SRI RAMACHANDRA

MEDICAL COLLEGE AND RESEARCH INSTITUTE

(DEEMED UNIVERSITY)

Porur, Chennai - 600 116

(2014-2015 Batch onwards)

REGULATIONS AND SYLLABUS FOR

BACHELOR OF PHARMACY DEGREE COURSE

[Credit Based System]

SRI RAMACHANDRA MEDICAL COLLEGE AND RESEARCH INSTITUTE (DEEMED UNIVERSITY)

Porur, Chennai - 600 116

REGULATIONS FOR

BACHELOR OF PHARMACY DEGREE COURSE

[Credit Based System]

In exercise of the powers conferred by Rule 8 B (a) of the Memorandum of Association & Rules and clause 21 of Bye-laws of Sri Ramachandra Medical College and Research Institute (Deemed University), Porur, Chennai - 600 116, the Academic Senate of the University hereby makes the following regulations:-

SHORT TITLE AND COMMENCEMENT

These regulations may be called "THE REGULATIONS FOR BACHELOR OF PHARMACY DEGREE COURSE OF SRI RAMACHANDRA MEDICAL COLLEGE AND RESEARCH INSTITUTE (DEEMED UNIVERSITY) PORUR, CHENNAI-600116".

These regulations shall be deemed to have come into force from the academic year 1998-1999. These regulations are subject to such modifications as may be approved by the Academic Senate from time to time.

[These revised regulations & syllabus are amended up to June 2005 and effective from the academic year 2005-2006 onwards]

ELIGIBILITY FOR ADMISSION

(a) A candidate desiring to join the four year programme leading to the Bachelor of Pharmacy Degree should have passed the HSC/CBSE/ISC or equivalent examination and obtained not less than 45% of marks in the aggregate in

  (i) Physics, Chemistry, Biology (or Botany & Zoology); or

  (ii) Physics, Chemistry, Mathematics subjects taken together at the qualifying examination after a period of 12 years of study.

(b) A candidate shall, at the time of admission, submit to the Head of the Institution, a Certificate of Medical Fitness from an authorized Medical Officer certifying that the candidate is physically fit to undergo the academic course and does not suffer from any disability or contagious disease.

AGE LIMIT FOR ADMISSION

Every candidate should have completed the age of 17 years as on 31st December of the year of admission.

ELIGIBILITY CERTIFICATE

Candidates who have passed any qualifying examination other than the Higher Secondary Course examination conducted by the Government of Tamil Nadu shall obtain an Eligibility Certificate from Sri Ramachandra Medical College and Research Institute (Deemed University) and produce it at the time of admission.

REGISTRATION

A candidate admitted to the course shall register his/her name with the Deemed University by submitting application form for registration duly filled in, along with the prescribed fee, through the Head of the Institution within the stipulated date.

DURATION OF THE COURSE

The duration of the Bachelor of Pharmacy Degree Course shall be four academic years comprising eight semesters.

COMMENCEMENT OF THE COURSE

The course shall commence ordinarily from 1st July of the academic year.

COMMENCEMENT OF THE EXAMINATIONS

There shall be two sessions of University examinations in an academic year, viz., April and November.

CUT-OFF DATES FOR ADMISSION TO THE EXAMINATION

The candidates admitted from 1st July to 31st August of the academic year shall be registered to take their first semester examination, after fulfillment of the regulations concerned, in the month of December of that academic year.

The candidates admitted from 1st September to 30th September of the academic year shall be registered to take up their first semester examinations, after fulfillment of the regulations concerned, in the month of April of the next year, along with the second semester examinations.

MEDIUM OF INSTRUCTION

English shall be the medium of instruction for all subjects of study and examinations will be conducted only in English.

CURRICULUM

The curriculum and the syllabus for the course shall be as prescribed by the Academic Senate of the Deemed University and may be modified from time to time.

WORKING DAYS IN A SEMESTER

Each semester shall consist of not less than 100 working days.

ATTENDANCE REQUIRED FOR ADMISSION TO EXAMINATIONS

(a) No candidate shall be permitted to appear for the University examinations, unless he/she attends the course for the prescribed period and produces the necessary certificate of attendance and satisfactory conduct from the Head of the Institution.

(b) Every candidate is required to put in a minimum of 80% of attendance both in theory and practical separately in each subject for admission to the examination.

(c) A candidate lacking in the prescribed attendance in any subject in theory and /or practical shall not be admitted to the entire examination.

CONDONATION OF LACK OF ATTENDANCE

(a) Discretionary power of condonation of shortage of attendance up to a maximum of 10% of minimum attendance prescribed for admission to the examination rests with the Vice-Chancellor. A candidate lacking in attendance should submit an application in the prescribed form remitting the prescribed fee, 15 days prior to the commencement of the theory examination to the University through the Head of the Institution.

(b) The Head of the Department and the Head of the Institution should satisfy themselves on the reasonableness of the candidate's request while forwarding the application of the candidate to the Controller of Examinations who would obtain the Vice-Chancellor's approval for admission to the examination. No application shall be considered if it is not forwarded through proper channel.

(c) The Head of the Institution, while recommending and forwarding the application for condonation should take into consideration the following circumstances:-

(i) Any illness afflicting the candidate:- In this case, the candidate should have submitted to the Head of the Institution, a medical certificate from a registered medical practitioner of Sri Ramachandra Medical College and Research Institute (Deemed University) soon after returning to the institution after treatment.

(ii) Any unforeseen tragedy in the family:- The parent/guardian should have given in writing the details for the ward's absence to the Head of the Institution.

(iii) Participation in N.C.C/N.S.S and other co-curricular activities representing the Institution or University:- A certificate issued by the officer-in-charge of the student activities concerned certifying the participation of the student in the event which necessitated the student's absence duly endorsed by the Head of the Institution should be enclosed.

CREDITS

The term credit is used to describe the quantum of syllabus for various programmes in terms and hours of study. It indicates differential weightage given according to the contents and duration of the courses in the curriculum design.

The minimum credit requirement for a four year Bachelor's programme shall be 192.

COURSES

Each course may consist of lectures / laboratory work / seminar / project work / practical training / report / viva voce.

COURSE WEIGHT

Core subject may carry different weightage. For example, a course carrying one credit for lectures will have instruction of one period per week during the semester, if three hours of lecture is necessary in each week for that course, then 3 credits will be the weightage.

Credits will be assigned on the basis of the lectures / laboratory work and other form of learning in a 20 week schedule.

1. One credit for one hour lecture per week. (1 credit = 20 hours)
2. One credit for every two hours of laboratory or practical work (1 credit = 40 hours)
3. One credit for three hours of clinics/project (1 credit = 60 hours)

GRADING SYSTEM

The term Grading system indicates a 10 point scale of evaluation of the performance of students in terms of marks, grade points, letter grade and class.

GRADING

All assessments of B.Pharm course on an absolute mark basis will be considered and passed by the respective results passing Boards in accordance with the rules of the University. Thereafter the Controller of Examinations shall convert the marks for each course to the corresponding letter grade as follows, compute the grade point average and cumulative grade point average, and prepare the grade and mark sheets.

Classification of Marks and Grades

Marks Range	Multiplication Factor for a unit of mark	Grade Point Range	Letter Grade	Classification	Remarks

75 – 100	0.1000	7.5 – 10.000	O	First Class with Distinction	**First attempt only**
70 – 74.99	0.1000	7.0 – 7.499	A	First Class	**Class will be awarded only when the course is completed within the stipulated period.** **All others would be declared as 'Pass'.**
60 – 69.99	0.1000	6.0 – 6.999	B	First Class	
55 – 59.99	0.1000	5.5 – 5.999	C	Second Class	
50 – 54.99	0.1000	5.0 – 5.499	D	Second Class	
0 – 49.99	–	0 – 4.999	E	Fail	

$$\mathbf{WAM = \sum_{i} C_i M_i \Big/ \sum_{i} C_i}$$

$$\mathbf{OWPM = \sum_{n}\sum_{i} C_{ni} M_{ni} \Big/ \sum_{n}\sum_{i} C_{ni}}$$

$$\mathbf{GPA = \sum_{i} C_i G_i \Big/ \sum_{i} C_i}$$

$$\mathbf{CGPA = \sum_{n}\sum_{i} C_{ni} G_{ni} \Big/ \sum_{n}\sum_{i} C_{ni}}$$

Where:

C_i	is the credit earned for the i^{th} course in any semester,
M_i	is the mark obtained for the i^{th} course in any semester
G_i	is the grade point obtained by the student for the i^{th} course
C_{ni}	number of credits of the i^{th} course in the n^{th} semester,
M_{ni}	marks of the i^{th} course in the n^{th} semester,
G_{ni}	grade points of the i^{th} course in the n^{th} semester
n	refers to the number of semesters in which such courses were credited.

The cumulative Grade point Average (CGPA) is calculated, registered from the first year onwards.

INTERNAL ASSESSMENT

(a) A minimum of two written internal assessment examinations shall be conducted in each subject during a semester and the average marks of these two examinations shall be taken into consideration for the award of internal marks.

(b) A minimum of two practical examinations shall be conducted in each subject (wherever practicals have been included in the curriculum) and the average marks of these two examinations shall be taken into consideration for award of internal marks in practicals.

(c) A candidate failed in any subject in the University examination shall be provided an opportunity to improve his/her sessional marks by conducting a minimum of two examinations in theory and two practicals separately.

(d) If a failed candidate does not appear for such "Improvement Examinations" for internal marks in the failed subject(s), the internal marks already secured by him/her shall be carried over for his subsequent appearance(s).

(e) The internal marks list shall be submitted to the University by the Principal 15 days prior to the commencement of the University examinations.

SUBMISSION OF PRACTICAL WORK BOOK

At the time of practical examination, each candidate shall submit to the examiners the practical workbook duly certified by the Head of the Institution as a bonafide record of work done by the candidate.

PRACTICAL TRAINING

1. Semester – IV Hospital Pharmacy Training – The student shall submit a report at the beginning of Semester –V and evaluated internally for 50 marks.

2. Semester –VI Industrial Training – The student shall submit a report at the beginning of Semester-VII and each student shall be evaluated internally for 100 marks.

3. Clinical Pharmacy Training – At the end of the Semester –VII students will be sent to Hospital for ward round participation. The student shall submit a report at the beginning of Semester –VIII and each student shall be evaluated internally for 100 marks.

PROJECT WORK

All the students shall submit a short report on a project study undertaken in any of the following subjects:

(a) Pharmaceutics
(b) Pharmaceutical Chemistry
(c) Pharmacognosy
(d) Pharmacology
(e) Pharmacy Practice

4. The project shall be carried out under the guidance of a faculty. The project may be carried out in groups not exceeding five in number. The project will be submitted to the University and evaluated for 100 marks by one internal and one external appointed by the University.

MARKS QUALIFYING FOR A PASS

A candidate shall be declared to have passed the examination if he/she obtains the following minimum qualifying marks:-

(a) 45% of marks in the University theory examinations and 50% of marks in the aggregate in theory and internal assessment taken together (for internal assessment no minimum passing mark is necessary).

(b) 50% of marks in University Practical examination

(c) 50% of marks for Project Work in University examination

(d) 40% of marks for Remedial Mathematics / Biology which is purely internal.

A student shall complete all the training programmes before completion of the degree course.

CLASSIFICATION OF SUCCESSFUL CANDIDATES

A successful candidate

(i) Who secures not less than 75% in the aggregate marks shall be declared to have secured '**FIRST CLASS WITH DISTINCTION'** provided he/she passes the whole examination in the FIRST ATTEMPT;

(ii) Who secures not less than 60% in the aggregate marks and completes the course within the stipulated course period shall be declared to have passed the examinations in the **'FIRST CLASS'**;

(iii) Who secures above 50% and less than 60% in the aggregate marks and completes the course within the stipulated course period shall be declared to have passed the examinations in the **'SECOND CLASS'**; and

(iv) All other successful candidates shall be declared to have **PASSED** the examinations

CARRY-OVER OF FAILED SUBJECTS

(a) Candidates are permitted to carryover the failed subject(s) in first semester to the fourth semester.

(b) After completion of the fourth semester and before entering the fifth semester, students should have successfully completed I & II semester subjects; however, they are permitted to carry over two failed papers of either third and (or) fourth semesters.

(c) After completion of sixth semester and before entering the seventh semester they should have successfully completed 3rd and 4th semester subjects; however, they are permitted to carry over two subjects of either fifth and (or) sixth semester.

RANKING OF CANDIDATES

The candidates who are eligible to get the B.Pharm degree in **FIRST CLASS WITH DISTINCTION** will be ranked together on the basis of CGPA for all the subjects of study from I to VIII Semester.

The candidate passing with **FIRST CLASS** will be ranked next after those with distinction on the basis of CGPA for all the subjects of study from I to VIII Semester.

REVIEW OF ANSWER PAPERS OF FAILED CANDIDATES

As per the regulations prescribed for review of answer papers by the University.

MIGRATION / TRANSFER OF CANDIDATES

Application seeking Migration/Transfer of a candidate from any recognized institution to the Deemed University shall be considered subject to the condition that:

(a) there must be vacancy in the particular year of study;

(b) the applicant should satisfy norms prescribed by AICTE/Pharmacy Council of India;

(c) transfer shall be effective only at the beginning of an academic year; and

(d) approval of the Vice-Chancellor shall be obtained.

RE-ADMISSION AFTER BREAK OF STUDY

(a) Candidates having a break of study of five years and above from the date of admission and more than two spells of break will not be considered for re-admission.

(b) The five years period of break of study shall be calculated from the date of first admission of the candidate to the course inclusive of all the subsequent spells of break of studies.

(c) Candidates having break of study shall be considered for re-admission provided that they are not subjected to any disciplinary action and no charges are pending or contemplated against them.

(d) All re-admissions of candidates are subject to the approval of the Vice-Chancellor.

(e) The candidates having a break of study below 6 months shall apply for re-admission in the prescribed form and remitting the stipulated fee for condonation to the Registrar of the University. The candidates may be re-admitted in the corresponding course of study at the commencement of the session and shall undergo a minimum period of study of 3 months and after fulfillment of the regulations of this University be admitted for the examination. The candidates shall be granted exemption in the subjects they have already passed.

(f) The candidates having a break of study of 6 months and above but less than one year shall apply for re-admission in the prescribed form and remitting the stipulated fee for condonation to the Registrar of the University. The candidates may be re-admitted in corresponding course of study at the commencement of the session and shall undergo a minimum period of study of 3 months and after fulfillment of the regulations of this University be admitted for the examination. The candidate shall be granted exemption in the subjects they have already passed.

(g) A candidate having a break of study one year and above but less than three years shall apply for re-admission in the prescribed form and remitting the stipulated fee for condonation to the Registrar of the University. The candidates may be re-admitted in the corresponding course of study at the commencement of the session and shall undergo a minimum period of study of 6 months and after fulfillment of the regulations of the University be admitted for the examination. The candidate shall be granted exemption only in the I B-Pharm subjects they have already passed.

(h) The candidates having a break of study of 3 years but less than 5 years shall apply for re-admission in the prescribed form and remitting the stipulated fee for condonation to the University. The candidates may be permitted to re-join the course the beginning of the I B-Pharm / II B-Pharm course, as the case may be, with the condition that these candidates will have to undergo the prescribed period of study from the I B-Pharm or from II B-Pharm course and will not be granted any exemption in any subject they have already passed. They shall subscribe to the regulations of this University.

VACATION

The Head of the Institution shall declare vacation not exceeding six weeks in an academic year.

DISCHARGE OF STUDENTS FROM COURSE

If a student admitted to a course of study in this University is for any reason not able to complete the course or qualify for the degree by passing the examinations prescribed within a period comprising twice the duration prescribed in the Regulations for the concerned course, he /she will be discharged from the said course, his / her name will be taken off the rolls of the University and he / she will not be permitted to attend classes or appear for any examination conducted by the University thereafter.

