

THE TAMIL NADU DR.M.G.R. MEDICAL UNIVERSITY,
CHENNAI – 600 032.

REGULATIONS OF PHARM D. & PHARM D. (POST BACCALAUREATE) COURSE

In exercise of the powers conferred by Section 44 of the Tamil Nadu Dr. M.G.R. Medical University, Chennai, Act, 1987 (Tamil Nadu Act 37 of 1987), the Standing Academic Board of the Tamil Nadu Dr. M.G.R. Medical University, Chennai hereby makes the following regulations:-

1. SHORT TITLE AND COMMENCEMENT:-

These regulations shall be called “REGULATIONS FOR PHARM D. (Doctor of Pharmacy) & PHARM D. (POST BACCALAUREATE) (Doctor of Pharmacy) DEGREE COURSES OF THE TAMIL NADU Dr. M.G.R. MEDICAL UNIVERSITY, CHENNAI”.

They shall come into force from the academic year 2008-2009 onwards.

The regulation framed is subject to modifications from time to time by the Standing Academic Board.

2. OBJECTIVES:-

The course is started for the purpose of registration as a Pharmacist to practice the profession under the Pharmacy Act, 1948.

3. MINIMUM QUALIFICATION FOR ADMISSION:-

a) Pharm . D. Part-I Course – A pass in any of the following examinations -

(i) A pass in 10 +2 examination with Physics and Chemistry as compulsory subjects along with one of the following subjects:

Mathematics or Biology.

(ii) A pass in D.Pharm course from an institution approved by the Pharmacy Council of India under section 12 of the Pharmacy Act.

(iii) Any other qualification approved by the Pharmacy Council of India as equivalent to any of the above examinations.

Provided that a student should complete the age of 17 years on or before 31st December of the year of admission to the course.

There shall be reservation of seats for the students belonging to the Scheduled Castes, Scheduled Tribes and other Backward Classes in accordance with the instructions issued by the Central Government / State Government as the case may be from time to time.

b) PHARM D. (POST BACCALAUREATE) COURSE:-
(GRADUATE ENTRY LEVEL)

A pass in B.Pharm from an institution approved by the Pharmacy Council of India under section 12 of the Pharmacy Act:

There shall be reservation of seats for the students belonging to the Scheduled Castes, Scheduled Tribes and other Backward Classes in accordance with the instructions issued by the Central Government / State Government Administration as the case may be from time to time.

4. AGE LIMIT FOR ADMISSION:-

The student should complete the age of 17 years on or before 31st December of the year of admission to the course.

5. NUMBER OF ADMISSIONS:-

Number of admissions in the above said programmes shall be as prescribed by the Pharmacy Council of the India from time to time and presently be restricted as below

- i) Pharm D Programme – 30 students.
- ii) Pharm D (Post Baccalaureate) Programme – 10 students.

6. DURATION OF THE COURSE:-

a) Pharm. D: The duration of the course shall be six academic years (five years of study and one year of internship or residency)

b) Pharm.D. (Post Baccalaureate): This is a graduate entry course to the 4th year of the Pharm.D. Course and the student should undergo the Pharm.D. Post Baccalaureate Programme for three academic years (fourth, fifth and sixth years of the Pharm.D. Programme) (two years of academic study and one year of internship or residency)

COMMENCEMENT OF THE COURSE:-

From 1st August of the academic year.

7. MEDIUM OF INSTRUCTION:-

English shall be the medium of instruction for all the subjects of study for examinations of Pharm D. & Pharm D. (Post Baccalaureate) Degree Courses.

8. CUT-OFF DATE FOR ADMISSION TO EXAMINATIONS:-

The candidates admitted upto 30th September shall be registered to take up their 1st year examination during 1st August of the next year after fulfillment of the regulations.

All kinds of admissions shall be completed on or before 30th September of the academic year. There shall not be any admissions after 30th September even if seats are vacant.

9. CURRICULUM:-

The Curriculum and the syllabi for the course shall be as prescribed by Pharmacy Council of India / University from time to time.

10. WORKING DAYS IN THE ACADEMIC YEAR:-

Each academic year shall consist of not less than 270 working days.

Total No. of days in a year		365 days
No. of weekly off (Sundays)	-	52 days
No. of Government Holidays	-	22 days
No. of Holidays	-	21 days
	-----	95 days
Total No. of working days including Examination period		----- 270 days -----

11. PHYSICAL FITNESS CERTIFICATE:-

Every candidate before admission to the course shall submit to the Principal of the Institution a Certificate of Medical Fitness from an authorized Medical Officer that the candidate is physically fit to undergo the academic course and does not suffer from any disability or contagious disease.

12. ELIGIBILITY CERTIFICATE:-

For Pharm.D & Pharm. D (Post Baccalaureate) the Candidate who have passed any qualifying examination other than the Higher Secondary Course Examination conducted by the Government of Tamil Nadu and other than B.Pharmacy degree awarded by the Tamil Nadu Dr. M.G.R. Medical University shall obtain an Eligibility Certificate from the University by remitting the prescribed fees along with the filled in Application Form (which can be downloaded from the University website (www.tnmmu.ac.in), Marksheets, Transfer Certificate and other relevant documents required by the University, before seeking admission to any one of the affiliated Institutions.

