar. Each seminar shall be evaluated by the concerned teacher along with the teacher(s) / committee as may be appointed by the Principal as a part of the continuous assessment activity. There shall be no end semester seminar examination for the PURPH 713 – IC.

PURPH 714: INSTRUMENTAL METHODS OF ANALYSIS

3 hrs. /week

1. Determination of absorption maxima for a given solution of the drug($KMnO_4$)
2. Colorimetric estimation of ferrous ions using 1,10phenanthroline
3. Quantitative determination of official drugs and pharmaceuticals by Colorimetry – Dextrose, Dapsone, Salbutamol, Analgin ,etc.,
4. Quantitative determination of official drugs and pharmaceuticals by UV-Visible spectrophotometry- Paracetamol , Nimesulide , Ibuprofen, etc.,
5. Estimation of Riboflavin in formulation by Fluorimetry
6. Estimation of Quinine sulphate by Fluorimetry
7. Nephelometric determination of sulphates
8. Determination of Sodium/Potassium by Flame photometry
9. Determination of Dextrose in Dextrose injection by Polarimetry
10. Infra red spectral graphs /peak identification of samples with different functional groups (-COOH, -COOR, -CONHR, -NH_2, -NHR, -OH, -CHO, -C=O,)

Books recommended

1. H. Beckett & J. B. Stenlake: "Practical Pharmaceutical Chemistry", 4th edition, Part-2, CBS Publishers, New Delhi, 2005.
2. D.. C. Garatt: "Quantitative Analysis of Drugs", 3rd edition, CBS Publishers,2005
3. T. Higuchi & E.B. Hanssen, "Text Book of Pharmaceutical Analysis", 1st edition, A Wiley Inter Science Publications,2005
4. Indian Pharmacopoeia" Government of India, Ministry of Health & Family Welfare, the Indian Pharmacopoeia Commision, Ghaziabad, 2007.
5. "United States Pharmacopoeia", USP 32 – NF 27, Vol1 & 2, Asian Edition, 2008.
6. British Pharmacopoeia",British Pharmacopoeia commision, The Stationary Office,6th edition, 2009.
7. Willard, Meritt, Dean, Settle, Wadworth,New York Instrumental method of Analysis, 7 th edition CBS publishers ,New delhi

PURPH 715: PROJECT WORK & SEMINAR (LITERATURE REVIEW)

Syllabus for Bachelor of Pharmacy (B. Pharm) 8th Semester (Theory)

PURPH 801: PHARMACEUTICAL TECHNOLOGY –IV (PARENTERAL AND SPECIAL PREPARATIONS)
3 hrs. /week

UNIT - I

Parenterals: Unique characteristics of parenteral dosage forms, Route of parenteral administration, formulation principles, General guidance for developing formulation of parenteral drugs, Types of parenteral dosage form, General manufacturing process, Water for injection: types, preparation, storage, distribution & purity, Containers: types & physical characterization, closures: materials & composition, Pyrogen: source & control, Production facilities: functional areas, maintenance of clean rooms: personnel, environmental control evaluation, Production procedures, Quality assurance & control.

UNIT - II

Ophthalmic Preparations: Introduction, Types of ophthalmic dosage forms, Mode of drug administration, General safety consideration, Manufacturing considerations, Manufacturing environment, Manufacturing techniques, Raw materials, Equipments used in ophthalmic preparation, Ophthalmic preparation characteristics.

UNIT - III

Pharmaceutical Aerosols: Components of aerosol package, Formulation of pharmaceutical aerosols, Stability testing, Manufacture of pharmaceutical aerosols, Quality control tests.

UNIT - IV

Suppositories: Introduction- dose characteristics, Therapeutic uses, Factors affecting drug absorption from suppository, Suppository base-Ideal characteristics, Types, Manufacturing, Specific problems in formulating suppository, Testing of suppository, Packaging of molded suppositories, Stability problems.