EXAMINATION PATTERN

SEMESTER - I to VIII

(For subjects with Theory and Practical components)

Duration : 3 hours Maximum marks : 80

Write Section A separately and Section B and C separately

SECTION - A

I. Answer any FOUR of the following essay question (4x10) 40 marks

1.
2.
3.
4.
5.

SECTION - B

I Write short notes on any Four of the following: (4x5) 20 marks

6.
7.
8.
9.
10.
11.

II. Answer all the following with one or two sentences (10X2) 20 marks

12.
13.
14.
15.
16.
17.
18.
19.
20.
21.

(For subjects with Theory only and without Practical component)

Duration : 3 hours Maximum marks 75

SECTION - A

I. Answer any THREE of the following essay question (3x15) 45 marks

1.
2.
3.
4.

SECTION - B

I Write short notes on any SIX of the following: (6x5) 30 marks

5.
6.
7.

8.
9.
10.
11.
12.

SEMESTER - III (APHE - II only)

ANATOMY, PHYSIOLOGY & HEALTH EDUCATION - II

Duration: 3 hours Maximum marks : 80

SECTION - A
(Physiology)

Answer any 3 of the following four essay questions (3x10) 30 marks

I.
II.
III.
IV.

Write short notes on any three of the following: (3x5) 15 marks
a.
b.
c.
d.

SECTION - B
(Anatomy)

I. a)
OR
b) (1X10) 10 marks

II. Answer all the following with one or two sentences (5X2) 10 marks

a.
b.
c.
d.
e.

SECTION - C
(HEALTH EDUCATION)

II. a)
OR
b) (1X10) 10 marks

III. Write short notes on: (1x5) 5 marks

a)
OR
b)

B. Pharm

SCHEME OF EXAMINATION

SEMESTER - I

(700 Hours/100 Working days)*

S. No.	Subject Title	No. of credits	Total Hrs/ Sem	Dur. of Exam Hrs	Marks Allotted				
					Theory Exam		I A	Viva Voce	Total
					Intern.	Univ.			
1.	Pharmaceutical Analysis - I				-				
	Theory	4	80	3		80	20	-	100
	Practical	2	80	4		60	20*	20	100
2.	Pharmacognosy - I				-				
	Theory	4	80	3		80	20	-	100
	Practical	2	80	4		60	20*	20	100
3.	Pharmaceutical Chemistry – I (Inorganic Chemistry)				-				
	Theory	4	80	3		80	20	-	100
	Practical	2	80	4		60	20*	20	100
4.	Computing and Computer Applications **Theory**	4	80	3	-	80	20	-	100
	Practical	2	80	4		60	20*	20	100

Total credits = 24

Note: A short course on Remedial Mathematics/Remedial Biology will be offered to the candidates who have no respective background at the +2 level. The subjects will be internally evaluated. A separate proficiency certificate will be issued by the Dean of Faculties.

SEMESTER - II

(700 Hours/100 Working days)*

S. No.	Subject Title	No. of credits	Total Hrs/ Sem.	Duration of Exam Hrs	Marks Allotted			
					University Exam	I A	Viva Voce	Total
1.	Pharmaceutics – I (Physical Pharmacy) **Theory**	4	80	3	80	20	-	100
	Practical	2	80	4	60	20*	20	100
2.	Pharmaceutical Chemistry – II (Physical Chemistry) **Theory**	2	40	3	80	20	-	100
	Practical	1	40	4	60	20*	20	100
3	Pharmaceutical Analysis - II **Theory**	3	60	3	80	20	-	100
	Practical	2	80	4	60	20*	20	100
4.	Anatomy, Physiology & Health Education - I **Theory**	3	60	3	80	20	-	100
	Practical	2	80	4	60	20*	20	100
5.	Mathematics & Statistics **Theory**	4	80	3	75	25	-	100
6	Environmental science	1	20	2	-	50	-	

Total credits = 24

Note: A short course on **communication skill (English) is offered for the candidates.** The subjects will be internally evaluated.

SEMESTER - III

(700 Hours/100 Working days)*

S. No.	Subject Title	No. of credits	Total Hrs/ Sem.	Duration of Exam Hrs	Marks Allotted			
					University Exam	I A	Viva Voce	Total
1.	Pharmaceutical Chemistry – III (Organic Chemistry-I) **Theory**	4	80	3	80	20	-	100
	Practical	2	80	4	60	20*	20	100
2.	Pharmaceutics - II (Unit Operations-I) **Theory**	4	80	3	80	20	-	100
	Practical	2	80	4	60	20*	20	100
3.	Pharmacognosy - II **Theory**	4	80	3	80	20	-	100
	Practical	2	80	4	60	20*	20	100
4	Anatomy, Physiology & Health Education-II **Theory**	2	40	3	80	20	-	100
	Practical	2	80	4	60	20*	20	100
5.	Pathophysiology of Common Diseases **Theory**	2	40	3	75	25	-	100

Total credits = 24

SEMESTER - IV

(700 Hours/100 Working days)*

S. No.	Subject Title	No. of credits	Total Hrs/ Sem.	Duration of Exam Hrs	Marks Allotted			
					University Exam	I A	Viva Voce	Total
1.	Pharmaceutical Chemistry –IV (Organic Chemistry-II) **Theory**	3	60	3	80	20	-	100
	Practical	2	80	4	60	20*	20	100
2.	Pharmaceutics - III (Unit Operations-II) **Theory**	3	60	3	80	20	-	100
	Practical	2	80	4	60	20*	20	100
3.	Pharmaceutical Microbiology **Theory**	3	60	3	80	20	-	100
	Practical	2	80	4	60	20*	20	100
4.	Pharmacognosy - III **Theory**	3	60	3	80	20	-	100
	Practical	2	80	4	60	20*	20	100
5	Pharmaceutics - IV (Dispensing & Community Pharmacy) **Theory**	2	40	3	80	20	-	100
	Practical	2	80	4	60	20*	20	100

Total credits = 24

Hospital Pharmacy Training one week (7 days) : 60 hours 1 credit

SEMESTER - V

(700 Hours/100 Working days)*

S. No.	Subject Title	No. of credits	Total Hrs/ Sem.	Duration of Exam Hrs	Marks Allotted			
					University Exam	I A	Viva Voce	Total
1.	Pharmaceutical Chemistry -V (Biochemistry) **Theory**	3	60	3	80	20	-	100
	Practical	2	80	4	60	20*	20	100
2	Pharmaceutical Chemistry-VI (Medicinal Chemistry I) **Theory**	3	60	3	80	20	-	100
	Practical	2	80	4	60	20*	20	100
3.	Pharmacology - I **Theory**	3	60	3	75	25	-	100
4.	Pharmacognosy - IV **Theory**	3	60	3	80	20	-	100
	Practical	2	80	4	60	20*	20	100
5	Pharmaceutics – V (Pharmaceutical Technology -I)	3	60	3	80	20	-	100
	Theory	2	80	4	60	20*	20	100
	Practical							
6.	Hospital Pharmacy Training	1	60	-	-	50	-	50

Total credits = 24

SEMESTER – VI

(700 Hours/100 Working days)*

S. No.	Subject Title	No. of credits	Total Hrs/ Sem.	Duration of Exam Hrs	Marks Allotted			
					University Exam	I A	Viva Voce	Total
1.	Pharmaceutical Chemistry VII (Medicinal Chemistry - II) **Theory**	3	60	3	80	20	-	100
	Practical	2	80	4	60	20*	20	100
2.	Pharmaceutics - VI (Dosage form Design) **Theory**	3	60	3	80	20	-	100
	Practical	2	80	4	60	20*	20	100
3.	Pharmacology - II **Theory**	3	60	3	80	20	-	100
	Practical	3	120	4	60	20*	20	100
4.	Pharmaceutical Jurisprudence & Ethics **Theory**	3	60	3	75	25	-	100
5.	Therapeutic Drug Monitoring & Bioavailability **Theory**	3	60	3	80	20	-	100
	Practical	2	80	4	60	20*	20	100

Total credits = 24

Industrial Training: 60 hours 1 credit

SEMESTER - VII

(700 Hours/100 Working days)*

S. No.	Subject Title	No. of credits	Total Hrs/ Sem.	Duration of Exam Hrs	Marks Allotted			
					University Exam	I A	Viva Voce	Total
1.	Pharmaceutical Analysis – III							
	Theory	3	60	3	80	20	-	100
	Practical	2	80	4	60	20*	20	100
2.	Pharmaceutics – VII							
	(Pharmaceutical **Theory**	3	60	3	80	20	-	100
	Technology -II) **Practical**	2	80	4	60	20*	20	100
3.	Pharmacology – III							
	Theory	3	60	3	80	20	-	100
	Practical	2	80	4	60	20*	20	100
4.	Pharmaceutical Biotechnology							
	Theory	3	60	3	75	25	-	100
5.	Pharmacology - IV							
	(Clinical Pharmacy &				80	20	-	100
	Pharmacotherapeutics)**Theory**	3	60	3	60	20*	20	100
	Practical	2	80	4				
6	Industrial Training	1	60	-	-	100	-	100

Total credits = 24

Clinical Pharmacy Postings: 120 hours, 2 credits

SEMESTER - VIII

(700 Hours/100 Working days)*

S. No.	Subject Title	No. of credits	Total Hrs/ Sem.	Duration of Exam Hrs	Marks Allotted			
					University Exam	I A	Viva Voce	Total
1.	Pharmacognosy – V (Chemistry of							
	Natural Products) **Theory**	3	60	3	80	20	-	100
	Practical	2	80	4	60	20*	20	100
2.	Pharmacognosy - VI **Theory**	3	60	3	80	20	-	100
	Practical	2	80	4	60	20*	20	100
3	Pharmaceutical Industrial Management							
	Theory	3	60	3	75	25	-	100
4	Pharmaceutics - VIII							
	(Biopharmaceutics &							
	Pharmacokinetics) **Theory**	3	60	3	80	20	-	100
	Practical	2	80	4	60	20*	20	100
5.	Pharmaceutics - IX							
	(Hospital Pharmacy) **Theory**	3	60	3	75	25	-	100
6.	Clinical Pharmacy Training	2	120	-	-	100	-	100
7	Project Work	1	-	-	100	-	-	100

Total credits = 24

***Internal Assessment - 20 Marks:** Practical 10 marks, Record 10 marks

***Out of 700 hours for 100 working days the extra hours in each semester is considered as self study/library hours

SYLLABUS

SEMESTER – I

PHARMACEUTICAL ANALYSIS – I

THEORY

UNIT – I 16 Hours

Basic Concept of Volumetric Analysis

Significance of quantitative analysis in quality control, Different techniques of analysis preliminaries and definitions: Equivalent weight, Fundamentals of volumetric analysis. Methods of expressing concentration, Classification of volumetric methods, precision and Accuracy, Primary and Secondary standards, end point detection, calibration of volumetric glass wares, significant figures, Rules for retaining significant digits, Types of errors, Selection of sample. Sampling of gases, liquids, solids, pharmaceuticals and vegetable drugs, mean, deviation, standard deviation, statistical treatment of small data sets.

UNIT – II 16 Hours

Acid-Base titrations:

Acid base concepts, role of solvent, relative strengths of acids and bases, ionization, law of mass action, ionic product of water, pH, hydrolysis of salts, Henderson-Hasselbach equation, buffer solutions, neutralization curves, acid-base indicators, theory of indicators, choice of indicators, mixed polyprotic system- Phosphoric acid.

UNIT – III 16 Hours

Oxidation-reduction titrations:

Concepts of oxidation and reduction, Redox reactions, strengths and equivalent weights of oxidizing and reducing agents, theory of redox titrations, Redox indicators, cell representations, measurement of electrode potential, oxidation-reduction curves, iodimetry and iodometry, titrations involving ceric sulphate, potassium iodate, potassium bromate, potassium permanganate.

UNIT – IV 16 Hours

Precipitation titrations:

Theory of Precipitation, Solubility Products, Calculation of Solubility and Solubility Product. Common ion effect, effect of temperature and solvent upon solubility of a precipitate, fractional

precipitation, calculation of titration curves. Detection of end point: Mohr's method, Volhard's method, Gay lussac method, Effects of acids, Argentometric titrations, Mercurometric titrations.

UNIT – V 16 Hours

Gravimetric analysis:

Introduction to gravimetric analysis, precipitation methods, conditions of precipitation. Properties of precipitate, the colloidal state, super saturation & precipitate formation, purity of precipitate, Co precipitation, post precipitation, ignition, washing of the precipitate, filtration, filter papers and crucibles, Drying and ignition of the precipitate, thermo gravimetric precipitating agents, simple gravimetric determination with special reference to determination of aluminum as aluminum oxide, calcium as calcium oxalate, magnesium as magnesium pyrophosphate.

PRACTICALS

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

1. Procedure & safety precaution in chemical laboratory.

2. Standard operating procedure for analytical balance-MODEL KROY.

3. Calibration of weights.

4. Determination of sulphate as barium sulphate by gravimetry.

5. Standardization of

a). 0.1M NaOH using secondary standard hydrochloric acid.

b). 0.1M NaOH using primary standard Potassium hydrogen phthalate.

c). 0.1M HCl using primary standard.

d). 0.05M Iodine using primary standard

e). 0.02M Potassium permanganate using primary standard and secondary standard.

f). 0.1M Sodium thiosulphate using primary standard.

g). 0.1M Silver nitrate using primary standard.

6. Assay of

a). Ammonium chloride.

b). Boric acid.

c). Sodium bicarbonate.

d). Ascorbic acid.

e). Bleaching powder.

f). Potassium chloride.

PHARMACOGNOSY – I

THEORY

UNIT – I 3 Hours

Definition, history, scope and development of Pharmacognosy**.**

UNIT - II 4Hours

Sources of drugs:

Plant, animal – terrestrial and marine, mineral and plant tissue culture as sources of drugs.

UNIT – III 7 Hours

Classification of drugs:

Alphabetical, Morphological, Taxonomical, Chemical and Pharmacological

UNIT - IV

a) Plant taxonomy: 20 Hours

Taxonomical study of the following families with reference to their salient morphological features and medicinally important plants:

Apocynacae, solanaceae, rutaceae, umbelliferae, leguminosae, rubiaceae, liliaceae, labiatae, papaveraceae.

b) Cultivation, collection, processing and storage of crude drugs: 22 Hours

Factors influencing cultivation of medicinal plants, types of pests and natural pest control agents, Plant growth hormones and their applications. Polyploidy, mutation and hybridization with reference to medicinal plants. Collection, processing, storage of crude drugs.

UNIT - V 24 Hours

Systematic pharmacognostic study of following:

Carbohydrates and derived products: Agar, Guar gum, acacia, Honey, Isabgol, Pectin, Starch, Sterculia and Tragacanth.

Lipids: Bees wax, castor oil, Cocoa butter, Cod-liver oil, Hydnocarpus oil, Kokum butter, Lard, Linseed oil, Rice-bran oil, shark liver oil and wool fat.

PRACTICALS

1. Morphological characteristics of plant families mentioned in theory
2. Identification of crude drugs belonging to carbohydrates and lipids
3. Preparation of herbarium sheets.

Major experiments:

1. Study of the morphological characters of the following plant families

   Apocynaceae

   Solanaceae

   Labiatae

   Leguminosae

   Rubiaceae

   Liliaceae

   Rutaceae

   Umbelliferae

   Papaveraceae

Minor experiments:

Chemical test and spot test for identification of the following crude drugs

Agar, guargum, acacia, honey, isapgol, pectin, starch, sterculia, beeswax, castor oil, cod liver oil, linseed oil, ricebran oil, shark liver oil, wool fat, tragacant

PHARMACEUTICAL CHEMISTRY – I
(INORGANIC CHEMISTRY)

THEORY

An outline of methods of preparation, uses, Assay, tests for purity and identity including and special tests if any of the following classes of inorganic pharmaceuticals included in Indian Pharmacopoeia.