13. MIGRATION / TRANSFER OF CANDIDATES:-

Migration / Transfer of candidates from one recognized institution to another recognized institution of this University shall be granted on the following conditions:-

- a) All migrations / transfers are subject to the approval of the Vice-Chancellor.
- b) Transfer shall be effected only at the beginning of the academic year.
- c) Transfer shall be effected only between Pharmacy Council of India recognized Institutions for pharm.D programme.
- d) The transfer application should be sent through proper channel to the Academic Officer within three months of publications of the results or admission to the course.
- e) Transfer shall be effected during any year of study after fulfillment of the regulations of this University.
- f) The Vice-Chancellor has been empowered to decide and issue transfer from one college to another college and is subject to verification of the vacancy position available in the college without contravention to the statutory rules of the Central Council and such transfers permitted by the University be placed in the Governing Council for information.
- g) The provision of combination of attendance shall be granted to the transfers for admission to the examination of the University on satisfactory fulfillment of the regulation of this University.
- h) Migration of interns from one Institution to another Institution, "Migration of intern from one hospital to another can be done only under specific conditions like transfer of parents, sickness etc., for which documentary evidence shall be submitted be replaced with "Migration of interns from one hospital to another be considered if the reason is genuine and acceptable by the University.

14. REGISTRATION:-

A candidate admitted in the Pharm.D. & Pharm D. (Post Baccalaureate) Degree Course in any one of the affiliated Institutions of this University shall register his/her name in the prescribed application form for registration duly filled along with the prescribed fee and a declaration in the prescribed format, to the Controller of Examination of this University through the affiliated Institution within 60 days from the Cut-off date prescribed for the Pharm.D & Pharm.D. (Post Baccalaureate) Degree Courses for admission.

15. VACATION:-

The Heads of the Institutions shall declare 30 days of vacation on completion of each year examinations to the students. The period(s) of vacation can be decided by the Head of the Institution.

16. ATTENDANCE REQUIRED FOR ADMISSION TO EXAMINATIONS:-

a) No candidate shall be permitted to appear in any one of the parts of Pharm.D & Pharm.D. (Post Baccalaureate) Degree Examinations, unless he/she has attended the course in the subject for the prescribed period in an affiliated Institution recognized by this University and produce the necessary certificate of study attendance, satisfactory conduct and progress from the Head of the Institution.

b) Each academic year shall consist of not less than 270 days(inclusive of the University exam days).

c) A candidate is required to put in a minimum of 80% of attendance in both theory and practical separately in each subject before admission to the examination for all the years to study in the Pharm.D & Pharm.D. (Post Baccalaureate) Degree Courses of this University.

d) A candidate lacking in the prescribed attendance and progress in anyone subject in theory and practical shall not be permitted for admission to the entire examination in the first appearance.

17. CONDONATION FOR LACK OF ATTENDANCE:-

There shall be no condonation of lack of attendance.

18. ELIGIBLE INSTITUTIONS:-

Institutions running B.Pharm programme approved under section 12 of the Pharmacy Act, will only be permitted to run Pharm.D. Programme. Pharm.D. (Post Baccalaureate) programme will be permitted only in those institutions which are permitted to run Pharm.D. Programme with the prior approval from the Pharmacy Council of India and the Tamil Nadu Dr. M.G.R. Medical University.

19. SYLLABUS:-

The syllabus for each subject of study in the said Tables shall be as specified in Appendix-A (PCI Regulation) to these regulations.

20. APPROVAL OF THE AUTHORITY CONDUCTING THE COURSE OF STUDY:-

(i) No person, institution, society or University shall start and conduct Pharm.D. or Pharm.D. (Post Baccalaureate) programme without the prior approval of the Pharmacy Council of India.

(ii) Any person or pharmacy college for the purpose of obtaining permission under sub-section(i) or section 12 of the Pharmacy Act, shall submit a scheme as prescribed by the Pharmacy Council of India.

(iii) The scheme referred to in sub-regulation (ii) above, shall be in such form and contain such particulars and be preferred in such manner and be accompanied with such fee as may be prescribed:

Provided that the Pharmacy Council of India shall not approve any institution under these regulations unless it provides adequate arrangement for teaching in regard to building, accommodation, labs., equipments, teaching staff, non-teaching staff, etc., as specified in Appendix-B (PCI Regulation) to these regulations.

21. COURSE OF STUDY:-

The course of study for Pharm.D. Shall include the subjects which are given in the Tables below. The number of hours in a week, devoted to each subject for its teaching in theory, practical and tutorial shall not be less than that noted against it in columns (3), (4) and (5) below.