UNIT - V

Radiopharmaceuticals: Background information, Diagnostic imaging, therapeutic use of radiopharmaceuticals, Radiopharmaceuticals, Positron Emission Tomography, Drug antidote for radiation exposure, Non-radioactive pharmaceutical use in Nuclear medicine, Practice of nuclear Pharmacy: procurement & storage, preparation, quality assurance & distribution of radiopharmaceuticals.

Books recommended

1. Leon Lachman, H. A. Lieberman & J. L. Kanig : "The Theory and Practice of Indusrtrial Pharmacy", 3rd edition, Varghese Publishing House, Bombay, 1991.
2. M. E. Aulton: "Pharmaceutics – The Science of Dosage Form Design", 2nd edition, Churchill Livingstone, 2002.
3. L. V. Allen, N. G. &Popovich H. C. Ansel: "Ansel's Parmaceutical Dosage Forms and Drug delivery systems", 8th edition, Lipincott William & Wilkins, USA, 2005.
4. "Remington: The Science and Practice of Pharmacy", 21st edition, Lippincott William & Wilkins, USA, 2006
5. K. E. Avis, , H. A. Lieberman, Leon Lachman Ed.: "Parmaceutical Dosage Forms: Parenteral Medications", 2nd edition (Revised and Expanded), Vol. 1, 2 & 3, Informa HealthcareUSA, Inc., Vol – 1,2 & 3, New York, 2008.

PURPH 802: PHARMACEUTICAL TECHNOLOGY –V
(EVALUATION OF PHARMACEUTICAL DOSAGE FORMS)
3 hrs. /week

UNIT – I

In –Process Quality Control Tests for Solid Dosage Forms –Tablets, Evaluation of Tablets, capsules, microspheres & microcapsules.

UNIT – II

In –Process Quality control tests for semisolid dosage forms – Ointment, Paste, Gels, Creams, Suppositories, Evaluation of final dosage forms

UNIT – III

Evaluation & quality control tests of liquid dosage forms with special reference to Emulsions, Suspensions, stability of biphasic liquid dosage forms

UNIT – IV

In –Process Quality control tests for sterile dosage dosage forms – Parenterals, Ophthalmic Preparations

Evaluation of sterile dosase forms & their containers

UNIT – V

Evaluation of aerosols.

Evaluation of different Pharmaceutical Packaging materials

Books recommended

1. Leon Lachman, H. A. Lieberman & J. L. Kanig : "The Theory and Practice of Indusrtrial Pharmacy", 3rd edition, Varghese Publishing House, Bombay, 1991.
2. M. E. Aulton: "Pharmaceutics – The Science of Dosage Form Design", 2nd edition, Churchill Livingstone, 2002.
3. L. V. Allen, N. G. & Popovich H. C. Ansel: "Ansel's Parmaceutical Dosage Forms and Drug delivery systems", 8th edition, Lipincott William & Wilkins, USA, 2005.
4. "Remington: The Science and Practice of Pharmacy", 21st edition, Lippincott William & Wilkins, USA, 2006.
5. H. A. Lieberman, Leon Lachman, J. B. Schwartz Ed.: "Parmaceutical Dosage Forms: Tablets", 2nd edition (Revised and Expanded), Vol. 1, 2 & 3, Marcel Dekker Inc.,Vol – 1, 2 & 3, New York, 2008.
6. H. A. Lieberman, M. M. Rieger and G. S. Banker Ed.: "Parmaceutical Dosage Forms: Disperse System", 2nd edition (Revised and Expanded), Vol. 1, 2 & 3, Marcel Dekker Inc.,Vol – 1, 2 & 3, New York, 2005.
7. K. E. Avis, , H. A. Lieberman, Leon Lachman Ed.: "Parmaceutical Dosage Forms: Parenteral Medications", 2nd edition (Revised and Expanded), Vol. 1, 2 & 3, Informa healthcare USA, Inc., Vol – 1, 2 & 3, New York, 2008.
8. G. S. Banker and C.T. Rhodes Ed.: "Modern Pharmaceutics", 4th edition (Revised and Expanded), Drugs and The Pharmaceutical Sciences, Vol. 121, Informa healthcare USA, Inc., 2009.