UNIT – I 8 Hours

a) Sources of impurities, limit tests for iron, arsenic, lead, heavy metals, chloride, sulphate

b) Monograph and pharmacopeia, introduction, types

c) Acid, Bases and buffers

Boric acid, Hydrochloric acid, ammonium solution, potassium hydroxide, sodium hydroxide, phosphoric acid.

d) Gastrointestinal agents:

Acidifying agents- hydrochloric acid, sodium phosphate

Antacids- aluminum hydroxide gel, dried aluminum hydroxide gel, calcium carbonate, di and tri basic calcium phosphate, magnesium carbonate (heavy and light), magnesium oxide (heavy and light), milk of magnesia, magnesium trisilicate, sodium bicarbonate,

Combination antacids therapy- magaldrate, Gelusil MPS, Gelusil, Gelusil M, Diegene gel,

Cathartics- magnesium sulphate, magnesium carbonate

UNIT – II 16 Hours

a) Major intra and extra-cellular electrolytes:

Physiological ions- sodium, potassium, calcium, magnesium

Electrolytes used for replacement therapy- ORS, sodium chloride injection, sodium chloride dextrose injection, potassium chloride glucose infusion

Combination therapy- sodium lactate injection, sodium chloride injection,

Acid-base balance- potassium acetate, potassium citrate, sodium acetate, sodium bicarbonate, sodium citrate, sodium potassium

b) Essential and trace elements:

Transition elements and their compounds of pharmaceutical importance:

Iron and haematinics- ferrous sulphate, ferrous fumerate , ferrous gluconate, ferric ammonium citrate, iron dextrose injection.

Mineral supplements.

UNIT – III 14 Hours

a)Topical agents:

Protectives- silicone polymers, talc, titanium dioxide, zinc stearate

Astringents- zinc oxide, silver nitrate alum aluminum sulphate, zinc chloride, zinc sulphate, sulphur compounds, selenium sulphide

Anti-infectives- hydrogen peroxide, potassium permanganate, chlorinated lime, iodine solution, povidone iodine, boric acid, yellow mercuric oxide

b) Complexing and chelating agents used in therapy- BAL, pencillamine, EDTA

UNIT –IV 18 Hours

a) Gases and Vapours:

Oxygen, carbon dioxide, nitrous oxide

Respiratory stimulants- ammonium carbonate

b) Miscellaneous agents:

Sclerosing agents- sodium tetradecyl sulphate

Expectorants- ammonium chloride, potassium iodide

Emetics- copper sulphate, antimony potassium tartrate

Poisons and antidotes- sodium nitrate, sodium thiosulphate

Sedatives- potassium bromide

Pharmaceutical aids used in Pharmaceutical Industry.

Anti-oxidants- sodium nitrate, sodium metabisulphate, sodium thiosulphate

Preservatives, filter aids, adsorbents, diluents, excipients, suspending agents, colorants etc.

UNIT – V 16 Hours

a) Dental products:

Role of fluoride, phosphate

Dentifrices- sodium fluoride, SMFP, stannous fluoride, strontium chloride,

Anti-caries agents- calcium carbonate, calcium phosphate, zinc chloride, zinc oxide, hydrogen peroxide

b) Inorganic Radio pharmaceuticals:

Nuclear radio pharmaceuticals, methods of obtaining their standards and units of activity, measurement of activity, clinical applications and dosage, hazards and precautions.

PRACTICALS

1. Limit test for chloride.
2. Limit test for sulphate.
3. Limit test for iron
4. Limit test for Lead.
5. Preparation of sodium citrate
6. Preparation of boric acid.
7. Preparation of magnesium salt
8. Six binary in-organic mixtures.

COMPUTING AND COMPUTER APPLICATIONS

UNIT: I 14 Hours

Computers: History of computers, Definition of computers, input devices, output devices, storage devices, types of memory, and units of measurement, range of computers, generations of computers, characteristics of computers,

UNIT: II 12 Hours

System: Hardware, Software, system definition, Fundamentals of Networking, Internet, performing searches and working with search engines, types of software and its applications

UNIT: III 14 Hours

Office application suite – Word processor, spreadsheet, presentations, other utility tools, Fundamentals of Linux / Windows operating system, functions, interfaces, basic commands, working with the shell and other standard utilities.

UNIT: IV 24 Hours

Language - Comparison chart of conventional language, programming languages, generations of programming languages, Compilers and interpreters, Universal programming constructs based on SDLC, Variable, constant, identifiers, functions, procedures, if while, do – while, for and other Structures. Programming in C language, Data types, identifiers, functions and its types, arrays, union, structures and pointers

UNIT: V 16 Hours

Introduction to object oriented programming with c++: classes, objects, inheritance polymorphism, and encapsulation. Introduction to databases, and query languages, Introduction to Bioinformatics

PRACTICALS

1. Hard ware – components demo
2. Software – Operating systems
3. Office suits – Open office / Windows Office 2004
4. Language – commands , Scripts
5. Database packages
6. Bioinformatics : Databases, Tools

REMEDIAL MATHEMATICS

THEORY

UNIT - I

Algebra:

Equations reducible to quadratics, simultaneous equations (linear and quadratic), determinants, properties of solution of simultaneous equations by Cramer's rule, matrices, definition of special kinds of matrices, arithmetic operations on matrices, inverse of a matrix, solution of simultaneous equations by matrices, pharmaceutical applications of determinants and matrices. Evaluation of En1, En2 and En3 mensuration and its pharmaceutical applications.

UNIT - II

Measures of Central Value Objectives and pre-requisites of an ideal measure, mean, mode and median.

UNIT - III

Trignometry:

Measurement of angle, t-ratios, addition, subtraction and transformation formulae, t-ratios of multiple, sub-multiple, allied and certain angles. Application of logarithms in pharmaceutical computations.

UNIT IV

Analytical plans Geometry:

Certain co-ordinates, distance between two points, area of triangle, a locus of point, straight line; slope and intercept form, double-intercept form, normal (perpendicular form), slope-point and two point form, general equation of first degree.

UNIT – V

Calculus:

Differential: Limits and functions, definition of differential coefficient, differentiation of standard functions, including function of a function (Chain rule). Parametric differentiation, differentiation of implicit functions, logarithmic differentiation, successive differentiation.

Integral: Integration as inverse of differentiation, indefinite integrals of standard forms, integration by parts, substitution and partial fractions, formal evaluation of definite integrals

OR

REMEDIAL BIOLOGY

THEORY

UNIT – I

Methods of classification of plants.

UNIT - II

Plant Cell: It's structure and non-living inclusions; mitosis and meiosis; different types of plant tissues and their functions.

UNIT - III

Morphology and histology of root, stem, bark, wood, leaf, flower, fruit and seed. Modification of root and stem.

UNIT - IV

General survey of animal kingdom; structure and life history of parasites as illustrated by amoeba, entamoeba, typanosoma, plasmodium, taenia, ascaris, schistosoma, oxyuris and ancylostoma.

UNIT - V

General structure and life history of insects like mosquito, housefly, mites and silkworm.

PRACTICAL

1. Morphology of plant parts indicated in theory.
2. Care, use and type of microscopes.
3. Gross identification of slides of structure and life cycle of lower plants / animals mentioned in theory.
4. Morphology of plant parts indicated in theory.
5. Preparation, microscopic examination of stem, root and leaf of monocot and dicot leaves.
6. Structure of human parasites and insects mentioned in theory with the help of specimens.

SEMESTER - II

PHARMACEUTICS – I

(PHYSICAL PHARMACY)

THEORY

UNIT - I **16 Hours**

a. Matter and properties of matter:

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

b. Micromeritics and Powder Rheology:

Particle size and size distribution, average particle size, Particle number and weight distribution, particle volume, optical microscopy, sieving, sedimentation, measurement, particle shape, specific surface; methods for determining surface area, permeability, adsorption, and measurement of derived properties of powders like porosity, packing arrangement, densities, bulkiness and flow properties.

UNIT – II **16 Hours**

a) Surface and Interfacial phenomenon:

Liquid interface, surface and interfacial tension, surface free energy, measurement of surface and interfacial tension, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB classification, solubilization, detergency, absorption at solid interfaces, solid gas and solid-liquid interfaces, complex films and electrical properties of interface.

b) Viscosity and Rheology:

Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudo plastic, dilatants, plastic, thixotropy, thixotropy in formulation, determination of viscosity - capillary, falling ball and rotational viscometers.

UNIT – III 16 Hours

Dispersion systems:

a) Colloidal dispersions: Definition, types and properties of colloids, protective colloids, applications of colloids in pharmacy.

b. Suspensions and emulsions: Interfacial properties of suspended particles, settling in suspensions, theory of sedimentation, effect of Brownian movement, sedimentation of flocculated particles, sedimentation parameters, wetting of particles, controlled flocculation, flocculation in structured vehicles, rheological considerations, emulsion: types, theories, physical stability.

UNIT – IV 16 Hours

Complexation:

Classification of complexes, methods of preparation, analysis and applications.

Kinetics and drug stability:

General considerations and concepts, half-life determination, influence of temperature, light, solvent, catalytic species and other factors, Accelerated stability study and expiration dating.

UNIT – V 16 Hours

Diffusion and dissolution

Steady state diffusion - diffusion principles in biological systems - (procedures and apparatus - vapour sorption and transmission - dissolution drug release).

pH – determination:

Buffer equation, Buffer capacity, Buffer used in pharmaceutical synthesis, Preparation of buffered isotonic solutions, Calculations and methods of adjusting isotonicity.

PRACTICALS

1. Determination of latent heat, vapour pressure critical point
2. Studies on polymorphs, their identification and properties.
3. Determination of particle size distribution, particle size distribution and surface area using various methods of particle size analysis.
4. Determination of derived properties of powders like density, porosity, compressibility, angle

of repose etc..

5. Determination of surface/interfacial tension, HLB value and critical micellar concentration of surfactants.
6. Study of rheological properties of various types of systems using different viscometers.
7. Studies of different types of colloids and their properties
8. Preparation of various types of suspensions and determination of their sedimentation parameters.
9. Preparation and stability studies of emulsions
10. Studies of different types of complexes and determination of their stability constants.
11. Determination of half life, rate constant and order of reaction.
12. To study the influence of various factors on the rate of reaction
13. Accelerated stability testing, Shelf-life determination and expiration dating of Pharmaceuticals.
14. Preparation of pharmaceutical buffers and determination of buffer capacity.
15. Experiment involving tonicity adjustments.

Major experiments

1. Determination of particle size
2. Determination of angle of repose
3. Effect of Glidants and lubricants on angle of repose.
4. Determination of Critical Micellar Concentration of surfactants
5. Determination of porosity
6. Evaluation of suspending agents.

Minor experiments

1. Determination of Surface tension
2. Determination of bulk density.
3. Determination of mutual solubility curve for a system
4. Preparation and study of properties of colloids

PHARMACEUTICAL CHEMISTRY – II

(PHYSICAL CHEMISTRY)

THEORY

UNIT – I 8 Hours

Thermodynamics- First law of Thermodynamics;

Types of Thermodynamic system, Intensive and extensive properties, Thermodynamic process, Reversible and irreversible process, Internal Energy, Enthalpy, Joule – Thomson effect.

UNIT – II 8 Hours

Thermo chemistry

Exothermic & Endothermic reactions, Different types of Heat of Reaction, Hess law, Measurement of the heat of Reactions

Second law of thermodynamics:

Entropy, Third law of Thermodynamics: Cannot cycle.

UNIT – III 8 Hours

Photochemistry

Consequence of light adsorption, Lambert's law, Beer's law, Quantum efficiency, Photosensitized, Reaction, Photo physical processes

Catalysis

Homogenous & heterogenous catalysis, Theories of catalysis, Acid base catalysis, Enzyme catalysis

UNIT – IV 8 Hours

Quantum mechanism

Wave mechanical concept of the atoms, De Broglies equations, Schrondinger's wave equation, Significance of ψ & ψ^2.

UNIT – V 8 Hours

Phase Rule:

One component systems – phase diagram, water system, sulphur system

Two – component system – phase diagram, Zinc Cadmium system, Silver lead, KI H2O system, Mg Zn system

Adsorption

Types of adsorption, Adsorptions of gases by solids, Adsorptions Isotherms, Freundlich adsorption Isotherm, Langmuir adsorption isotherms .

PRACTICALS

Determination of specific gravity, heat of solution, heat of ionisation of acetic acid, adsorption, acetic acid on activated charcoal, critical solution temperature of phenol water system, rate constant, order of reaction.

Major experiments:

Determination of:

1. Partition co-efficient
2. Adsorption of acetic acid on activated charcoal
3. Optical activity
4. Critical solution temperature, phenol water system

Minor experiments:

Determination of:

1. Specific gravity
2. Heat of ionisation of acetic acid
3. Heat of solution

PHARMACEUTICAL ANALYSIS – II

THEORY

Theoretical considerations and application in drug analysis and quality control of the following analytical techniques will be discussed:

UNIT – I **10 Hours**

A) Non – aqueous titrations

Theory, acidimetry and alkalimetry in non aqueous solvents.

B) Complexometric titrations

Theory, Types of Complexometric titrations, masking and demasking agents, PM indicator

C) Diazotisation Titration

Theory, Types of titrations

UNIT – II **5 Hours**

Miscellaneous methods of analysis such as:, Kjeldahl method of nitrogen estimation, Karl –– Fischer titration, Oxygen flask combustion.

Unit-III **16 Hours**

a) UV spectrophotometry

Introduction, EMR, Fundamental law of photometry, Deviation from Beer's law, Instrumentation, Terminology, Electronic Transition, application and Woodward Fieser rule.

b) Colorimetry

Introduction, Principle, Instrumentation and Application.

c) Infrared spectroscopy

Introduction, principle, factors influencing vibrational frequency, Instrumentation, Finger print region, sampling techniques, applications**.**

UNIT – IV **14 Hours**

Chromatography

Introduction and instrumentation of the following techniques will be discussed with relevant examples of Pharmacopoeial products:

TLC, HPLC, GLC, HPTLC, Paper Chromatography, Ion chromatography, Size exclusion chromatography and Column Chromatography Introduction to system suitability criteria as per USP

UNIT – V **15 Hours**

Electrometric methods:

a) Potentiometry

Refeence electrode Indicator electrode measurement of potential and pH, Potentiometric titrations, method of detecting end point.

b) Conductometry

Introduction, Instrumentation, conductometric titrations, Applications of conductometry in Analysis.

c) Polarography

Introduction, polarographic apparatus, principle, Quantitative polarographic methods and recent advances in polarography.

d) Amperometry

Introduction, Instrumentation and Applications.

PRACTICALS

1. Non aqueous titration:
    (a) Assay of Mebendazole tablet.
    (b) Assay of Metronidazole tablet.
2. Complexometric titration:
    (a) Assay of Magnesium stearate tablet.
3. Determination of alcohol content of Dasamularishta tincture by distillation method.

4. Chromatography:
    (a) Identification of amino acid by paper chromatography.
    (b) Preparation of TLC plates.
    (c) Separation of mixture of amino acids by paper chromatography.
    (d) Determination of phenothiazine in the given sample by TLC method.
5. Assay of the Following:
    i). Nicotinic acid.
    ii). Dapsone.
    iii).Sulphamethoxazole.
6. Determination of Hardness of water.

ANATOMY, PHYSIOLOGY & HEALTH EDUCATION – I

THEORY

UNIT – I 6 Hours

Scope of anatomy and physiology and basic terminology used in these subjects.

UNIT – II 9 Hours

a) Structure of cell, its components and their functions.

b) Elementary tissues of the human body:

Epithelial, connective, muscular and nervous tissues, their sub-types and characteristics.

UNIT – III 15 Hours

a) Osseous system:

Structure, composition and functions of skeleton, classification of joints, types of movements at joints, disorders of joints

b) Skeletal muscle:

Their gross anatomy; physiology of muscle contraction, physiological properties of skeletal muscle and their disorders.