TABLES

FIRST YEAR

Sl. No. (1)	Name of Subject (2)	No. of hours of Theory (3)	No. of hours of Practical (4)	No. of hours of Tutorial (5)
1.1	Human Anatomy and Physiology	3	3	1
1.2	Pharmaceutics	2	3	1
1.3	Medicinal Biochemistry	3	3	1
1.4	Pharmaceutical Organic Chemistry	3	3	1
1.5	Pharmaceutical Inorganic Chemistry	2	3	1
1.6	Remedial Mathematics/Biology	3	3*	1
	Total hours	16	18	6 = (40)

* for Biology

SECOND YEAR

Sl. No.	Name of Subject	No. of hours of Theory	No. of hours of Practical	No. of hours of Tutorial
2.1	Pathophysiology	3	-	1
2.2	Pharmaceutical Microbiology	3	3	1
2.3	Pharmacognosy & Phytopharmaceuticals	3	3	1
2.4	Pharmacology - I	3	-	1
2.5	Community Pharmacy	2	-	1
2.6	Pharmacotherapeutics I	3	3	1
	Total hours	17	9	6 = 32

THIRD YEAR

Sl. No.	Name of Subject	No. of hours of Theory	No. of hours of Practical	No. of hours of Tutorial
3.1	Pharmacology- II	3	3	1
3.2	Pharmaceutical Analysis	3	3	1
3.3	Pharmacotherapeutics - II	3	3	1
3.4	Pharmaceutical Jurisprudence	2	-	-
3.5	Medicinal Chemistry	3	3	1
3.6	Pharmaceutical Formulations	2	3	1
	Total hours	16	15	5 = 36

FOURTH YEAR

Sl. No.	Name of Subject	No. of hours of Theory	No. of hours of Practical	No. of hours of Tutorial
4.1	Pharmacotherapeutics - III	3	3	1
4.2	Hospital Pharmacy	2	3	1
4.3	Clinical Pharmacy	3	3	1
4.4	BioStatistics & Research Methodology	2	-	1
4.5	Biopharmaceutics & Pharmacokinetics	3	3	1
4.6	Clinical Toxicology	2	-	1
	Total hours	15	12	6 = 33

FIFTH YEAR

Sl. No.	Name of Subject	No. of hours of Theory	No. of hours of Practical	No. of hours of Tutorial
5.1	Clinical Research	3	-	1
5.2	Pharmacoepidemiology and Pharmacoeconomics	3	-	1
5.3	Clinical Pharmacokinetics & Pharmacotherapeutic Drug Monitoring	2	-	1
5.4	Clerkship*	-	-	1
5.5	Project work(Six months)	-	20	-
	Total hours	8	20	4 = 32

* Attending ward rounds on daily basis.

SIXTH YEAR: FOR BOTH PHARM.D AND PHARM.D(POST BACCULAUREATE)

Internship or Residency Training including postings in specialty units. Student should independently provide the clinical pharmacy services to the allotted wards.

- (I) Six months in General Medicine department and
- (II) Two months each in three other specialty departments.

22. REVALUATION / RETOTALLING OF ANSWER PAPERS:-

There shall be no revaluation/ retotalling of the answer papers of failed candidates in any Post-Graduate examination.

23. DURATION FOR COMPLETION OF THE COURSE OF STUDY:-

The duration for the completion of the course shall be fixed as double time of the course and the students have to pass within the said period, otherwise they have to get fresh admission.

24. RE-ADMISSION AFTER BREAK OF STUDY:-

The regulations for readmission are as per the University Common Regulations for Readmission

25. COMMENCEMENT OF EXAMINATION:-

- (i) Every year there shall be an examination to examine the students.
- (ii) Each examination may be held twice every year. The first examination in a year shall be the annual examination and the second examination shall be supplementary examination.
- (iii) Regular Examinations will commence from 1st August and supplementary Examinations will commence from 1st February every year. *
* It was resolved in the 45th SAB dated 15.11.2012 and 48th SAB dated 02.07.2014.
- (iv) If the date of commencement of examination falls on Saturdays, Sundays or declared Public Holidays, the examination shall begin on the next working day.
- (v) The examinations shall be of written and practical (including oral) carrying maximum marks for each part of a subject as indicated in Tables @ Sl.No. 37 (Scheme of Examinations)

26. ELIGIBILITY FOR APPEARING EXAMINATION:-

Only such students who produce certificate from the Head of the Institution in which he or she has undergone the Pharm.D. or as the case may be, the Pharm.D. (Post Baccalaureate) course, in proof of his or her having regularly and satisfactorily undergone the course of study by attending not less than 80% of the classes held both in theory and in practical separately in each subject shall be eligible for appearing at examination.

27. MODE OF EXAMINATIONS:-

(i) Theory examination shall be of three hours and practical examination shall be of four hours duration.

(ii) A student who fails in theory or practical examination of a subject shall re-appear both in theory and practical of the same subject.

(iii) Clerkship examination - Oral examination shall be conducted after the completion of clerkship of students. An external and an internal examiner will evaluate the student. Students may be asked to present the allotted medical cases followed by discussion. Students' capabilities in delivering clinical pharmacy services, pharmaceutical care planning and knowledge of therapeutics shall be assessed.

(iv) Project evaluation - Final evaluation of project work shall be done. The project will be evaluated on the writeup, presentation, communication, Question and answer skills.

28. AWARD OF SESSIONAL MARKS AND MAINTENANCE OF RECORDS:-

(i) A regular record of both theory and practical class work and examinations conducted in an institution imparting training for Pharm.D. or Pharm.D. (Post Baccalaureate) course, shall be maintained for each student in the institution and 20 marks for each theory and 30 marks for each practical subject shall be allotted as sessional.

(ii) There shall be at least two periodic sessional examinations during each academic year and the highest aggregate of any two performances shall form the basis of calculating sessional marks.