PURPH 803: ELECTIVE–II

The candidate has to opt for any one of the following electives. The elective in a particular subject shall be offered based on the number of candidates opting for the same.

PURPH 803 –IIA: ADVANCED MEDICINAL CHEMISTRY – II
3 hours/week

UNIT - I

Synthon approach:

Definition of terms - disconnection, synthon, functional group interconversion (FGI),Basic rules in Disconnection, Use of synthon approach in synthesis of following compounds: Trimethoprim, Terfenadine, lbuprofen, Propanolol, Fentanyl, Ciprofloxacin, Cimetidine Piroxicam, Rosiglitazone, Diclofenac, Captopryl, Nifedipine, Losartan.

UNIT - II

Receptor mapping and QSAR:

a. Receptor theories, Stereochemical aspects of drug action
b. Pharmacophore identification and receptor mapping
c. Three dimensional quantitative structure property relationships (CoMFA, CoMSIA)

UNIT - III

Protein modeling and rational drug design

a. Protein crystallography, homology modelling and drug discovery
b. Docking and Structure based drug design

UNIT - IV

a. Chemical Modifications Influencing the Pharmacokinetic properties
b. Xenobiotics, Biotransformation reactions, Designing safer drugs

UNIT - V

a. Designing prodrugs and bioprecursors
b. Macromolecular carriers for drug targeting

Books recommended

1. J. H. Block and J. M. Beale: "Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry", 11th edition, Lippincott-Williams & Wilkins, Philadelphia, 2004.
2. William et al. "Foye's Principles of Medicinal Chemistry", 6th edition, Lippincott-Williams & Wilkins, Philadelphia, 2008.
3. D. J. Abraham Ed.: "Burger's Medicinal Chemistry & drug Discovery", 6th edition, Vol 1 to 6, John Willey & Sons, Inc., 2007.
4. Andrew R. Leach, "Molecular Modeling – Principles and Applications", 2nd edition, Prentice Hall.
5. Fenniri. H., "Combinatorial Chemistry – A practical approach", 1st edition, Oxford University Press.
6. Lednicer, D., "Strategies for Organic Drug Discovery Synthesis and Design", 1st edition, Wiley International Publishers.
7. Gordon, E.M. and Kerwin, J.F., Wiley "Combinatorial chemistry and molecular diversity in drug discovery", 1st edition, Liss Publishers.
8. Swatz, M. E., "Analytical techniques in Combinatorial Chemistry", 1st edition, Marcel Dekker Publishers.

PURPH 803–IIB: COSMETIC TECHNOLOGY
3 hours/week

UNIT –I

Fundamentals of cosmetic technology, classification of cosmetics, A brief study of raw materials used for Cosmetic preparations: surfactants, humectants, cream bases, aerosol propellants, perfumes, colours.

UNIT -II

Stability aspects of cosmetics: Shelf-life, effects of environmental factors like light, temperatures etc on product stability.

Quality control tests of different cosmetic products, Packaging of Cosmetics

UNIT -III

Skin Care Products: Anatomy and physiology of skin, formulation of skin cleaners, moisturizers, sunscreen products, acne products, anti ageing creams.

UNIT -IV

Hair Care Products: Hair structure, Shampoos, Conditioners, Setting lotion, Hair creams, Hair dyes.

Dental products: Dentifrices, Oral rinses, Tooth powder, Tooth paste.

UNIT -V

Colour Cosmetics: Introduction, lip colour, nail polish, face make-up, eye make-up.

Personal Hygiene Products: Shaving creams, after shave products.