UNIT – IV 15 Hours

a) Haemopoietic system:

Composition and functions of blood and its elements, their disorders, blood groups and their significance, mechanism of coagulation, disorders of platelets and coagulation.

b) Lymph and Lymphatic system:

Composition, formulation and circulation of lymph; disorders of lymph and lymphatic system. Basic physiology and functions of spleen.

UNIT – V 15 Hours

Cardiovascular system:

Basic anatomy of the heart, physiology of heart, blood vessels and circulation. Basic understanding of cardiac cycle, heart sounds and electrocardiogram. Blood pressure and its regulation. Brief outline of cardiovascular disorders like hypertension, hypotension, arteriosclerosis, angina, myocardial infarction, congestive heart failure and cardiac arrhythmias.

PRACTICALS

1. Study of human skeleton.
2. Study of different systems with the help of charts and models.
3. Microscopic study of different tissues.
4. Estimation of hemoglobin in blood. Determination of bleeding time, clotting time, R.B.C. Count, total leucocyte count, D.L.C. and E.S.R.
5. Recording of body temperature, pulse rate and blood pressure, basic understanding of electrocardiogram-PQRST waves and their significance.

MATHEMATICS & STATISTICS

THEORY

UNIT - I 16 Hours

Differential equations:

Revision of integral calculus, definition and formation of differential equations, equations of first order and first degree, variable separable, homogeneous and linear differential equations of order greater than one with constant coefficients, complementary function and particular integral, simultaneous linear differential equations, pharmaceutical applications.

UNIT – II 16 Hours

Lap lace transforms:

Definition, transforms of elementary functions, properties of linearity and shifting, inverse laplace transforms, transforms of derivatives, solution of ordinary and simultaneous differential equations.

UNIT – III 16 Hours

Biometrics:

Significant digits and rounding of numbers, data collection, random and non-random sampling methods, sample size, data organization; diagrammatic representation of data, bar, pie, 2-D and 3-D diagrams, measures of central tendency, measures of dispersion, standard deviation and standard error of means, coefficient of variation, confidence (fiducial) limits, probability and events.

UNIT – IV 16 Hours

Bayes theorem, probability theorems, probability distributions, elements of binomial and Poisson distribution, normal distribution curve and properties, kurtosis and skewness,

UNIT – V 16 Hours

Correlation and regression analysis, method of least squares, statistical inference, student's and paired T-test, F-test and elements of ANOVA, applications of statistical concepts in pharmaceutical sciences.

ENVIRONMENTAL STUDIES

Unit - I

The Multidisciplinary Nature of Environmental Studies 2 Hours

Definition, scope and importance, Need for public awareness.

Unit - II

Natural resources: 8 Hours

Renewable and Non-Renewable Resources:

Natural resources and associated problems

a. Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
b. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
c. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d. Food resources: world food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer pesticide problems, water logging, salinity, case studies.
e. Energy resources: growing energy needs, renewable and non renewable energy sources, use of alternative energy sources case studies.
f. Land resources: land as a resource, land degradation, msn induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Unit - III

Ecosystems 5 Hours

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem:-
    a. Forest ecosystem
    b. Grassland ecosystem
    c. Desert ecosystem
    d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit - IV

Biodiversity and Its Conservation 7 Hours

- Introduction- Definition: genetic, species and ecosystem diversity
- Biogeographically classification of India
- Value of biodiversity: consumptive use, productive use, social, ethical, anesthetic and option values
- Biodiversity at global, national and local levels.
- India as a mega-diversity nation

- Hot-spots of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts
- Endangered and endemic species of India
- Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity

Unit - V

Environmental Pollution 7 Hours

- Introduction to key environmental aspects of pharmaceutical industry in India
- Definition, Causes, effects and control measures of:-
    a. Air pollution
    b. Water pollution
    c. Soil pollution
    d. Marine pollution
    e. Noise pollution
    f. Thermal pollution
    g. Nuclear pollution ‘
- Solid waste management: cause, effects and control measures of urban and industrial waste
- Role of an individual in prevention of pollution.
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides

Unit - VI

Social Issues and the Environment 6 Hours

- From unsustainable to sustainable development
- Urban problem related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case studies
- Environment ethics: Issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation

- Consumerism and waste products
- Environment protection Act
- Air (prevention and control of pollution) Act.
- Water (prevention and control of pollution) Act
- Wildlife protection Act
- Forest conservation Act
- Issues involved in enforcement of environmental legislation
- Public awareness.

Unit - VII

Human Population and the Environment 5 Hours

- Population growth variation among nations
- Population explosion- family welfare programme
- Environment and human health
- Human rights
- Value reduction
- HIV/AIDS.
- Role of information technology in environment and human health
- Case studies.

SEMESTER - III

PHARMACEUTICAL CHEMISTRY – III

(ORGANIC CHEMISTRY-I)

THEORY

The subject of organic chemistry will be treated in its modern perspective keeping for the sake of convenience, the usual classification of organic compounds.

UNIT – I 13 Hours

Structure and Properties:-

Atomic structure, quantum number, Tetra-co-valency of carbon, Wave equations, Atomic Orbitals, Molecular orbital, Molecular orbital theory, Bonding and anti-bonding orbitals, Covalent bond, Hybrid orbitals, hybridization, sp, sp^2, sp^3, dsp^2, dsp^3, d^2sp^3, intra-molecular forces, Bond dissociation energy, Polarity of bonds & molecules, Intermolecular forces, Structure & physical properties.

UNIT – II 13 Hours

Stereochemistry

Isomerism, nomenclature, associated physicochemical properties, optical isomerism - enantiomers, projection diagrams, optical isomerism in-compounds possessing 2 or more chiral carbon atoms; allenes; biphenyls; absolute configuration; racemic modification and resolution; asymmetric synthesis

UNIT – III 29 Hours

Structure, Nomenclature, Preparation & reactions:-

Alkanes – Methane, ethane, Alkenes - Ethylene, Alkynes – Acetylene, Cyclo Alkanes, Dienes – 1,3 butadiene, Alcohol - monohydric alcohol – methanol ethanol, Di-hydric Alcohol – glycol, Trihydric alcohol – glycerin, ,Ether – diethyl ether, Aldehyde – Acetaldehyde, formaldehyde, Ketones – Acetone, Alkyl halide – methyl iodide, chloroform, Carboxylic acid– Monocarboxylic acid, formic acid, acetic acid, crotonic acid.

UNIT IV 14 Hours

Dicarboxylic acid– oxalic acid, malonic acid, maleic acid, fumaric acid. Amine – Methylamine, Derivatives of carboxylic acid. Esters – Malonic ester. Amide – urea

UNIT – V 11 Hours

Aromatic hydrocarbons – Benzene, Aromatic acids – Salicylic acid, Aldehydes – Benzaldehyde, Ketones, Amine – Aniline,

PRACTICALS

I. Preparation of

1. Salicylic acid from methyl salicylate
2. Acetanilide from aniline
3. Acetyl salicylic acid from salicylic acid
4. Benzoic acid from benzaldehyde
5. Picric acid from phenol
6. Methyl orange from salicylic acid

II. Semi micro qualitative analysis of some unknown organic compounds

PHARMACEUTICS – II

(UNIT OPERATIONS- I)

THEORY

UNIT – I 12 Hours

a) Unit operations:

Introduction, basic laws

b) Fluid Flow:

Types of flow, Reynolds number, Viscosity, Concept of boundary layer, basic equations of fluid flow, valves, flow meters, manometers and measurement of flow and pressure.

UNIT - II 16 hours

Material handling systems:

(a) Liquid handling – Different types of pumps.

(b) Gas handling – Various types of fans, blowers and compressors

(c) Solid handling – Bins, Bunkers, Conveyers, Air transport

UNIT – III 22 Hours

a) Filtration and Centrifugation

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

b) Crystallization:

Characteristics of crystals like purity, size, shape, geometry, habit, forms and factors affecting them. Solubility curves and calculation of heat balances around Swenson Walker Crystallizer, Supersaturation theory and its limitations, Nucleation mechanisms, crystal growth. Study of various types of Crystallizer, tanks, agitated batch, Swenson Walker, Single vacuum, circulating magma and crystal Crystallizer, Caking of crystals and its prevention. Numerical problems on yields.

UNIT – IV 18 Hours

a) Dehumidification and Humidity Control:

Basic concepts and definition, wet bulb and adiabatic saturation temperatures, Psychometric chart and measurement of humidity, application of humidity measurement in pharmacy, equipment's for dehumidification operations.

b) Refrigeration and Air Conditioning:

Principles and applications of refrigeration and air conditioning.

UNIT – V 12 Hours

Material of construction:

a) General study of composition, corrosion, resistance, properties and applications of the materials of construction with special reference to stainless steel and glass

b) Industrial hazards and safety precautions:

Mechanical, Chemical, Electrical, fire and dust hazards, Industrial dermatitis, Accident records etc.

PRACTICALS

1. Operation of sieve shaker and sieve analysis
2. Particle size measurement by strokes equation
3. Rate of filtration studies, calculation of specific cake and filter medium resistance, measurement of Reynolds number.
4. Experiment on methods of crystallization, study of crystal habits
5. Determination of water permeability across the packaging material
6. Experiment to determine the leaching of contents from packaging material
7. Application of psychometric chart at different controlled humidities
8. Experiment to demonstrate the application of centrifugation.

Major experiments

1. Determination of Reynolds number
2. Determination of centrifugal efficiency

3. Determination of particle size by sieve shaker
4. Determination of particle size by sedimentation through sub sieving
5. Crystallization - Super saturation by cooling
6. Crystallization - Super saturation by evaporation
7. Effect of Humidity on mechanical hygrometers

Minor experiments

8. Effect of viscosity on rate of filtration
9. Effect of filter aids on rate of filtration
10. Determination of humidity by Dew point method

PHARMACOGNOSY – II

THEORY

UNIT – I 16 Hours

An introduction to active constituents of drugs:

Properties, classification, isolation and identification of alkaloids, flavanoids, saponins and other gylcosides, tannins, steroids, lipids, volatile oils and resins.

UNIT – II 16 Hours

Source, collection and preparation for market, macroscopy, microscopy, chemical constituents, allied drugs, uses of drugs containing resins : podophyllum, jalap, cannabis, capsicum, myrrh, asafoetida, balsam of tolu, balsam of peru, benzoin, turmeric, ginger.

UNIT – III 16 Hours

Study of tannins and tannin containing drugs like Gambier, black catechu, gall and myrobalan.

UNIT – IV 16 Hours

Volatile Oils: General methods of obtaining volatile oils from plants, study of volatile oil of mentha, coriander, Cinnamon, cassia; Lemon grass, Citronella, Clove, Fennel, Nutmeg, Eucalyptus, Cardamom, Valerian, Musk, Palmarosa, Gaultheria, Sandal wood, Ginger.

UNIT - V 16 Hours

a) Fibers-Study of fibres used in pharmacy such as cotton, silk, wool, nylon, glass-wool, polyester and asbestos, Jute, Pyroxylin, Regenerated cellulose.

b) Study of pharmaceutical aids like talc, diatomite, kaolin, bentonite, gelatin and natural colors.

PRACTICALS

1. Macroscopy of (spot test) colophony, jalap, capsicum, myrrh, asafetida, benzoin, turmeric, ginger, black and pale catechu, gall, myrobalan, cinnamon, cassia, clove, spearmint, fennel, nutmeg, eucalyptus, cardamom, sandalwood, valerian
2. Chemical test for cotton, silk, jute, talc, diatomite, kaolin, bentonite, gelatin
3. TS of clove, cinnamon, cassia, coriander, fennel
4. Power characters and chemical tests of above drugs

Major experiments:

Transverse section, preparation and study of microscopical features of crude drugs studied in theory.

Minor experiments:

Demonstration of the microscopic, microchemical and chemical properties of powdered crude drugs and fibres studied. Chemical tests for identification of alkaloids, tannins, saponins, steroids, flavanoids and resins.

ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION – II

THEORY

UNIT – I 16 Hours

Digestive system: Gross anatomy of the gastrointestinal tract, functions of its different parts including those of liver pancreas and gall bladder, various gastrointestinal secretions and their role in the absorption and digestion of food. Disorders of digestive system.

Respiratory system: Anatomy of respiratory organs, Functions of respiration, mechanism and regulation of respiration, respiratory volumes and vita capacity.

UNIT – II 16 Hours

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

Autonomic `Nervous System: Physiology and functions of the autonomic nervous system. Mechanism of Neurohumoral transmission of the A.N.S

UNIT – III 16 Hours

Urinary system: Various parts, structures and functions of the kidney and urinary tract. Physiology of urine formation and acid – base balance. Diseases of the urinary system.

Reproductive system: Male and female reproductive systems and their hormones, physiology of menstruation, spermatogenesis & cogenesis Pregnancy its maintenance and parturition.

UNIT – IV 16 Hours

Endocrine system: Basic anatomy and physiology of Pituitary, Thyroid, Parathyroid, Adrenals, Pancreas, Testes and ovary, their hormones and functions.

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

UNIT – V 16 Hours

Health education:

(a) Concepts of health and disease, disease causing agents and prevention of disease.

(b) Classification of food requirements, balanced diet, nutritional deficiency disorders,

(c) Their treatment and nutritional deficiency disorders, their treatment and prevention, specifications for drinking water.

(d) Demography and family planning

(e) Medical termination of pregnancy.

(f) 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, gonorrhoea, and AIDS).

(g) First Aid: Emergency treatment of shock, snakebites, burns, poisoning, fractures and resuscitation methods

PRACTICALS

1. Study of different systems with the help of charts and models
2. Microscopic studies of different tissues.
3. Physiological experiments on nerve – muscle preparations.
4. Determination of vital capacity, experiments on spirometry.

PATHOPHYSIOLOGY OF COMMON DISEASES

THEORY

UNIT – I 8 Hours

Basic principles of cell injury and adaptation: Causes of Cellular injury, pathogenesis, and morphology of cell injury. Intercellular alterations in lipids, proteins and carbohydrates, Cellular adaptation, atrophy, hypertrophy.

UNIT – II 8 Hours

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

UNIT – III 8 Hours

Pathophysiology of: Rheumatoid arthritis, gout, epilepsy, psychosis, depression, mania, hypertension, angina, congestive heart failure, atherosclerosis, myocardial infarction.

UNIT – IV 8 Hours

Pathophysiology of : diabetes, peptic ulcer, asthma, ulcerative colitis, hepatic disorders, acute and chronic renal failure, tuberculosis.

UNIT – V 8 Hours

Pathophysiology of urinary tract infections, sexually transmitted diseases, anemias and common types of neoplasms. Wherever applicable the molecular basis should be discussed.

SEMESTER - IV

PHARMACEUTICAL CHEMISTRY – IV

(ORGANIC CHEMISTRY – II)

THEORY

UNIT – I 8 Hours

Geometrical isomerism stereochemistry of cyclic compounds, stereochemistry and reactivity SN_1 and SN_2 reactions, E_1 and E_2 elimination, Diel's – Alder reaction, neighbouring group participation.

UNIT – II 8 Hours

Frontier orbital and orbital symmetry cycloaddition (Diel's Alder Reaction)

Sigmatropic reactions eg. Cope rearrangement, Electrocyclic reactions

Poly-nuclear hydrocarbons, Naphthalene, Phenanthrene, Anthracene.

Reactive intermediates

Carbocations, Carbanions

Important official compounds under each category

UNIT – III 8 Hours

Heterocyclic compounds – general classification, nomenclature, synthesis, properties and reactions of Pyrrole, Furan, Thiophene, Pyridine, Piperidine, Quinoline and Isoquinoline

UNIT – IV 8 Hours

Pyrazole, Imidazole, Oxazole, Isoxazole

Pyrimidine, Pyrazine, Pyridazine

Azepines, Phenothiazines

UNIT – V 8 Hours

Structures and medicinal uses of Nicotinic acid, INH, Mepyramine, Phenazone, Phenylbutazone, Chloroquine, Histamine, Carbimazole, Piperazine, Diethyl Carbamazine citrare, Sulphadiazine, Metronidazole, Chlorpromazine, Imipramine, Diazepam.