(iii) The sessional marks in practicals shall be allotted on the following basis:-

- (a) Actual performance in the sessional examination (20 marks);
- (b) Day to day assessment in the practical class work, Promptness, viva-voce, record maintenance, etc., (10 marks).

29. QUESTION PATTERN:-

	No. of Questions			Total	Marks
2 Essays	4	x	10	=	40
10 Short notes	6	x	5	=	30

					70

30. MINIMUM MARKS FOR PASSING EXAMINATION:-

The candidate should have appeared for theory, practical and Oral examinations for securing a pass in a subject. A student shall not be declared to have passed examination unless he or she secures at least 50% marks in each of the subjects, separately in the theory and practical including IA marks and practicals.

31. CLASSIFICATION OF SUCCESSFUL CANDIDATES:-

The students securing 60% marks or above in aggregate in all subjects in a single attempt at the Pharm.D. or as the case may be, Pharm.D. (Post Baccalaureate) course examination shall be declared to have passed in first class. Students securing 75% marks or above in any subject or subjects shall be declared to have passed with distinction in the subject or those subjects provided he or she passes in all subjects in a single attempt.

32. AWARD OF MEDALS / PRIZES:-

The University shall award at its Convocation, medals and prizes to outstanding candidates as and when instituted by the donors as per the schedule prescribed for the award.

33. AUTHORITY TO ISSUE TRANSCRIPT:-

The Controller of Examination shall be the Authority for issuing Transcript of marks after remitting the prescribed fee.

34. ELIGIBILITY FOR PROMOTION TO NEXT YEAR:-

Effective for 2008-09 batch onwards

All students who have appeared for all the subjects and passed the first year annual examination are eligible for promotion to the second year and, so on. However, failure in more than two subjects shall debar him or her from promotion to the next year classes.

Effective for 2010-11 batch onwards

The candidates who have appeared and failed in annual examination of the particular academic year to allow to appear for the supplementary examination without losing additional six months and further resolved that if a candidate fails in more than two subjects in the supplementary examination shall not be permitted to the next year classes.

35. EXEMPTION FROM RE-EXAMINATION IN A SUBJECT:-

- a) Candidates who failed in the examination but obtained pass marks in any subject shall be exempted from re-examination in that subject.
- b) Failed candidates who are not permitted to the next phase of study are also required to put in a minimum of 80% attendance during the calendar period of study before appearing for next examinations.

36. RESIDENCY TRAINING:-

- (i) Residency Training is a phase of training wherein a student is expected to conduct actual practice of pharmacy and health care and acquires skills under the supervision so that he or she may become capable of functioning independently.
- (ii) Every student has to undergo one year Residency Training as per Appendix-C (PCI Regulations).
- (iii) Residency Training under the Departments mentioned below
- (a) Six months posting in General Medicine
 - (b) Two months in each speciality Departments namely Paediatric, O&G, and General Surgery including Orthopaedics.
- (iv) Intern should get trained in the following areas in addition to the existing training suggested in the Pharm-D and Pharm-D(Post Baccalaureate) Programme:
- (a) TDM – Therapeutic Drug Monitoring
 - (b) IV – Admixture Programme
 - (c) TPN Programme – Total Parenteral Nutrition
 - (d) ADR Monitoring
 - (e) Report Drug Interactions
 - (f) Manage Drug Logistics in a hospital Setting.

37. APPROVAL OF EXAMINATIONS:-

Examinations mentioned in regulations 25, 27, 30 and 31 shall be held by the examining authority herein after referred to as the university, which shall be approved by the Pharmacy Council of India Under sub-section (2) of section 12 of the Pharmacy Act, 1948. Such approval shall be granted only if the examining authority concerned fulfills the conditions as specified in Appendix-D (PCI Regulation) to these regulations.

Pharm -D

SCHEME OF EXAMINATION - I YEAR

Sl. No.	Name of Subject	Theory			Practicals		
		Examination	Sessional	Total	Examination	Sessional	Total
1	Human Anatomy and Physiology	70	30	100	70	30	100
2	Pharmaceutics	70	30	100	70	30	100
3	Medicinal Biochemistry	70	30	100	70	30	100
4	Pharmaceutical Organic Chemistry	70	30	100	70	30	100

5	Pharmaceutical Inorganic Chemistry	70	30	100	70	30	100
6	Remedial Mathematics/ Biology	70	30	100	70 *	30 *	100*
				600			600=1200

*for Biology

No minimum is required either in IA or Theory & Practical exams.

SCHEME OF EXAMINATION - II YEAR

Sl. No.	Name of Subject	Theory			Practicals		
		Examination	Sessional	Total	Examination	Sessional	Total
1	Pathophysiology	70	30	100	-	-	-
2	Pharmaceutical Microbiology	70	30	100	70	30	100
3	Pharmacognosy & Phytopharmaceutics	70	30	100	70	30	100
4	Pharmacology - I	70	30	100	-	-	-
5	Community Pharmacy	70	30	100	-	-	-
6	Pharmacotherapeutics I	70	30	100	70	30	100
				600			300=900

SCHEME OF EXAMINATION - III YEAR

Sl. No.	Name of Subject	Theory			Practicals		
		Examination	Sessional	Total	Examination	Sessional	Total
1	Pharmacology- II	70	30	100	70	30	100
2	Pharmaceutical Analysis	70	30	100	70	30	100
3	Pharmacotherapeutics - II	70	30	100	70	30	100