Books recommended

1. H. Butler Ed.: "Paucher's Perfumes, Cosmetics & Soaps", 10th edition (1st Indian edition), Springer (India) Pvt. Ltd.
2. M.S. Balsan & E. Sagari: "Cosmetics-Science & Technology", 2nd ed., Vol. I to III, Willey Interscience 2008.
3. Cosmetics: Formulation, manufacturing, and Quality control by P.P.Sharma
4. B.M. Mithal, R.N. Saha: "A Handbook of Cosmetics", 1st edition (Reprint), Vallabh Prakashan, Delhi, 2010.
5. K. Sampath: " A Concise Book of Cosmetic", 2nd edition, Birla Publications Pvt. Ltd., 2008.
6. The Theory and Practice of Industrial Pharmacy by Lachman L., Liberman, H.A.
7. Modern Cosmetics by Thomson, E.G.
8. Hary's cosmeticology by J.B.Wilkimsson.

PURPH 803–IIC : HERBAL DRUG TECHNOLOGY
3 hours/week

UNIT – I

Definition of Herbal drug, Importance of Herbal therapies, Herbal verses conventional drugs, Safety in herbal drugs, Toxicity in Herbals and their interactions.

UNIT - II

Herbs used as nutraceuticals and healing agents

Herbal cosmetics.

UNIT - III

Making and using herbal medicines for common ailments like cold, skin infections and diarrhoea.

UNIT - IV

Analytical Profiles of selected herbs – Brahmi Aradrographis paniculata, Aegle marmelos and Gymnema sylvestre.

UNIT - V

Quality Control and Quality Assurance of Herbal ingredients as per W.H.O. guidelines – Determination of tannins, Ash value, Extractable matter and Pesticide residues.

Books recommended

1. Trease and Evan's Pharmacognosy 15th edition
2. Indian Herbal Pharmacopeia Vol-I and II
3. Quality Control methods for medicinal plant material by W.H.O., Geneva.
4. Quality Control of Herbal drugs by Dr. Pulak K. Mukherjee
5. Botanical safety hand book by Michael Meguffin, Christopher Hobbs published by American Herbal Product Association.
6. Herbal drugs by P.Mukherjee

PURPH 804: PHARMACY PRACTICE-II
3 hrs. /week

UNIT- I

Organization and structure: Organization of a hospital and hospital pharmacy, Responsibilities of a hospital pharmacist, Responsibility of various divisions of hospital pharmacy, Pharmacy and therapeutic committee, Budget preparation and implementation, hospital pharmacy policies.

UNIT- II

Hospital Formulary: Contents, Preparation and revision of hospital formulary.

Drug store Management and Inventory Control: (a) Organization of drug store, Types of materials stocked, storage conditions. (b) Purchase and Inventory control principles, purchase procedures, Purchase order, Procurement and stocking

UNIT – III

Drug Distribution System: Types of distribution system, Outpatient dispensing, method adopted; Dispensing of drug to in-patients, drug distribution to ambulatory patients, distribution of controlled drugs, changing policy, labeling.

Central Sterile Supply Units and their Management: Types of materials for sterilization, Packaging of materials prior to sterilization, Sterilization facilities, equipments & methods, Distribution of sterile materials.

UNIT – IV

Manufacture of Sterile & Non-sterile Products: Policy making of manufacturable items, Demands & Costing, Personnel requirements, Manufacturing practice, Master formula card, Production control, manufacturing records

Surgical Products: Definition, Primary wound dressing, Adsorbents, Surgical cotton, Surgical gauzes, Bandages, Adhesive tapes, Protective cellulosic hemostatics, Dressings, Absorbable & Non-absorbable sutures, Ligatures, Catguts

UNIT – V

Drug Information Services: Sources of information on drugs, disease, Treatment schedule, procurement of information, Computerizes service (e.g. MEDLINE), Retrieval of information, Medication error.

Records and reports: Prescription filling, Drug profile, Patient medication profile, Cases on drug interaction and Adverse reactions, Idiosyncratic cases Etc.