PRACTICALS

Synthesis involving various heterocyclic ring systems,

1. Benztriazole
2. Benzimidazole
3. 2-Methyl benzimidazole
4. Diphenyl quinoxaline
5. 1,4-dihydroquinoxalin-2,3-dione
6. N- Acetyl glycine
7. 2-Methyl-4-benzylidene-5-oxazolone
8. 2-Phenyl-4-benzyliden-5-oxazolone
9. Benzil
10. 5,5 – Diphenyl hydantoin
11. 2-phenyl-3,1-benzoxazin-4-one
12. Dihydro pyrimidinone

PHARMACEUTICS – III

(UNIT OPERATIONS - II)

THEORY

UNIT – I 12 Hours

a) Stoichiometry:

Unit processes, material and energy balances, molecular units, mole fraction, (tie substances), gas laws, mole volume, primary and secondary quantities, equilibrium state, rate process, steady and unsteady states, dimensionless equations, dimensionless formulae, dimensionless groups, different types of graphical representation, mathematical problems.

b) **Heat Transfer:**

Source of heat, heat transfer, steam and electricity as heating media, determination of requirement of amount of steam/electrical energy, steam pressure, Boiler capacity, Mathematical problems on heat transfer

UNIT – II 12 Hours

a) Evaporation:

Basic concept of phase equilibria, factors affecting evaporation, evaporators, film evaporators, single effect and multiple effect evaporators, problems on evaporation.

b) Distillation:

Raoult's law, phase diagrams, volatility, simple steam and flash distillations, principles of rectification, Mc Cabe Thiele method for calculations of number off theoretical plates, Azeotropic and extractive distillation, Mathematical problems on distillation.

UNIT – III 12 Hours

a) Drying:

Moisture content and mechanism of drying, rate of drying and time of drying calculations, classification and types of dryers, dryers used in pharmaceutical industries and special drying methods. Mathematical problems on drying.

b) Size Reduction and Size Separation:

Definition, objectives of size reduction, factors affecting size reduction, laws governing energy and power requirements of a mill, types of mills including ball mill, hammer mill, fluid energy mill etc

UNIT – IV 12Hours

a) Mixing:

Theory of mixing, solid – solid, solid – liquid and liquid – liquid mixing equipments.

b) Automated process control systems:

Process variables, temperature, pressure, flow level and vacuum and their measurements. Elements of automatic process control and introduction to automatic process control systems. Elements of computer aided manufacturing (CAM)

UNIT – V 12 Hours

Reactors and fundamentals of reactors design for chemical reactions.

PRACTICALS

1. Determination of rate of evaporation
2. Drying of wet granules and to plot the rate of drying curves
3. Operation of ball mill and to calculate Rettinger's law and Kicke's law
4. Experiment to illustrate solid solid mixing
5. Azeotropic distillations
6. Determination of rate of drying, free moisture content and Bounet moisture content
7. Determination of mixing efficiency using different types of mixers

Major Experiments

1. Determination of moisture content of granules by drying method
2. Effect of mixers on globule size of castor oil emulsion
3. Determination of work done in size reduction using Rettinger's law
4. Determination of equilibrium moisture content
5. Determination of work done in size reduction using Kick's law

Minor Experiments

6. Degree of mixing
7. Determination of rate of evaporation
8. Determination of heat flow through a cylinder.

PHARMACEUTICAL MICROBIOLOGY

THEORY

UNIT – I 8 Hours

a) Introduction to the scope of microbiology, classification of microbes and their taxonomy, Actinomycetes, bacteria, and viruses.

b) Structure of bacterial cell, nutrition, cultivation, isolation of bacteria, actinomycetes, fungi, Viruses, Algae.

UNIT – II 4 Hours

Identification of Microbes: Stains and types of staining techniques, electron microscopy.

UNIT – III 8 Hours

Microbial genetics and variation

UNIT – IV 12 Hours

a) Control of microbes by physical and chemical methods.

b) Disinfectants, factors influencing disinfectants, dynamics of disinfectant, antiseptics and their evaluation, Sterilization, different methods, validation of sterilization methods & equipments.

c) Microbial testing in support of aseptic processing – antimicrobial effectiveness testing, microbial examination of non sterile products: microbial enumeration tests, microbial examination of non sterile products: tests for specified microorganisms, microbial examination of non sterile products: acceptance criteria for pharmaceutical preparations and substances for pharmaceutical use, objectionable microorganism, bio burden control of non sterile drug substances and products, sterility tests, sterility assurance, bacterial endotoxins test, water microbiological testing.

UNIT – V 8 Hours

a) Immunity, Primary and secondary defensive mechanism of body, microbial resistance, interferons.

b) Microbial assays of antibiotics, vitamins & amino acids.

PRACTICAL

Major Experiments

1. Gram's staining.
2. Acid fast staining.
3. Inoculation of liquid medium.
4. Inoculation of solid medium (Streak plate method).
5. Inoculation of solid medium (Pour plate method).

Minor Experiments

6. Animalcules observation study.
7. Simple staining.
8. Broth preparations.
9. Media preparations.
10. Motility test.

PHARMACOGNOSY – III

THEORY

UNIT – I 10 Hours

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

Saponins: liquorice, ginseng, dioscorea, sarsaparilla, and senega

Cardioactive steroids: Digitalis, squill, strophanthus and thevetia

Anthraquinone cathartics: Aloe, senna, rhubarb and cascara

Others: Psoralea, Ammi majus, Ammi visnaga, gentian, saffron, chirata, quassia

UNIT – II 10 Hours

Studies of traditional drugs, Common vernacular names, botanical sources, morphology, chemical nature of chief constituents, pharmacology, categories and common uses and marketed fomulations of following indigenous drugs.

Amla, Kantkari, Satavari, Tylophora, Bhilwa, Kalijiri, Bach, Rasna. Punarnava, Chitrack, Apamarg, Gokhru, Shankhapushpi, Brahmi, Adusa.

UNIT – III 10 Hours

Holistic concept of drug administration in Ayurveda.

Introduction to ayurvedic preparation like Arishtas, Asavas, Gutikas, Tailas, Churnas, Lehyas and Bhasmas. Approaches to simple physicochemical standardization of these preparations.

UNIT – IV 10 Hours

Phytochemical screening:

Methods of preparation of extracts. Phytochemical screening tests employed for the detection of carbohydrates, proteins, lipids, alkaloids and glycosides.

PRACTICAL

1. Macroscopy of liquorice, Ginseng, Dioscorea, Sarsaparilla, Digitalis, Squill, Strophanthus, Aloes, Senna, Rhubarb, Cascara, Psoralea, Gentian, Saffron, Chirata, Quassia, Amla, Brahmi, Ashoka, Methi, Lahsun, Neem, Gymnema, Senega, Visnaga.
2. Microscopy of Liquorice, Digitalis, Squill, Senna, cascara, Neem, Gentian.
3. Powder Microscopy of above drugs.
4. Standardization of – Arishtas, Asavas, Tailas, churnas, lehyas.
5. Preparation of extracts by maceration, infusion, decoction and percolation.

Major Experiments:

Microscopy and powder characteristic of following drugs:

1. Digitalis
2. Senna
3. Liquorice
4. Squill
5. Quassia
6. Gentian

Standardisation of traditional drug formulation like

1. Churnas
2. Lehyas
3. Aristas

Minor Experiments:

Powder characteristics of above mentioned drugs

PHARMACEUTICS – IV

(DISPENSING AND COMMUNITY PHARMACY)

THEORY

UNIT – I 8 Hours

a) Definition and Scope.

b) Prescription: Handling of prescription, source of errors in prescription, care required in dispensing procedures including labeling of dispensed products.

UNIT – II 8 Hours

Pharmaceutical calculations:

Posology, calculation of doses for infants, adults and elderly patients, allegation, Percentage solutions, alcohol dilution, proof spirit, isotonic solutions, milliequivalents, osmolal, displacement value etc

UNIT – III 8 Hours

Principles involved and procedures adopted in dispensing of:

Typical prescriptions like mixtures, solutions, emulsions, creams, ointments, powders, capsules, pastes, jellies, suppositories, ophthalmic solutions, drops, ear drops, pastilles, lozenges, pills, lotions, liniments, inhalations, paints, sprays tablet triturates.

UNIT – IV 8 Hours

Incompatibilities:

Physical, chemical and therapeutic incompatibilities, correction of incompatibilities**.**

UNIT – V 8 Hours

Community pharmacy:

Organisation and structure of retail and whole sale drug store - types of drug store and design, legal requirements for establishment, maintenance of drug store - dispensing of proprietary products, maintenance of records of retail and wholesale, patient counseling, role of pharmacist in community health care and education.

PRACTICALS

1. Dispensing of prescriptions falling under the categories: Mixtures, Solutions, Emulsions, Creams, Ointments, Powders, Suppositories, Ophthalmic solutions, Drops, Ear drops, Capsules, Pastes, Jellies, Pastles, Lozenges, Pills, Tablet triturates, Lotions, Liniments, Inhalations, Paints etc.
2. Identification of various types of incompatibilities in prescription, correction thereof and dispensing of such prescriptions.
3. Dispensing procedures involving pharmaceutical calculations, pricing of prescriptions, and dosage calculations for pediatric and geriatric patients.
4. Dispensing of prescriptions involving adjustments of tonicity.
5. Categorization and storage of pharmaceutical products based on legal requirements of labeling and storage.
6. Project report on visit to nearby hospitals pharmacy for counseling of rationale usage of drugs and aspects of healthcare and prescription handling, dispensing, storage record keeping, pharmacy service to in and out patients.

Major experiments

1. Liquid paraffin oral emulsion
2. Castor oil emulsion
3. White liniment
4. Turpentine liniment
5. Whitfield ointment
6. Compound zinc oxide paste
7. Zinc oxide and salicylic acid paste
8. Cold cream
9. Vanishing cream

Minor experiments

1. Percentage solutions
2. Mouth washes and gargles
3. Effervescent mixtures
4. Kaolin mixture
5. Sodium salicylate mixture

6. Alba mixture
7. Carminative mixture
8. Alkaline diuretic mixture
9. Creta mixture
10. Salicylic acid lotion
11. Calamine lotion

SEMESTER – V

PHARMACEUTICAL CHEMISTRY - V

(BIOCHEMISTRY)

THEORY

CHEMICAL ASPECTS

UNIT – I 7 Hours

Biochemical organization of the cell - transport processes across cell membrane.

UNIT – II 12 Hours

Classification, properties and biomedical importance of:

(a) Carbohydrates, Lipids, Proteins and amino acids, Nucleic acids, Hemoglobin

(b) Enzymes: Classification, mechanism of action, factors affecting enzyme activity, Enzyme inhibition, Enzymes and iso enzymes in clinical diagnosis, Coenzymes,

(c) Vitamins: Chemistry, sources, RDA, function, deficiency manifestations, hypervitaminosis antivitamins - assays.

METABOLISM

UNIT – III 12 Hours

a) Biological oxidation and reduction - examples - importance.

b) Electron transport chain - organisation - oxidative phosphorylation - mechanism - inhibitors.

c) Bioenergetics - High energy and low energy compounds - examples - importance.

UNIT – IV 17 Hours

a) Digestion and absorption of carbohydrates.

b) Metabolism of carbohydrates - Glycolysis -Citric acid cycle - Glycogen metabolism - Glycogen storage diseases - Gluconeogenesis - outlines of Hexose monophosphate shunt and uronic acid pathway - metabolism of fructose and galactose - Blood sugar regulation - Glucose tolerance test.

c) Digestion and absorption of lipids. Metabolism of lipids - Oxidation of fatty acids - Biosynthesis of fatty acids - Formation and utilization of ketone bodies - Biosynthesis and degradation of cholesterol, outlines of hypoprotein metabolism - lipids storage disease - Essential fatty acids - lipotropic factors.

d) Digestion and absorption of proteins. Metabolism of proteins - Disposal of amino groups and carbon skeleton of amino acids - urea cycle and its metabolic disorders - metabolism of essential and non essential aminoacids with special reference to Glycine, sulphur containing amino acids and Aromatic amino acids.

UNIT – V 12 Hours

a) Outline of biosynthesis and catabolism of purine and pyrimidine nucleotides - uric acid formation - Gout.

b) Outline of biosynthesis of porphyrins and hemoglobin - Formation of Bile pigments – Jaundice.

c) Biochemical genetics and molecular biology, genetic organization of mammalian genoms, DNA replication, protein biosynthesis - Transcription - Genetic code - Translation - Regulation of genetic expression, mutation - DNA repair - Carcinogenesis - PCR , genetic engineering (Recombinant DNA Technology), important inborn errors of metabolism.

d) Brief account of water and mineral metabolism, acid base balance, food and Nutrition, organ function tests - LFT & RFT, detoxication.

PRACTICALS

I. QUALITATIVE ANALYSIS:

1. Reaction of carbohydrates, proteins and non-protein nitrogenous substances
2. Identification of biochemically important compounds.
3. Identification of constituents of abnormal urine.
4. Reaction of lipids.
5. Detection of constituents of gastric juice and Bile
6. Analysis of milk.

II. QUANTITATIVE ANALYSIS:

7. Estimation of glucose in blood
8. Estimation of urea in blood
9. Estimation of protein in blood
10. Estimation of SGOT and SGPT in blood

III. DEMONSTRATION EXPERIMENTS:

11. Separation of serum proteins by electrophoresis
12. Separation of amino acids by chromatography
13. Hydrolysis of starch / glycogen
14. Determination of DNA and RNA
15. Preparation of standard buffers and measurement of pH.

PHARMACEUTICAL CHEMISTRY - VI

(MEDICINAL CHEMISTRY - I)

THEORY

UNIT – I 13 Hours

a) General introduction: Basic principles of medicinal chemistry, Definition, classification of drugs, nomenclature of medicinal compounds,

b) Bio-isosterism,

c) Principles of drug design

prodrug designing, Types of prodrug, carrier linked prodrug, Drawbacks of prodrug approach, soft drug concept,

Combinatorial chemistry, introduction, methods and application

d) QSAR: Introduction, physico chemical parameters, QSAR methods, substituent constants, Electronic parameters, steric substituent constants,

e) Application of computer in pharmacy, computer aided drug designing and molecular modeling introduction and application

UNIT – II 8 hours

Classification, synthetic procedures, mode of action, uses, structure activity relationship of the following class of drugs should be covered.

a) Drugs acting on the central Nervous system:

i) General Anaesthetics:-

Enflurane, Ketamine HCl, Halothane, Thiopentane sodium

ii) Local Anaesthetics:-

Mepivacaine, Lignocaine, Prilocaine HCl, Dibucaine HCl, Procaine HCl Benzocaine, Cyclomethycaine, Bupivacaine.

iii) Hypnotics and sedatives:

Phenobarbitone, Quinal barbitone, Nitrazepam, Triclofos sodium

UNIT-III 8 hours

Psychopharmacological agents:

Anxiolytics

Lorazepam, Oxazepam, Chlordiazepoxide Diazepam, Clonazepam,

Neuroleptics

Chlorpromazine, Haloperidol, Meprobamate, Trifluperazine, Thioridazine, Fluphenazine, Promazine, Promethazine, Ethopropazine, Chlorprothixene, Prochlorperazine, Perphenazine.

Antidepressants:

Trimipramine, Chlorimipramine, Amitriptyline, Imipramine, Doxepin, Phenelzine, Tranylcypromine, Dothiepin, Fluoxetine.