4	Pharmaceutical Jurisprudence	70	30	100	-	-	-
5	Medicinal Chemistry	70	30	100	70	30	100
6	Pharmaceutical Formulations	70	30	100	70	30	100
				600			500=1100

PHARM-D & PHARM -D(POST BACCALAUREATE)

SCHEME OF EXAMINATION - IV YEAR

Sl. No.	Name of Subject	Theory			Practicals		
		Examination	Sessional	Total	Examination	Sessional	Total
1	Pharmacotherapeutics - III	70	30	100	70	30	100
2	Hospital Pharmacy	70	30	100	70	30	100
3	Clinical Pharmacy	70	30	100	70	30	100
4	BioStatistics & Research Methodology	70	30	100	-	-	-
5	Biopharmaceutics & Pharmacokinetics	70	30	100	70	30	100
6	Clinical Toxicology	70	30	100	-	-	-
7	**Pharmacotherapeutics I & II	70	30	100	70	30	100
				700			500=1200

**** PHARMACOTHERAPEUTICS I & II(only for Pharm-D(Post Baccalaureate))**

- a. The students of Pharm-D (Post Baccalaureate) of 2008-09 should pass the Pharmacotherapeutics (I & II) as a single additional subjects in the 5th year.
- b. The students of Pharm-D (Post Baccalaureate) of 2009-10 should pass the Pharmacotherapeutics (I & II) as a single additional subjects in the 4th year and should complete the same by 5th year (applicable only to 2009-10 batch.)
- c. All the other candidates (2010-11 batch onwards) should carry over only two subjects till fifth year of the study.

SCHEME OF EXAMINATION - V YEAR

Sl. No.	Name of Subject	THEORY			PRACTICAL		
		Examination	Sessional	Total	Examination	Sessional	Total
1	Clinical Research	70	30	100	-	-	-
2	Pharmacoepidemiology and Pharmacoeconomics	70	30	100	-	-	-
3	Clinical Pharmacokinetics & Pharmacotherapeutic Drug Monitoring	70	30	100	-	-	-
4	Clerkship*	-	-	-	70	30	100
5	Project work	-	-	-	100**	-	100
				300			200=500

* Attending ward rounds on daily basis

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IA	30
Project Presentations	70

38. CERTIFICATE OF PASSING EXAMINATION :-

Every student who has passed the examinations for the Pharm D. (Doctor of Pharmacy) or Pharm.D. (Post Baccalaureate) (Doctor of Pharmacy) as the case may be, shall be granted a certificate by the examining authority.

PRACTICAL TRAINING

39. HOSPITAL POSTING:-

Every student shall be posted in constituent hospital for a period of not less than fifty hours to be covered in not less than 270 working days in each of second, third and fourth year course. Each student shall submit report duly certified by the preceptor and duly attested by the Head of the Department or Institution as prescribed. In the fifth year, every student shall spend half a day in the morning hours attending ward rounds on daily basis as a part of clerkship. Theory teaching may be scheduled in the afternoon.

40. PROJECT WORK:-

(i) To allow the student to develop data collection and reporting skills in the area of community, hospital and clinical pharmacy, a project work shall be carried out under the supervision of a teacher. The project topic must be approved by the Head of the Department or Head of the Institution. The same shall be announced to students within one month of commencement of the fifth year classes. Project work shall be presented in a written report and as a seminar at the end of the year. External and the internal examiners shall do the assessment of the Project work.

(ii) Project work shall comprise of objectives of the work, methodology, results, discussions and conclusions.

41. OBJECTIVES OF PROJECT WORK:

The main objectives of the project work is to-

- (i) show the evidence of having made accurate description of published work of others and of having recorded the findings in an impartial manner, and
- (ii) develop the students in data collection, analysis and reporting and interpretation skills.

42.METHODOLOGY:-

To complete the project work following methodology shall be adopted, namely:-

(i) students shall work in groups of not less than two and not more than four under an authorized teacher:

(ii) project topic shall be approved by the Head of the Department or Head of the Institution:

(iii) Project work chosen shall be related to the pharmacy practice in community, hospital and clinical setup. It shall be patient and treatment (Medicine) oriented, like drug utilization reviews, pharmacoepidemiology, pharmacovigilance or pharmacoconomics:

(iv) Project work shall be approved by the Institutional ethics committee.

(v) Student shall present at least three seminars, one in the beginning, one at middle and one at the end of the project work; and

(vi) two-page write-up of the project indicating title, objectives, methodology anticipated benefits and references shall be submitted to the Head of the Department or Head of the Institution.

43. REPORTING:-

(i) Student working on the Project shall submit jointly to the Head of the Department or Head of the Institution a project report of about 40-50 pages. Project report should include a certificate issued by the authorized teacher, Head of the Department as well as by the Head of the Institution.

(ii) Project report shall be computer typed in double space using Times Roman font on A4 paper. The title shall be in bold with font size 18, sub-titles in bold with font size 14 and the text with font size 12. The cover page of the project report shall contain details about the name of the student and the name of the authorized teacher with font size 14.