Books recommended

1. W. E. Hassan: "Hospital Pharmacy", Lee & Febiger, Philadelphia
2. P. C. Dandiya & M. Mathur: "A Text Book of Hospital & Clinical Pharmacy", 4th edition, Vallabh Prakashan, 2009.
3. Qadry et al.: "A Text-Book of Hospital Pharmacy", 10th edition, B. S. Shah Prakashan, 2009.
4. Tipnis and Baja: "Hospital Pharmacy", 1st edition

PURPH 805: BIO PHARMACEUTICS & PHARMACOKINETICS

3 hrs. /week

UNIT – I

1. Introduction to biopharmaceutics and pharmacokinetics and their role in information development and clinical setting.

2. Biopharmaceutics- Passage of drug across biological barrier (Passive diffusion, Active transport, Facilitated diffusion and Pinocytosis), Factors influencing absorption- Physicochemical, Physiological and Pharmaceutical.

UNIT – II

1. Drug distribution in the body and factors influencing drug distribution, Volume of distribution and distribution coefficient.

2. Protein binding, Factors affecting protein-drug binding and its Significance.

UNIT – III

1. Metabolism- Pathway of drug metabolism, First pass effect, Enzyme induction and Inhibition and their influence on drug activity.

2. Clearance concept, Mechanism of renal clearance, Clearance Ratio, Determination of renal clearance, Extraction ratio, Hepatic clearance, Enterohepatic cycling, Billiary excretion and Extrahepatic circulation.

3. Pharmacokinetic drug interactions- Mechanism of drug interaction, Drug interactions at absorption, distribution, metabolism and excretion (ADME) pathways. Pharmacodynamic drug interactions in polypharmacy, food-drug interactions.

UNIT – IV

1. Pharmacokinetics- Plasma drug concentration-time profile, Pharmacokinetic parameters, Rates, Rate constants and order of reaction (Zero order, First order and mixed order), Different pharmacokinetic models and their significance.

2. Compartment kinetics- One compartment model based pharmacokinetic derivations (Involving the concepts of (A) experimentally determines rate constant by Wagner Nelson and Loo-reiglman method. (B) Method of Residual (Curve fitting) (C) Trapezoidal rule) for the following modes of drug administration.
   - Single dose
   - Repeated/Multiple dosing (Plasma data)
   - Continuous or constant rate administration (Infusion)

3. Nonlinear pharmacokinetics- Cause of nonlinearity, Michaeliss Menten equation, Estimation of Km and Vmax, Detection of non-linearity (Saturation mechanism).

UNIT – V

1. Bioavailability: Types of bioavailability, Measurement of bioavailability- Cmax, Tmax, and AUC and their significance, Relation between drug dissolution and bioavailability, *In-vivo-in-vitro* correlation, Methods for enhancement of bioavailability.

2. Bioequivalence: Equivalence type, Design of single dose bioequivalence study and related statistics.

Books recommended

1. L. Shargel, & ABC.Yu: "Applied Biopharmaceutics & Pharmacokinetics", Appleton and Lange, Connecticut, USA.
2. Milo Gibaldi: "Biopharmaceutics and Clinical Pharmacokinetics", 4th edition (Indian Reprint), PharmaMed Press, 2008.
3. Notari : Biopharmaceutics and Clinical Pharmacokinetics
4. M. Brahmankar and Sunil B. Jaiswal: Biopharmaceutics and Pharmacokinetics – A Treatise", 2nd edition, Vallabh Prakashan, Delhi, 2009.
5. Venkateswarulu: "Biopharmaceutics and Pharmacokinetics", 1st edition, PharmaMed Press, 2008.
6. Leon Lachman, H. A. Lieberman & J. L. Kanig: "The Theory and Practice of Indusrtrial Pharmacy", 3rd edition, Varghese Publishing House, Bombay, 1991.
7. G. R. Chatwal: "Biopharmaceutics and Pharmacokinetics", 1st edition, Himalaya Publishing House, 2003.