UNIT-IV 18 Hours

a) Anti convulsants:

Diphenylhydantoin sodium, Ethosuximide, Carbamazepine, Valproic acid, Primidone, Mephobarbitone, Clonazepam.

b) Antiparkinsonism drugs:

Carbidopa, Benzhexol, Amantadine, Levodopa, Bromocryptine.

c) Analeptics:

Nikethamide, Piracetam, Doxapram, Amphetamine, Methyl Phenidate,

UNIT – V 13 Hours

Drugs acting at synaptic and neuro effector junction sites:

a) Adrenergic drug:

Epinephrine, Isoprenaline, Dopamine, Norepinephrine, Methyl dopa, PhenylEphrine, Dobutamine, Salbutamol, Propranolol, Isoxsuprine HCl, Naphazoline HCl, Ephedrine, Xylometazoline, Orciprenaline, Terbutaline

b) Cholinergic drugs:-

Pyridostigmine bromide, Carbachol, Neostigmine.

c) Anti cholinergics:-

Propanthelene bromide, Tropicamide, Pralidoxime,

d) Anti adrenergics:

Timolol, Prazosine HCl, Sotolol, Phenoxy benzamine, Phentolamine, Metoprolol, Atenolol,

e) Muscle relaxants;

Baclofen, Succinyl choline chloride, Pancuronium chloride, Gallamine triethiodide, Dantrolene

PRACTICALS

1. Synthesis of Chlorbutanol
2. Synthesis of Sodium Salicylate
3. Synthesis of Acetyl salicylic acid
4. Synthesis of 5-nitro salicylic acid
5. Synthesis of Benzocaine
6. Assay of Aspirin
7. Determination of partition coefficient of Aspirin
8. Determination of partition coefficient of Salicylic acid
9. Determination of partition coefficient of Sodium Salicylate
10. Determination of partition coefficient of p-amino benzoic acid
11. Determination of partition coefficient of 5-nitro salicylic acid
12. Determination of partition coefficient of Benzocaine
13. Monograph experiment on Chlorbutanol
14. Monograph experiment on prepared Sodium Salicylate.
15. Determination of pi-value for Salicylic acid derivative.
16. Determination of pi-value for p-Amino benzoic acid derivative.

PHARMACOLOGY – I

THEORY

UNIT – I **12 Hours**

General Pharmacology:

Introduction to pharmacology, sources of drugs, dosage forms and routes of administration, Pharmacodynamics: principles and mechanism of drug action, combined effect of drugs, factors modifying drug action.

UNIT – II **12 Hours**

Pharmacokinetics: Absorption, distribution, metabolism and excretion of drugs, drug interactions, biological standardization, discovery and development of new drugs, adverse drug effect.

UNIT – III: **12 Hours**

Pharmacology of Peripheral Nervous Systems:

Neurohumoral transmission (autonomic and somatic)

(a) Parasympathomimetics, Sympathomimetics, parasympatholytics, Adrenergic Receptor and neuron blocking agents, Ganglionic, stimulants and blocking agents.

(b) Neuromuscular blocking agents.

UNIT – IV **12 Hours**

Pharmacology of Central Nervous System:

(a) Neurohumoral transmission in the C.N.S.

(b) General Anesthetics and Local anesthetic agents.

(c) Alcohols and disulfiram.

(d) Sedatives, hypnotics, Anti-anxiety agents and centrally acting muscle relaxants.

(e) Psychopharmacological agents

UNIT – V **12 Hours**

Pharmacology of Central Nervous System:

a) Anti-epileptic drugs and Anti-Parkinsonian drugs

b) Analgesics, Antipyretics, Anti-inflammatory and Anti-gout drugs

c) Narcotic analgesics and antagonists.

d) C.N.S. stimulants

e) Drug Addiction and Drug Abuse

PHARMACOGNOSY – IV

THEORY

UNIT – I 13 Hours

Systematic study of source, cultivation, collection, processing, commercial varieties, chemical constituents, substitutes, adulterants, uses, diagnostic macroscopic and microscopic features and specific chemical tests of following alkaloid-containing drugs:

(a) Pyridine - piperidine: tobacco, areca and lobelia
(b) Tropane: belladonna, hyoscyamus, datura, duboisia, coca and withania.
(c) Quinoline and isoquinoline: cinchona, ipecac, opium
(d) Indole: ergot, rauwolfia, catharanthus, nux-vomica and physostigma
(e) Imidazole: pilocarpus
(f) Steroidal: veratum and kurchi
(g) Alkaloidal amine; ephedra and colchicum
(h) Glycoalkaloid: solanum
(i) Purines; Coffee, Tea and Cola

UNIT – II 12 Hours

Plant products in therapeutics

(a) Artemesinin and derivatives
(b) Taxol and derivatives
(c) Vinca alkaloids and derivatives.
(d) Forskolin
(e) Gossipol

UNIT – III 5 Hours

Biological sources, preparation, identification tests and uses of the following enzymes:
Diastase, papain, pepsin, trypsin, pancreatin.

UNIT – IV 15 Hours

a) General techniques of biosynthetic studies and basic metabolic pathways. Plant cell metabolomics, introduction to primary and secondary metabolites

b) Introduction to chromatographic techniques used in plant drug analysis. Applications of TLC, CC, HPTLC and GC.

c) Chemotaxonomy and serotaxonomy of medicinal plants

UNIT – V 13 Hours

Studies of traditional drugs, Common vernacular names, botanical sources, morphology, chemical nature of chief constituents, pharmacology, categories and common uses and marketed formulations of following

Indigenous drugs: Arjuna, Ashoka, Methi, Lahsun, Palash, Guggal, Gymnema, Shilajit, Nagarmoth and Neem.

PRACTICALS

1. Identification of crude drugs: Ashoka, Methi, Lahson, Neem, Gymnema, Senega, Visnaga, Kurchi, Tobacco, Cinchona, Tea, Areca, Withania, Catharanthus, Nuxvomica, Ephedra.
2. Microscopic study of selected drugs in entire and powdered form.

Datura	Cinchona	Ipecac
Rauwolfia	Vinca	Kurchi
Ephedra	Nux-vomica	

3. Chemical Evaluation of powdered drugs, and enzymes.
4. Chromatographic studies of some herbal constituents.

Major Experiments:

Microscopic study of characters of following crude drugs

Datura	Cinchona	Ipecac
Rauwolfia	Vinca	Kurchi
Ephedra	Nuxvomica	

Minor Experiments:

Identification studies of the above drugs

PHARMACEUTICS – V

(PHARMACEUTICAL TECHNOLOGY- I)

THEORY

UNIT – I 12 Hours

Liquid dosage forms:

Introduction to various types of additives used in formulation of liquid dosage forms. Vehicles, stabilizers, preservatives, suspending agents, emulsifying agents, solubilizers, colours, flavours and others, manufacturing, packaging and evaluation of clear liquids, suspensions and emulsions official in Pharmacopoeia.

UNIT – II 12 Hours

Semisolid dosage forms:

Definitions, types, mechanisms of drug penetration, factor influencing penetration, semisolid bases and their selection. General formulation of semisolids, clear gels manufacturing procedure, evaluation and packaging.

UNIT – III 7 Hours

Extraction and Galenical products:

Principle and method of extraction, preparation of infusion, tinctures, dry, soft liquid extracts.

UNIT – IV 12 Hours

a) Pharmaceutical aerosols:

Definition, propellants, general formulation, manufacturing and packaging methods, pharmaceutical applications.

b) Ophthalmic preparations:

Requirements, formulation, methods of preparation, containers and evaluation.

UNIT – V 17 Hours

a) Cosmetology and Cosmetic Preparations:

Fundamentals of cosmetic science, structures and functions of skin. Formulation, preparation and packaging preparations like, lipsticks, baby care products, shampoos, sunscreens etc.

b) Nuclear Pharmacy:

Introduction to Radio pharmaceuticals, radioactive half life, Units of radio activity, production of radio pharmaceuticals, methods of isotopic tagging, preparation of radio isotopes in laboratory using radiation dosimetry, permissible radiation dose level, radiation hazards and their prevention.

PRACTICALS

1. Preparation, evaluation and packaging of liquid orals like
    a) Solutions
    b) Syrups

c) Suspensions

d) Emulsions

2. Preparation and evaluation of topical applications

a) Ointments

b) Creams

3. Preparation of eye drops and eye ointments, evaluation and test for sterility

4. Formulation of cosmetics for skin

Cold cream, vanishing cream, body lotion, face wash, face powder, moisturizing lotion, after shave lotion, shaving cream, depilatories, sunscreen lotion, brilliantine, pomades

5. Formulation of dentifrices

Tooth powder and tooth paste

6. Manicure Preparations

a) Nail colour and varnishes

b) Cuticle cream, cuticle removers

c) Varnish removers

Major experiment

Preparation of

1. Eye drops and test for sterility
2. Eye ointments and test for sterility
3. Suspensions and emulsions and evaluation of their stability
4. Topical application like ointment, creams and their evaluation

Minor experiment

1. Cold cream
2. Vanishing cream
3. Shaving cream
4. Nail varnishes
5. Nail colour
6. Sunscreen lotion
7. Aftershave lotion
8. Depilatories
9. Face powder

10. Tooth powder
11. Tooth paste

SEMESTER - VI

PHARMACEUTICAL CHEMISTRY - VII

(MEDICINAL CHEMISTRY - II)

THEORY

Synthetic procedures of the drugs except * marked ones, mode of action, uses and structure activity relationship including physico-chemical properties of the following classes of drugs.

UNIT I 10 Hours

a) Opioid analgesics:

Dextropropoxyphene Hcl, Fentanyl citrate, semi synthetic derivatives of Morphine- methadone, Dipipanone, Dextro moramide, Levallorphan, Pentazocine, Nalorphin.

b) Non-steroidal anti-inflammatory agents, Analgesics & Antipyretics:

Ibuprofen, Oxyphenbutazone, Indomethacin, Flurbiprofen, Phenazone Ketoprofen, Mefenamic acid, Ketotifen, Piracetam, Aspirin, Paracetamol, Sodium salicylate, Analgin, Ketrolac, Probenecid, Phenylbutazone, Piroxicam, Diclofenac

UNIT – II 7 Hours

Autocoids:

a) Antihistamines H_1-blockers

Hydroxyzin, Chlorpheniramine, Promethazine, Pheniramine, Mepyramine, Antazoline, Triprolidine, Cyclizine, Diphenhydramine, Doxylamine, Cyproheptadine, Buclizine, Methdilazine, Phenindamine, Meclizine, Chlorcyclizine, Promazine, Dimenhydrinate, Sodium chromo glycate*.

b) H_2 blockers: (Anti ulcer drugs)

Ranitidine, Cimetidine, Famotidine, Proton Pump Inhibitors: Omeprazole

UNIT – III 16 Hours

Drugs acting on cardiovascular system:

a) Antihypertensive drugs

Captopril, Amlodipine, Clonidine, Nifedipine, Hydralazine, Guanethidine, Sodium nitro prusside, Methyl dopa*, Diltiazem, Atenolol*, Propranolol*

b) Diuretics

Amiloride, Bumetimide, Ethacrinic acid, Acetazolamide, Triamterene, Furosemide, Spiranolactone*, Hydrochlorthiazide, Mannitol

c) Anti-anginal drugs

Nitroglycerine, Penta erythrityl tetra nitrate, Verapamil, Diltiazem*, Isosorbide

d) Anti-arrhythmic drugs

Procainamide, Disopyramide, Mexiletine, Lignocaine*, Phenytoin*

e)Antihyperlipidemic drugs

Nicotinic acid, Clofibrate, Gemfibrosil, Lovastatin*,

g) Anticoagulant and antiplatelet drugs

Warfarin, Phendione, Heparin and its derivatives, Atromentin

UNIT – IV 21 Hours

Chemotherapeutic agents used in protozol, parasitic, and other infections:

a) Anti amoebics:

Metronidazole, Tinidazole, Diloxanide furoate,

b) Antitubercular Drugs:

Ethambutol, Isoniazid, Pyrazinamide, & Rifampicin*.

c) Anti leprosy drugs:

Dapsone, Clofazimine,

d) Anti fungal agents:

Tolnaflate, Clotrimazole, Miconazole, Undecylenic acid, Ketoconazole, Fluconazole, Terbinafine.

e) Anti malarial drugs:

Chloroquine, Pyrimethamine, Proguanil, Primaquine, Mefloquine, Halofantrin, Pamaquine,

f) Anthelmintics:

Niclosamide, Pyrantel Pamoate, Praziquantel, Mebendazole, Thiabendazole, Diethyl carbamazine, Piperazine, Albendazole.

g) Sulphonamides:

Sulfanilamide, Sulfacetamide, Sulfadiazine, Sulfamerazine, Sulfadimidine, Trimethoprim, Succinyl sulphathiazole*, Phthalyl sulpha thiazole*, Sulpha dimethoxine, Sulphaguanidine, Sulpha furazole, Sulpha thiazole, Sulphamethoxazole, Sulphasomidine, Silver sulphadiazine*.

h) Antibiotics:

β -lactam antibiotics, amino glycoside antibiotics, polypeptide antibiotics, macrolide antibiotics Tetracycline group, Chloramphenicol.

i) Antiviral agents including anti HIV agents:

Acyclovir, Vidarabin, Idoxuridine, Cidofovir, Amantadine, Ribavirin, Zidovudine, Stavudine, Lamivudine, Atazanavir, Ritonavir, Didanosine, Interferons

j) Anti cancer agents:

Ifosamide, 5 – fluoro uracil, Cyclophosphamide, Dacarbazine. Methotrexate Flutamide, Azathioprine, Clemastime, Tamoxifen, Cisplatin, Chlorambucil, 7-Mercaptopurine, Busulfan, Carboplatin.

UNIT - V 6 hours

Miscellaneous

a) Drugs affecting uterine motility:

Oxytocin

b) Endocrines:

i) Anti thyroid drugs:

Propyl thiouracil, Carbimazole, Methimazole,

ii) Oral hypoglycemic agents:

Tolbutamide, Chlorpropamide, gylbelclamide, Metformin, Tolazamide

PRACTICALS

I. Preparation of

1. 7-Hydroxy-4-methyl coumarin from Resorcinol
2. 7-Hydroxy-4-methyl-8-nitro and 6-nitro coumarin
3. Fluorescein from phthalic anhydride
4. Eosin
5. Sulphacetamide
6. Broxy quinoline
7. Isoniazid

II. Assay of

1. Ethambutol tablets
2. Primaquine tablets
3. Chloroquine phosphate tablets
4. Analgin tablets
5. Diethyl carbamazine tablets

III. Monograph experiment of

1. Sulphanilamide
2. Anti-coagulant dextrose solution.

PHARMACEUTICS - VI

(DOSAGE FORM DESIGN)

THEORY

UNIT – I 15 Hours

Preformulation studies:

(a) Study of physical properties of drug like physical form, particle size, shape, density, wetting dielectric constant. Solubility, dissolution and organoleptic property and their effect on formulation, stability and bioavailability.

(b) Study of chemical properties of drugs like hydrolysis, oxidation, reduction, racemization, polymerization etc., and their influence on formulation and stability of products.

(c) Study of pro drugs in solving problems related to stability, bioavailability and elegancy of formulations

UNIT – II 12 Hours

Design, development with special emphasis on Q8(R2) and process validation methods for pharmaceutical operations involved in the production of pharmaceutical products with special reference to tablets, suspensions.

UNIT – III 12 Hours

Stabilization and stability testing protocols of new drug substances and various pharmaceutical products with special emphasis on Q1A(R2).

UNIT - IV 9 Hours

GMP and quality assurance.