(iii) Submission of the report shall be done at least one month prior to the commencement of annual or supplementary examination.

44. EVALUATION:-

The following methodology shall be adopted for evaluating the project work-

(i) Project work shall be evaluated by internal and external examiners.

(ii) students shall be evaluated in groups for four hours (i.e., about half an hour for a group of four students).

(iii) Three seminars presented by the students shall be evaluated for fifty marks each and the average of best two shall be forwarded to the University with marks of other subjects.

(iv) Valuation shall be done on the following items:

IA	30
Project	70

EXPLANATION :-

For the purposes of differentiation in the evaluation in case of topic being the same for the group of students, the same shall be done based on item numbers b, c and d mentioned above.

PHARM.D. SYLLABUS

FIRST YEAR:

1.1. HUMAN ANATOMY & PHYSIOLOGY (THEORY)

Theory : 3 Hrs./week

1.SCOPE AND OBJECTIVES :

This course is designed to impart a fundamental knowledge on the structure and functions of the human body, It also helps in understanding both homeostasis mechanisms and homeostatic imbalances of various body systems. Since a medicament, which is produced by pharmacist, is used to correct the deviations in human body, it enhances the understanding of how the drugs act on the various body systems in correcting the disease state of the organs.

2. UPON COMPLETION OF THE COURSE THE STUDENT SHALL BE ABLE TO :

- a. describe the structure (gross and histology) and functions of various organs of the human body:
- b. describe the various homeostatic mechanisms and their imbalances of various systems:
- c. identify the various tissues and organs of the different systems of the Human body:
- d. perform the hematological tests and also record blood pressure, heart rate, pulse and Respiratory volumes:
- e. appreciate coordinated working pattern of different organs of each system, and
- f. appreciate the interlinked mechanisms in the maintenance of normal functioning (Homeostasis) of human body

3.COURSE MATERIALS:

Test books

- a. Tortora Gerard J. and Nicholas, P. Principles of anatomy and physiology
Publisher Harpercollins College, New York.
- b. Wilson. K.J.W. Ross and Wilson's foundations of anatomy and physiology.
Publisher : Churchill Livingstone, Edinburg.

Reference books

- a. Guyton arthur, C.Physiology of human body, Publisher:HoltSaunders.
- b. Chatterjee, C.C.Human Physiology, Volume 1 & 11.Publisher: medical allied agency, Calcutta.
- c. Peter L. Williams, Roger warwick, Mary Dyson and Lawrence H.
- d. Gray's anatomy publisher : Churchill Livingstone, London.

4. LECTURE WISE PROGRAM:

TOPICS

1. Scope of anatomy and physiology, basic terminologies used in this subject (Description of the body as such planes and terminologies)
2. Structure of cell-its components and their functions.
3. Elementary tissues of the human body: epithelial, connective, Muscular and nervous tissues - their sub types and characteristics
- 4.(a) Osseous system - structure, composition and functions of the skeleton. (done in practical classes-6hrs)
- (b) Classification of joints, Types of movements of joints and disorders of joints (Definitions only)

5. HAEMOPOETIC SYSTEM

- a) Composition and functions of blood,
- b) Haemopoesis and disorders of blood components (definition of disorders)
- c) Blood groups
- d) clotting factors and mechanism
- e) Plateletis and disorders of coagulation.

6. LYMPH

- a) Lymph and lymphatic system, composition,formation and circulation.
- b) Spleen: structure and functions, Disorders
- c) Disorders of lymphatic system (definition only)

7. CARDIOVASCULAR SYSTEM

- a) Anatomy and functions of heart
- b) Blood vessels and circulation (Pulmonary, coronary and systemic circulation)
- c) Electrocardiogram (ECG)
- d) cardiac cycle and heart sounds
- e) Blood pressure -its maintenance and regulation
- f) Definition of the following disorders
Hypertension, Hypotension, Arteriosclerosis, Atherosclerosis, Angina,
Myocardial infarction, Congestive heart failure, Cardiac arrhythmias.

8 RESPIRATORY SYSTEM

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

9. DIGESTIVE SYSTEM

- a) Anatomy and Physiology of GIT
- b) Anatomy and functions of accessory glands of GIT
- c) Digestion and absorption
- d) Disorders of GIT (definitions only)

10 NERVOUS SYSTEM

- a) Definition and classification of nerves system
- b) Anatomy, Physiology and functional areas of cerebrum
- c) Anatomy, Physiology of cerebellum
- d) Anatomy and physiology of mid brain
- e) Thalamus, hypothalamus and Basal Ganglia
- f) Spinal cord: Structure & reflexes -mono-poly planter
- g) Cranial nerves - names and functions
- h) ANS-Anatomy & functions of sympathetic & Parasympathetic N.S.