PURPH 806: COMPREHENSIVE VIVA – VOCE

PURPH 811: PHARMACEUTICAL TECHNOLOGY - IV
(PARENTERAL AND SPECIAL PREPARATIONS INCLUDING EVALUATION OF PHARMACEUTICAL DOSAGE FORMS)

3 hrs. /week

1. Preparation, Sterilization & Filling of Ascorbic acid injection I.P.
2. Evaluation of Ascorbic acid injection I.P.
3. Manufacture of Calcium gluconate injection
4. Preparation of Sodium chloride infusion
5. Preparation of Dextrose I.V. Infusion I.P.
6. Manufacture of Dextrose & Sodium chloride infusion
7. Performance of test for sterility of marketed parenteral preparations and eye preparations

Syllabus for Bachelor of Pharmacy (B. Pharm) 8th Semester (Practical)

PURPH 812: PHARMACEUTICAL TECHNOLOGY –V
(EVALUATION OF PHARMACEUTICAL DOSAGE FORMS)

1. Evaluation of market samples of solid dosage forms: Tablets, Capsules etc.
2. Evaluation of market samples of liquid dosage forms: Suspensions, Emulsions, Oral Liquids
3. Evaluation of market samples of semi-solid dosage forms: Ointments, Creams, and Pastes
4. Evaluation of market samples of parenterals, other dosage forms and Cometics
5. Determination of ANC value of marketed Antacid Tablets.
6. Determination of ANC value of marketed Antacid Suspensions.

PURPH 813: ELECTIVE-II

PURPH 813-IIA: ADVANCED MEDICINAL CHEMISTRY – II
3 hrs. /week

*** PURPH 813: Elective-II (Seminar)**

Every candidate shall present two to three seminars covering the topics of each unit of the respective elective paper (Total of atleast 10 seminars shall be presented by each candidate covering the topics of all 5 Units of the respective elective paper). The candidate shall also submit a typed report for each seminar. Each seminar shall be evaluated by the concerned teacher along with the teacher(s) / committee as may be appointed by the Principal as a part of the continuous assessment activity. There shall be no end semester seminar examination for the PURPH 813 – IIA.

PURPH 813-IIB: COSMETIC TECHNOLOGY
3 hours/week

*** PURPH 813: Elective-II (Seminar)**

Every candidate shall present two to three seminars covering the topics of each unit of the respective elective paper (Total of atleast 10 seminars shall be presented by each candidate covering the topics of all 5 Units of the respective elective paper). The candidate shall also submit a typed report for each seminar. Each seminar shall be evaluated by the concerned teacher along with the teacher(s) / committee as may be appointed by the Principal as a part of the continuous assessment activity. There shall be no end semester seminar examination for the PURPH 813 – IIB.

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PURPH 813-IIC: HERBAL DRUG TECHNOLOGY
3 hours/week

*** PURPH 813: Elective-II (Seminar)**

Every candidate shall present two to three seminars covering the topics of each unit of the respective elective paper (Total of atleast 10 seminars shall be presented by each candidate covering the topics of all 5 Units of the respective elective paper). The candidate shall also submit a typed report for each seminar. Each seminar shall be evaluated by the concerned teacher along with the teacher(s) / committee as may be appointed by the Principal as a part of the continuous assessment activity. There shall be no end semester seminar examination for the PURPH 813 – IIC.

PURPH 814: PROJECT WORK (PRACTICAL WORK) & SEMINAR, VIVA-VOCE

Project dissertation (Preface, Objectives General Introduction, Drug profile, Review of Literature, Plan of work, Methodology/ Experimental work and Investigations, , Interpretation and analysis of data, Results and Discussion, summary, Bibliography/ References, Scope for further work.

PURPH 815: PRACTICAL TRAINING/ VISITS