UNIT – V 12 Hours

Packaging of Pharmaceutical products:

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

PRACTICALS

1. Preformulation studies including drug excipient compatibility studies, effect of stabilizers, preservatives etc. in dosage form design
2. Experiments demonstrating improvement in bio availability through pro drug concept
3. Accelerated stability studies and prediction of expiry date, shelf life for tablets, capsules and Parenterals
4. Dissolution testing and data evaluation for oral solid dosage forms
5. Evaluation of bioequivalence of some marketed products
6. *In vivo* bioavailability evaluation from plasma drug concentration and urinary excretion curves
7. Evaluation of glass container as per IP

Major experiments

1. Pre-formulation studies for Paracetamol granules
2. Pre-formulation studies for Ferrous sulphate granules
3. Pre-formulation studies for Ascorbic acid granules
4. Effect of stress on stability of emulsion
5. Determination of physical stability of Calamine suspension
6. Description of tablet manufacturing batch record
7. Dissolution and its importance
8. Dissolution test for Paracetamol tablets as per I.P
9. Dissolution test for Metformin Hydrochloride as per I.P
10. Dissolution test for Diclofenac sodium SR tablets
11. Evaluation of packaging materials as per IP

Minor experiments

1. Flow properties
2. Solubility studies
3. Effect of hydrolysis on formulation

4. Powder characteristics in preformulation – bulk density, porosity, wettability

5. Preparation of master formula card for tablet manufacturing

6. Maintenance of manufacturing record

7. Leak test

8. Packaging test

PHARMACOLOGY – II

THEORY

UNIT – I **18 Hours**

Pharmacology of Cardiovascular System:

(a) Digitalis and cardiac glycosides

(b) Antihypertensive drugs

(c) Antianginal and vasodilator drugs, including calcium channel blockers

(d) Antiarrhythmic drugs

(e) Antihyperlipidemic drugs

(f) Drugs used in the therapy of shock

UNIT – II **13 Hours**

Drugs Acting on the Hemopoietic System:

(a) Hematinics

(b) Anticoagulants, Vitamin K and hemostatic agents

(c) Fibrinolytic and anti-platelet drugs

(d) Blood and plasma volume expanders.

UNIT – III **8 Hours**

Drugs acting on urinary system:

(a) Fluid and electrolyte balance

(b) Diuretic

UNIT – IV **13 Hours**

Autacoids:

(a) Histamine, 5-HT and their antagonists

(b) Prostaglandins, thromboxanes and leukotrienes

(c) Pentagastrin, Cholecystokinin, Angiotensin, Bradykinin and substance P.

UNIT – V **8 Hours**

Drugs Acting on the Respiratory System:

(a) Anti-asthmatic drugs including bronchodilators

(b) Anti-tussives and expectorants, Respiratory stimulants

PRACTICALS

Introduction

1. Introduction to Experimental Pharmacology
2. Basic equipments used in experimental Pharmacology
3. Experimental animals in pharmacology Laboratory
4. Randomization of Animals
5. Animal Testing, OECD & ICH Guidelines
6. Routes of Drug Administration by using Xcology Pro Software

Minor Experiments

1. Effects of Drugs on Rabbit Eye by using ExPharm Pro software
2. Effect of Drugs on Isolated Frog Heart by using ExPharm Pro software
3. Effect of Drugs on Blood Pressure (BP) and Heart Rate (HR) of Dog by using ExPharm Pro software
4. Demonstration of Analgesic Activity of Drug in Mice using Eddy's Hot Plate by using Xcology Pro Software
5. Determination of the Anticonvulsant Effect of Phenytoin in Mice using Electroconvulsiometer by using Xcology Pro Software
6. Bioassay of Histamine on the Ileum of Guinea Pig by using ExPharm Pro software

Major Experiments

1. DRC of Acetylcholine by using Xcology Pro Software and lab methods
2. CDRC of Acetylcholine by using Xcology Pro Software and lab methods
3. Determination of Concentration of given sample of Acetylcholine by Matching bioassay method by using Xcology Pro Software and lab methods
4. Determination of Concentration of given sample of Acetylcholine by Interpolation bioassay method by using Xcology Pro Software and lab methods

5. Effect of Drugs on Locomotor Activity in Mice using Actophotometer by using Xcology Pro Software
6. Screening of Effect of CNS Depressant and Skeletal Muscle Relaxant Drugs using Rota-rod Apparatus by using Xcology Pro Software
7. In-vitro chemical assays for antioxidant and anti-inflammatory activities

PHARMACEUTICAL JURISPRUDENCE & ETHICS

THEORY

UNIT – I 5 Hours

Introduction:

(a) Pharmaceutical Legislations - A brief review.

(b) Pharmaceutical Education - A brief review.

UNIT – II 15 Hours

Drugs and Cosmetics Act 1940 and Rules 1945.

UNIT – III 15 Hours

An elaborate (practical oriented) study of the following

(a) Pharmaceutical Ethics

(b) Pharmacy Act 1948

(c) Drugs and Magic Remedies (Objectionable Advertisements) Act 1954

(d) Medicinal & Toilet Preparations (Excise Duties) Act 1955

(e) Narcotic Drugs & Psychotropic Substances Act 1985 & Rules

(f) Drugs Price Control Order.

UNIT – IV 20 Hours

A brief study of the following with special reference to the main provisions.

(a) Poisons Act 1919

(b) Medical Termination of Pregnancy Act 1970 & Rules 1975

(c) Prevention of Cruelty to Animals Act 1960

(d) State & Shops & Establishments Act & Rules

(e) Insecticides Act 1968

(f) AICTE Act 1987

(g) Factories Act 1948

(h) Minimum Wages Act 1948

(i) Patents Act.

UNIT – V 5 Hours

a) New Drug Policy

b) A brief study of the various Prescription/Non-prescription Products,

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

THERAPEUTIC DRUG MONITORING & BIOAVAILABILITY (COMPULSORY ELECTIVE)

THEORY

UNIT I 12 Hours

- Pharmacokinetic parameters of drugs and their determination (9 Hours)
- Introduction to clinical pharmacokinetics and TDM (3 Hours)

UNIT II 12 Hours

- Pharmacokinetic variability - body weight, size, obesity, age (neonates, infants, children and elderly), sex, genetic factors (9 Hours)
- Drug dosing in pediatrics, elderly and pregnancy (3 Hours)

UNIT III 15 Hours

- Pharmacokinetic variability – effect of disease states (renal diseases, liver diseases, cardiovascular diseases, thyroid diseases, burns) on drug ADME (9 Hours)
- Drug dosing in renal diseases and liver diseases (6 Hours)

UNIT IV 09 Hours

- Pharmacokinetic variability- drug interactions (9 Hours)

UNIT V 12 Hours

- Role of clinical pharmacist in optimization of dosage regimen. Deciding the dosages of drugs based on clinical data, clinical manifestation and TDM. (6 Hours)

- Individualization and optimization based on plasma drug levels. (6 Hours)
    - TDM of digoxin, phenytoin, theophylline, gentamycin, vancomycin, lithium

SEMESTER - VII

PHARMACEUTICAL ANALYSIS – III

THEORY

UNIT – I 12 Hours

a) Good Laboratory Practices

Grading of an Analyst, Desirable Qualities of an analyst, specification, central registry, reference materials, safety guidelines in drug control laboratories, systems and procedure in a Quality control laboratory. Introduction to OECD guidelines on Good Laboratory Practices.

b) Total Quality Management

Standards of Total Quality Management.

c) ISO

Different types of ISO certificates, its salient features, implementation of ISO 9001.

d) Quality review and Quality documentation

Quality audit and its control

UNIT – II 12 Hours

Overview of modern pharmaceutical analysis

Brief introduction to applications of pharmaceutical analysis in

A. Discovery of NCE and High-Throughput Screening

B. Solid-State Studies on Drug Substances

C. Degradation and Impurity Analysis of Drug Substances

D. Preformulation Studies

E. Solid Oral Dosage Forms

F. Parenteral Dosage Forms

G. Developing New Dosage Forms

H. Compendial Testing

I. Method Development

J. Setting Specifications

K. Method Validation

L. Stability Studies

M. Analytical Methodology Transfer

N. Documentation and Inspection

O. Innovative Analytical Platforms

UNIT – III 18 Hours

a) Regulatory control and regulatory drug analysis, Principle and Procedure

b) Validation-Types of validation, purpose for validation, selection of analytical methods, Types of analytical problems, analytical validation parameters. Introduction to USP and ICH guidelines.

UNIT – IV 7 Hours

a) Fluorimetry

Principle, types of fluorescence, Jablonski diagram, factors affecting fluorescence, instrumentation & applications.

b) Flame photometry

Principle, Interferences, instrumentation and application

c) Atomic absorption spectroscopy

Instrumentation, principle, interferences and applications

d) Inductively coupled mass spectrometry (ICP-OES & ICP-MS)

UNIT – V 11 Hours

a) Nuclear magnetic Resonance spectroscopy

Introduction, Theory, instrumentation, chemical shift, shielding and de-shielding effect, factors affecting chemical shift, spin-spin coupling, coupling constant, spin-spin relaxation, splitting of signals and applications.

b) Mass spectroscopy

Introduction, principle, instrumentation, resolution of mass spectra, fragmentation Pattern, McLafferty rearrangement, interpretation of mass spectra, Nitrogen rule, types of mass spectroscopy and application.

PRACTICALS

1. Verification of Beer's law using $KMnO_4$.
2. Spectrophotometric estimation of

(a) Paracetamol by UV and colorimetry

(b) Trimethoprim by UV

(c) Riboflavin by visible and fluorimetry

(d) Pyridoxine hydrochloride by UV method

(e) Frusemide tablets by UV

(f) Chloramphenicol capsule by UV

g) Pheniramine maleate injection by UV

3. Estimation of sodium and potassium ion in ORS by flame photometry.
4. Woodward Fieser rule and determination of max
5. Calculations in UV spectroscopy.
6. Determination of specific absorbance and molar absorptivity.
7. Determination of isobestic point.
8. Interpretation of IR, NMR and Mass spectra.

PHARMACEUTICS - VII

(PHARMACEUTICAL TECHNOLOGY II)

THEORY

UNIT – I 12 Hours

Liquid dosage forms:

Introduction to various types of additives used in formulation of liquid dosage forms. Vehicles, stabilizers, preservatives, suspending agents, emulsifying agents, solubilizers, colours, flavours and others, manufacturing, packaging and evaluation of clear liquids, suspensions and emulsions official in Pharmacopoeia.

UNIT – II 12 Hours

Semisolid dosage forms:

Definitions, types, mechanisms of drug penetration, factors influencing penetration, semisolid bases and their selection. General formulation of semisolids, clear gels manufacturing procedure, evaluation and packaging.

UNIT – III 7 Hours

Extraction and Galenical products:

Principle and method of extraction, preparation of infusion, tinctures, dry, soft liquid extracts.

UNIT – IV 12 Hours

a) Pharmaceutical aerosols:

Definition, propellants, general formulation, manufacturing and packaging methods, pharmaceutical applications.

b) Ophthalmic preparations:

Requirements, formulation, methods of preparation, containers and evaluation.

UNIT – V 17 Hours

a) Cosmetology and Cosmetic Preparations:

Fundamentals of cosmetic science, structures and functions of skin. Formulation, preparation and packaging preparations like, lipsticks, baby care products, shampoos, sunscreens etc.

b) Nuclear Pharmacy:

Introduction to Radio pharmaceuticals, radioactive half life, Units of radio activity, production of radio pharmaceuticals, methods of isotopic tagging, preparation of radio isotopes in laboratory using radiation dosimetry, permissible radiation dose level, radiation hazards and their prevention.

PRACTICALS

1. Preparation, evaluation and packaging of liquid orals like
    e) Solutions
    f) Syrups
    g) Suspensions
    h) Emulsions
2. Preparation and evaluation of topical applications
    c) Ointments
    d) Creams
3. Preparation of eye drops and eye ointments, evaluation and test for sterility
4. Formulation of cosmetics for skin

Cold cream, vanishing cream, body lotion, face wash, face powder, moisturizing lotion, after shave lotion, shaving cream, depilatories, sunscreen lotion, brilliantine, pomades

5. Formulation of dentifrices

Tooth powder and tooth paste

6. Manicure Preparations

d) Nail colour and varnishes

e) Cuticle cream, cuticle removers

f) Varnish removers

Major experiment

Preparation of

1. Eye drops and test for sterility
2. Eye ointments and test for sterility
3. Suspensions and emulsions and evaluation of their stability
4. Topical application like ointment, creams and their evaluation

Minor experiment

12. Cold cream
13. Vanishing cream
14. Shaving cream
15. Nail varnishes
16. Nail colour
17. Sunscreen lotion
18. Aftershave lotion
19. Depilatories
20. Face powder
21. Tooth powder
22. Tooth paste

PHARMACOLOGY – III

THEORY

UNIT – I **12 Hours**

Drugs Acting on the Gastrointestinal Tract:

(a) Antacids, Anti secretory and Anti-ulcer drugs

(b) Laxatives and antidiarrhoeal drugs

(c) Appetites stimulants and Suppressants

(d) Emetics and anti-emetics

(e) Miscellaneous: Carminatives, demulcents, protectives, adsorbents, astringents, digestants, enzymes and mucolytics.

UNIT – II **12 Hours**

Pharmacology of Endocrine System:

(a) Hypothalamic and pituitary hormones

(b) Thyroid hormones and anti thyroid drugs, parathormone, calcitonin and VitaminD.

(c) Insulin, oral hypoglycemic agents & glucagon.

(d) ACTH and corticosteroids.

(e) Androgens and anabolic steroids.

(f) Estrogens, progesterone and oral contraceptives.

(g) Drugs acting on the uterus.

UNIT – III **12 Hours**

Chemotherapy:

a) General principles of chemotherapy.

b) Sulfonamides and cotrimoxazole.

c) Antibiotics: Pencillins Cephalosporins, Aminoglycosides, Tetracyclines, Chloramphenicol, Macrolides, Quinolones and Miscellaneous Antibiotics

UNIT – IV **12 Hours**

a) Chemotherapy of tuberculosis, leprosy, fungal Diseases, viral diseases, urinary tract infections and sexually transmitted diseases.

b) Chemotherapy of malignancy and Immunosuppressive Agents.

UNIT – V **12 Hours**

Treatment of poisoning:

(a) Definition of poison, general principles of treatment of poisoning with particular reference to barbiturates, opioids, organophosphorus and atropine poisoning.

(b) Heavy metals and heavy metal antagonists.

PRACTICALS

Introduction

1. Introduction to Biological standardization
2. Basic equipments used in Biological standardization

Major Experiments

1. Effect of Neostigmine (Agonist) on DRC of Acetylcholine by using Xcology Pro Software and lab methods

2. Effect of Pancuronium (Antagonist) on DRC of Acetylcholine by using Xcology Pro Software and lab methods
3. DRC of Acetylcholine on Frog Rectus Abdominis Muscle by using Xcology Pro Software
4. Effect of Physostigmine (Agonist) on the DRC of Acetylcholine on Frog Rectus Abdominis Muscle by using Xcology Pro Software and lab methods
5. Effect of Atropine (Antagonist) on the DRC of the Acetylcholine on Rat Ileum by using Xcology Pro Software and lab methods
6. Effects of Spasmogens and Spasmolytics on the Rabbit Jejunum by using Xcology Pro Software
7. Bioassay of Oxytocin by Interpolation Method using Isolated Rat Uterus Preparation by using Xcology Pro Software
8. Bioassay of Serotonin on Rat Stomach Strip by Three Point Assay Method by using Xcology Pro Software
9. Bioassay of Atropine (an Antagonist) by Interpolation Method by using Xcology Pro Software
10. Bioassay of Acetylcholine on Rat Ileum by Three Point Assay Method by using Xcology Pro Software
11. Bioassay of Adrenaline by Interpolation Method using Isolated Rabbit Jejunum Preparation by using Xcology Pro Software
12. Effect of Drugs on Ciliary Motility of Frog Oesophagus by using ExPharm Pro software

Minor Experiments

1. Identification of salicylates in given biological sample.
2. Identification of digoxin in given biological sample.
3. Identification of phenothiazines in given biological sample.
4. Identification of barbiturates in given biological sample.
5. Identification of alkaloids in given biological sample.
6. Identification of sulfonamides in given biological sample.

PHARMACEUTICAL BIOTECHNOLOGY

THEORY

UNIT – I 12 Hours

Immunology and Immunological Preparations:

Principles, antigens and haptens, immune system, cellular humoral immunity, immunological tolerance, antigen-antibody reactions and their applications. Hypersensitivity, Active and passive immunization, vaccines and sera, their preparations standardization and storage.