11 URINARY SYSTEM

- a) Anatomy and Physiology of urinary system
- b) Formation of urine
- c) Renin Angiotensin system-Juxtglomerular apparatus - acid base balance
- d) Clearance tests and micturition

12 ENDOCRINE SYSTEM

- a) Pituitary gland
- b) Adrenal gland
- c) Thyroid and parathyroid glands
- d) Pancreas and gonads

13 REPRODUCTIVE SYSTEM

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

14 SENSE ORGANS

- a) Eye
- b) Ear
- c) Skin
- d) Tongue & Nose

15 SKELETAL MUSCLES

- a) Histology
- b) Physiology of muscle contraction
- c) Physiological properties of skeletal muscle and their disorders (definitions)

16. SPORTS PHYSIOLOGY

- a) Muscles in exercise, Effect of athletic training on muscles and muscle performance
- b) Respiration in exercise, CVS in exercise, Body heat in exercise, Body fluids and salts in exercise.
- c) Drugs and athletics

1.1. HUMAN ANATOMY & PHYSIOLOGY (PRACTICAL)

Practical :3Hrs/ week

GENERAL REQUIREMENTS: Dissection box, Laboratory Napkin, muslin cloth , record, observation book (100pages), stationery items, Blood lancet

COURSE MATERIALS:

Text books

Goyal, R.K.Nalvar M.P. and shah S.A.Practical anatomy physiology and biochemistry, latest edition, publisher B.S. Shah Prakshan, Ahmedabad.

Reference books

Ranade VG, Text book of practical Physiology, Latest edition Publisher : PVG, Pune
Anderson

Experimental Physiology, Latest edition, Publisher : NA

LIST OF EXPERIMENTS:

1. Study of tissues of human body

- (a) Epithelial tissue.
- (b) Muscular tissue.

2. Study of tissues of human body

- (a) Connective tissue.
- (b) Nervous tissue

3. Study of appliances used in hematological experiments.

4. Determination of W.B.C. Count of blood.

5. Determination of R.B.C. Count of blood.

6. Determination of differential Count of blood.

7. Determination of

- a) Erythrocyte Sedimentation Rate.
- b) Hemoglobin content of Blood.
- c) Bleeding time & Clotting time.

8. Determination of

- a) Blood pressure.
- b) Blood group.

9. Study of various systems with the help of charts, models, & specimens.

- a) Skeleton system Part I - axial skeleton.
- b) Skeleton system Part II appendicular skeleton.
- c) Cardiovascular system.
- d) Respiratory system.
- e) Digestive system.
- f) Urinary system.
- g) Nervous system.
- h) Special senses.
- i) Reproductive system.

10. Study of different family planning appliances.

11. To perform pregnancy diagnosis test.

12. Study of appliances used in experimental physiology.

13. To record simple muscle curve using gastrocnemius sciatic nerve preparation.

14. To record simple summation curve using gastrocnemius sciatic nerve preparation.

15. To record simple effect of temperature using gastrocnemius sciatic nerve preparation.

16. To record simple effect of load & after load using gastrocnemius sciatic nerve preparation.

17. To record simple fatigue curve using gastrocnemius sciatic nerve preparation.

SCHEME OF PRACTICAL EXAMINATION:

Sessionals Annual

Identification

Synopsis

Major Experiment

Minor Experiment

Viva

Max Marks

100

1.2.PHARMACEUTICS (THEORY)

Theory : 2 Hrs./Week

1. SCOPE AND OBJECTIVES :

This course is designed to impart a fundamental knowledge on the art and science of formulating different dosage forms. It prepares the students for most basics of the applied field of pharmacy.

2. UPON THE COMPLETION OF THE COURSE THE STUDENT SHOULD BE ABLE TO:

- a. Know the formulation aspects of different dosage forms:
- b. do different pharmaceutical calculation involved in formulation:
- c. formulate different types of dosage forms: and
- d. appreciate the importance of good formulation for effectiveness.

3. COURSE MATERIALS:

Text books

- a. Cooper and Gunns Dispensing for Pharmacy students.
- b. A test book Professional Pharmacy by N.K.Jain and S.N.Sharma.

Reference books

- a. Introduction to Pharmaceutical dosage forms by Howard C. Ansel.
- b. Remington's Pharmaceutical Sciences.
- c. Register of General Pharmacy by Cooper and Gunn.
- d. General Pharmacy by M.L.schroff.

4. LECTURE WISE PROGRAMME:

Topics

- 1 a. Introduction to dosage forms -classification and definitions.
b. Prescription definition, parts and handling.
c. Posology, Definition, Factors affecting dose selection, calculation of children and infant doses.
2. Historical back ground and development of profession of Pharmacy and Pharmaceutical industry in brief.
3. Development of Indian Pharmacopoeia and introduction to other Pharmacopoeias such as BP, USP, European Pharmcopoeia, Extra Pharmacopoeia and Indian national formulary.

4. Weights and measures, Calculations involving percentage solutions, allegation, proof spirit. isotonic solutions etc.

5. Powders and Granules :

Classification advantages and disadvantages, Preparation of simple, compound powders, insufflations Dusting powders, Eutectic and Explosive. Powders, Tooth powder and effervescent powders and granules.

6. Monophasic Dosage forms :

Theoretical aspects of formulation including adjuvant like stabilizers, colorants, flavours with examples, study of Monophasic liquids like gargles, mouth washes, Throat paint, Ear drops, Nasal drops, Liniments and lotions. Enemas and collodions.

7. Biphasic dosage forms:

Suspensions and emulsions, Definition advantages and disadvantages, classification , test for the type of emulsion, formulation, stability and evaluation.

8. Suppositories and pessaries :

Definition , advantages and disadvantages, types of base method of preparation, Displacement value and evaluation.