UNIT – II 12 Hours

Genetic Recombination:

Transformation, conjugation, transduction, protoplast fusion and gene cloning and their applications. Development of hybridoma for monoclonal antibodies. Study of drugs produced by biotechnology such as activase, Humulin, Humatrope, HB etc.

UNIT – III 12 Hours

Antibiotics:

Historical development of antibiotics. Antimicrobial spectrum and methods used for their standardization. Screening of soil for organisms producing antibiotics, Fermenters and its design, control of different parameters, Isolation of mutants, factors influencing rate of mutation. Design of fermentation process Isolation of fermentation products with special reference to penicillin, streptomycin, tetracycline and vitamin B12.

UNIT – IV 12 Hours

Microbial Transformation:

Introduction, types of reactions mediated by microorganisms, design of biotransformation processes, selection of organisms, biotransformation process and its improvements with special reference to steroids

UNIT – V 12 Hours

Enzyme immobilization:

Techniques of immobilization of enzymes, factors affecting enzyme kinetics. Study of enzymes such as hyaluronidase, pencillinase, streptokinase and streptodornase, amylases and proteases etc. immobilization of bacteria and plant cells.

PHARMACOLOGY – IV

(Clinical Pharmacy and Pharmacotherapeutics)

Theory: 60 hours

UNIT I (1 hour)

Introduction to Clinical Pharmacy Practice

UNIT II (9 hours)

Drug use in Pediatrics and Geriatrics

Drug use in Pregnancy

Drug induced diseases – Blood, liver, lungs and kidney

UNIT III (20 hours)

Important disorders of organ system and their management

Cardiovascular: Hypertension, Heart Failure, Angina, Myocardial Infarction, Cardiac Arrhythmias

Respiratory: Asthma, Chronic Obstructive Pulmonary Disease

Gastrointestinal: Peptic Ulcer Disease, Gastro Esophageal Reflex Disease, Hepatitis

Endocrine: Diabetes Mellitus, Thyroid Disorders, Poly Cystic Ovarian Syndrome, Hormone Replacement Therapy, Osteoporosis

UNIT IV (15 hours)

Infectious Diseases: Tuberculosis, Urinary Tract Infections, Gastero enteritis, Upper Respiratory Infections, Endocarditis, Septicemia

Hematopoietic disorders: Iron deficiency anemia, Megaloblastic anemia

Musculoskeletal: Rheumatoid arthritis, Osteoarthritis, Gout

Renal: Acute Kidney Injury, Chronic Kidney Disease

UNIT V (15 hours)

CNS: Epilepsy, Parkinsonism, Stroke, Schizophrenia, Depression

Neoplastic diseases: Basic Principles of cancer Chemotherapy, Breast Cancer, Leukemias

Sexually Transmitted Diseases: Syphilis, Gonorrhoea, AIDS

Skin disorders: Psoriasis, Eczema, Acne

SEMESTER - VIII

PHARMACOGNOSY - V

(CHEMISTRY OF NATURAL PRODUCTS)

THEORY

UNIT – I **4 Hours**

a) Preliminary phytochemical evaluation.

b) Spectral approaches to simple molecules of natural origin

UNIT-II **20 HOURS**

a) Classification and General Structural Elucidation of Terpenoids, Chemistry and pharmacological activity of medicinally important monoterpenes

b) Fat soluble and water soluble vitamins: Chemistry,

UNIT – III **20 Hours**

a) Alkaloids: , Classification and general structural elucidation. Chemistry, biogenesis (only underlined) and pharmacological activity of Atropine, Quinine, Reserpine, Morphine, Ephedrine, Ergotamine

b) Chemistry of Flavonoids –Introduction, identification test, chemistry of Flavones and Isoflavone.

UNIT – IV **5 Hours**

Acid value, Saponification value, ester value, iodine value and peroxide value.

UNIT – V **11 Hours**

Steroids and related drugs:

Steroidal nomenclature and Stereochemistry, Androgens, Estrogens and Progestational agents, adrenocorticoids, Cholesterol, Ergosterol, and Bileacids.

PRACTICALS

1. Isolation of casein from milk.
2. Isolation of starch from potato.
3. Isolation of calcium citrate from lemon.
4. Assay of Ascorbic acid
5. Assay of Quinine sulphate
6. Assay of Niacinamide

7. Assay of Atropine sulphate.
8. Assay of Caffeine citrate.
9. Determination of acid value of fixed oil.
10. Determination of Saponification value of fixed oil.
11. Determination of eugenol in clove oil
12. Determination of swelling factor.
13. Determination of Peroxide value.
14. Determination of Aldehyde in lemon grass oil.

PHARMACOGNOSY – VI

THEORY

UNIT – I 18 Hours

(a) World-wide trade in medicinal plants and derived products with special reference to diosgenin (disocorea) taxol (Taxus sps), digitalis, tropane alkaloid containing plants, Papain, Cinchona, Ipecac, Liquorice, Ginseng, Aloe, Valerian, Rawolfia and plants containing laxatives.

(b) A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India.

(c) Utilization and production of phytoconstituents such as Quinine, Calcium sennosides, podophyllotoxin, diosgenin, solasodine and tropane alkaloids and utilization of aromatic plants and derived products with special reference to sandalwood oil, mentha oil, lemon grass oil, vetiver oil, geranium oil and eucalyptus oil.

UNIT – II 8 Hours

Herbal Drug Regulatory affairs: Milestones and objectives of herbal drug regulation, Herbal drug regulation in Europe, USA, UK, Australia, India, Japan and China

UNIT – III 12 Hours

a) Historical development of plant tissue culture, types of cultures, nutritional requirements, growth and their maintenance. Applications of plant tissue culture in pharmacognosy.
b) Marine pharmacognosy, novel medicinal agents from marine sources.
c) Natural allergens and photosensitizing agents and fungal toxins.
d) Plant bitters and sweeteners - silybum species, phyllanthus species

UNIT – IV 10 Hours

a) An introduction to functional foods, nutraceuticals, and dietary supplements

b) Clinical pharmacognosy: Integration of traditional pharmacology of crude drugs used in ayurveda and siddha with modern therapeutics

UNIT – V 12 Hours

a) Herbal cosmetics on commercial scale.

b) Quality control of crude drugs:

Adulteration of crude drugs and their detection by organoleptic, microscopic, physical, chemical and biological methods of evaluation.

c) Newer approaches to standardization of multiconstituent herbals

PRACTICALS

1. Isolation of some selected phytoconstituents studied in theory.
   (a) Tropane alkaloids from datura leaves
   (b) Solasodine from potato
2. Extraction of volatile oils and their chromatographic profiles
   (a) Eucalyptus oil from eucalyptus leaves
   (b) Mentha oil from peppermint leaves
   (c) Vetiver oil from roots of vetiver
3. Demonstration of tissue culture techniques.
4. TLC of quinine and tropane alkaloids, PC of sugars from plant extracts
5. Quantitative microscopy

Major Experiments:

Extraction of volatile oils and their chromatographic profiles

1. Eucalyptus oil from eucalyptus leaves
2. Mentha oil from peppermint leaves
3. Vetiver oil from roots of vetiver

Quantitative microscopic measurements of the following cell contents

1. Starch grains 2. Phloem fibres 3.Calcium oxalate crystals

Determination of the following leaf constants

Stomatal index, Stomatal numbers, Vain-islet number, vein-termination number, palisade ratio

Minor Experiments:

TLC of quinine and tropane alkaloids, PC of sugars from plant extracts

PHARMACEUTICAL INDUSTRIAL MANAGEMENT

THEORY

UNIT – I 12 Hours

Concept of Management Administrative Management (Planning, Organizing, Staffing, Directing and Management (Personnel, Materials Production, Financial, Marketing, Time/Space, Margin/Morale). Principles of Management (Co-ordination, Communication, Motivation, Decision-making, leadership, Innovation, Creativity, Identification of key points to give maximum thrust for development and perfection.

UNIT – II 12 Hours

a) Accountancy:

Principles of Accountancy, Ledger posting and book entries, preparation of trial balance, columins of cash book, Bank reconciliation statement, rectification of errors, Profits and loss account, balance sheet, cheques, bills of exchange, promissory notes and hundies documentary bills.

b) Economics:

Principles of economics with special reference to the laws of demand and supply, demand schedule, demand curves, labor welfare, general principles of insurance and inland and foreign trade, procedure of exporting and importing goods.

UNIT – III 12 Hours

a) Pharmaceutical Marketing:

Functions buying, selling, transportation, storage, finance, feedback, information, channels of distribution, wholesale, retail, departmental store, multiple shop and mail order business.

b) Salesmanship:

Principles of sales promotion, advertising, ethics of sales, merchandising, literature, detailing. Recruitment, training, evaluation, compensation to the pharmacist.

c) Market Research:

Recruitment, training, evaluation, compensation to the pharmacist pre-requisition: Basic information services.

UNIT – IV 12 Hours

Materials Management:

A brief exposure of the basic principles of Materials Management Purchase, stores and inventory control (Eligibility, Efficiency Evaluation, Recruitment Methodology, Service Conditions, Termination, Performance Evaluation, etc.)

UNIT – V 12 Hours

Production Management:

A brief exposure of the different aspects of Production Management a (Visible and Invisible inputs, Methodology of Activities, Performance Evaluation Technique, Process-Flow, Process Know-how, Maintenance Management.

PHARMACEUTICS - VIII

(BIOPHARMACEUTICS & PHARMACOKINETICS)

THEORY

UNIT – I 13 Hours

Introduction to Biopharmaceutics and Pharmacokinetics

Role of Biopharmaceutics and pharmacokinetics on formulation development and clinical setting.

Passage of drugs across biological barrier (passive diffusion, active transport, facilitated diffusion) Factors influencing absorption - Physicochemical, physiological and pharmaceutical. Drug distribution in the body, Volume of distribution, plasma protein binding.

UNIT - II 11 Hours

(a) Significance of plasma drug concentration measurement.

(b) Compartment model: Definition and Scope

(c) Pharmacokinetics of drug absorption, zero order and first order absorption rate constant using Wagner - Nelson method.

(d) Volume of distribution

UNIT-III 18 Hours

(a) Compartment kinetics - one compartment and two compartment models. Determination of pharmacokinetic parameters from plasma and urine data after drug administration by intra-vascular and extra vascular route.

(b) Curve fitting (method of residuals) regression procedures

(c) Clearance concept, renal clearance, determination of renal clearance

(d) Extraction ratio, hepatic clearance, biliary excretion, Extra hepatic circulation

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

UNIT – IV 10 Hours

Clinical Pharmacokinetics:

(a) Definition and scope

(b) Dosage adjustment in patients with renal and hepatic failure

(c) Design of single dose bio-equivalence study and relevant statistics

UNIT-V 8 Hours

(d) Measurement of bioavailability, C_{max} and area under the curve (AUC)

(e) Pharmacokinetic drug interactions and their significance in combination therapy

(f) Review of regulatory requirements for conduction of bio-equivalent studies.

PRACTICALS

1. Estimation of absorbtion rate constant, elimination rate constant and Cmax, tmax with given data

2. Determination of AUC (Area under the curve) by trapezoidal rule.

3. Analysis of biological specimens for drug content and determination of various pharmacokinetic parameters

4. Specimen –Blood, saliva and urine

5. *In vitro* evaluation of different dosage forms for drug release - Tablets, Capsules

6. Absorption studies - *In-vitro& in-vivo* study of gels, ointments using animals skin and franz diffusion cell

7. Estimation of volume of distribution and total body clearance, distribution co-efficient for a drug with given data

8. Determination of percentage of protein binding of drugs – demonstration

Major experiments

1. Determination of plasma concentrations of Paracetamol and aspirin
2. Determination of C_{max} and t_{max}.

3. Determination of AUC (Area under the curve) by trapezoidal rule
4. Plotting of plasma concentration time profile on ordinary and semi log graph paper
5. Determination of $t_{½}$ and k from PC - time profile of IV infusion
6. *In-vitro* evaluation - dissolution studies of marketed Paracetamol preparations.

Minor experiments

7. Disintegration test for marketed samples of capsules and tablets and their effect on absorption.
8. Determination of : $t_{½}$, K, V, and CL from PC - time data following oral administration, IV bolus
9. Determination of absorption rate constant by method of residuals.

PHARMACEUTICS - IX
(HOSPITAL PHARMACY)

THEORY **Total hrs - 60**

UNIT I 10 hours

a) Organization and structure: organization of a hospital and hospital pharmacy, responsibilities of a hospital pharmacist, budget preparation and implementation
b) Pharmacy and therapeutics committee, Infection control committee
c) Hospital formulary: contents, preparation and revision of hospital formulary.
d) Drug store management and inventory control.
   i) Organization of drug store, types of material stocked, storage conditions
   ii) Purchase and inventory control-principles-purchase procedures purchase order, procurement and stocking.

UNIT II 15 hours

Drug distribution systems in hospitals

a) Outpatient dispensing-methods adopted

b) Dispensing of drugs to in patients: types of drug distribution systems. Charging policy, labeling

c) Dispensing of drugs to ambulatory patients

d) Dispensing of controlled drugs.

e)Central sterile supply unit and their management

Types of materials for sterilization, sterilization equipments, supply of sterile materials.

UNIT III 15 hours

a) Blood products and plasma substitutes

Collection, processing and storage of whole human blood, concentrated human RBCs, dried human plasma, human fibrinogen, human thrombin, human normal immunoglobulin, human fibrin foam, plasma substitutes-ideal requirements, PVP, Dextran as per IP

b) Surgical products

Definition, primary wound dressing, absorbants, surgical cotton, surgical gauze etc, bandages, adhesive tape, protective cellulosic hemostatics, official dressing, absorbable and non absorbable sutures, ligatures and catguts. medical prosthetics and organ replacement materials.

Unit IV 8 hours

Nutrition in pharmacy practice-Nutritional requirements, drug nutrient interaction, total parentral nutrition

Nuclear pharmacy practice- procurement, compounding, dispensing, quality assurance, and clinical use of radiopharmaceuticals.

Unit V 9 hours

Drug information services

Sources of information on drugs, disease, treatment schedules, procurement of information, computerized services (eg MEDLINE), retrieval of information, medication error.

Unit VI 3 hours

Good pharmacy practice-GPP requirement, elements of GPP, Role of pharmacist in satisfying GPP

SRI RAMACHANDRA COLLEGE OF PHARMACY – SRU

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REFERENCE BOOKS (LATEST EDITION)

PHARMACEUTICAL CHEMISTRY

Pharmaceutical Inorganic Chemistry

1. Pharmacopoeia of India, Ministry of Health, Govt. of India, New Delhi.
2. Jeffery G.H., Bassett J., Mendham J., Denney R.C., Vogel's Text Book of Quantitative Chemical Analysis, E.L.B.S. London.
3. Beckett A.H. and Stenlake J.B., Practical Pharmaceutical Chemistry, Part-I, The Athlene Press University of London.
4. Connors K.A., A Text Book of Pharmaceutical Analysis,John Willey & Sons.
5. Chatten L.G., Pharmaceutical Chemistry, Vol. I & II, Marshal Dekker, New York.

6. Block J., Roche E.B., Sonie T.O., Wilson C.O., Inorganic Pharmaceutical chemistry, Lea & Febiger, Philadelphia, PA.
7. Atherden L.M, Bentley and Driver's Text Book of Pharmaceutical Chemistry, Oxford University Press, London.
8. Jeffery G.H., Bassett J., Mendham J., Denney R.C., Vogel's text book of quantitative chemical analysis, E.L.B.S. London.
9. Brey W. S., Physical Chemistry and its Biological Applications, Academic press.
10. Disher L. A., Modern Inorganic Pharmaceutical Chemistry.
11. Suchla G., Vogel's Textbook of Micro and Semi micro Qualitative Inorganic Analysis, Orient Longman,Hyderabad.

Pharmaceutical Organic Chemistry

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2. Finar I. L.,Organic Chemistry, Vol-1, E.L.B.S. London.
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