9. Galenicals:

Definition, equipment for different extraction processes like infusion, Decoction, Maceration and percolation, methods of preparation of spirits, tinctures and extracts.

10. Pharmaceutical calculations

11. Surgical aids:

Surgical dressings, absorbable gelatin sponge, sutures, ligatures and medicated bandages.

12. Incompatibilities :

Introduction, classification and methods to overcome the incompatibilities.

1.2.PHARMACEUTICS (PRACTICAL)

Practical : 3 Hrs/Week

LIST OF EXPERIMENTS:

1. syrups

- a. Simple syrup I.P.
- b. Syrup of Ephedrine Hcl NF
- c. Syrup vasaka IP
- d. Syrup of ferrous Phosphate IP
- e. Orange Syrup

2. Elixir

- a. Piperizine citarte elixir BP
- b. Cascara elixir BPC
- c. Paracetamol elixir BPC

3. Linctus

- a. Simple Linctus BPC
- b. Pediatric simple Linctus BPC

4. Solutions

- a. Solutions of cresol with soap IP
- b. Strong solution of ferric chloride BPC
- c. Aqueous Iodine Solution IP
- d. Strong solution of Iodine IP
- e. Strong solution of ammonium acetate IP

5. Liniments

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

6. Suspensions*

- a. Calamine lotion
- b. Magnesium Hydroxide mixture BP

7. Emulsions*

- a. Cod liver oil emulsion
- b. Liquid paraffin emulsion

8.Powders*

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

9.Suppositories*

- a. Boric acid suppositories
- b. Chloral suppositories

10. Incompatibilities:

- a. Mixtures with Physical
- b. Chemical & Therapeutic incompatibilities

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

Scheme of Practical Examination :

Sessionals Annual

Synopsis

Major Equipment

Minor Experiment

Viva

Max Marks 100

1.3.MEDICINAL BIOCHEMISTRY (THEORY)

THEORY: 3Hrs/Week

1. **SCOPE OF THE SUBJECT:** Applied biochemistry deals with complete understanding of the molecular level of the chemical process associated with living cells. Clinical chemistry deals with the study of chemical aspects of human life in health and illness and the application of chemical laboratory methods to diagnosis. Control of treatment, and prevention of diseases.

2.OBJECTIVES OF THE SUBJECT (know, do, appreciate):

The objective of the present course is providing biochemical facts and the principles to the students of pharmacy. Upon completion of the subject student shall be able to -

- a. Understand the catalytic activity of enzymes and importance of isoenzymes in diagnosis of diseases.
- b. Know the metabolic process of biomolecules in health and illness (metabolic disorders):
- c. Understand the genetic organization of mammalian genome: protein synthesis: replication:mutation and repair mechanism:
- d. Know the biochemical principles of organ function tests of kidney, liver and endocrine gland and
- e. do the qualitative analysis and determination of biomolecules in the body fluids.

Text books (Theory)

- a. Harpers review of biochemistry - Martin
- b. Text book of biochemistry -D .Satyanarayana
- c. Text book of clinical chemistry - Alex kaplan & Laverve L.Szabo

Reference books (Theory)

- a. Principles of biochemistry -- Lehninger
- b. Text book of biochemistry -- Ramarao
- c. Practical Biochemistry -- David T.Plummer.
- d. Practical Biochemistry -- Pattabiraman

3.LECTURE WISE PROGRAMME:

Topics

1. Introduction to biochemistry :

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

2. Enzymes:

Definition, Nomenclature, IUB classification: Factor affecting enzyme activity: Enzyme action: enzyme inhibition, isoenzymes and their therapeutic and diagnostic applications: coenzymes and their biochemical role and deficiency diseases.

3. Carbohydrate metabolism:

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

4. Lipid metabolism:

Oxidation of saturated (B-oxidation): Ketogenesis and ketolysis; biosynthesis of fatty acids, lipids: metabolism of Cholesterol: Hormonal regulation of lipid metabolism. Defective metabolism of lipids (Atherosclerosis, fatty liver, hypercholesterolemia)

5. Biological oxidation:

Co enzyme system involved in Biological oxidation Electron transport chain (its mechanism in energy capture : regulation and inhibition) : Uncouplers of ETC Oxidative Phosphorylation:

6. Protein and amino acid metabolism:

Protein turn over, nitrogen balance: catabolism of Amino acids (Transamination, deamination & decarboxylation) urea cycle and its metabolic disorders: production of bile pigments : hyperbilirubinemia, porphyrinuria, jaundice, Metabolic disorder of Amino acids.

7. Nucleic acid metabolism:

Metabolism of purine and pyrimidine nucleotides: protein synthesis: Genetic code: inhibition of protein synthesis: mutation and repair mechanism: DNA application (Semiconservative/one strand models) and DNA repair mechanism.

8. Introduction to Clinical Chemistry: Cell :

Composition: malfunction: Role of the clinical chemistry laboratory,

9. The Kidney function tests :

Role of kidney : Laboratory tests for normal function includes a) urine analysis (macroscopic and physical examination, quantitative and semiquantitative tests.)

b) Test for NPN constituents. (Creatinine/urea clearance, determination of blood and urine creatinine, urea and uric acid)

c) Urine concentration test

d) Urinary tract calculi (stones)

10. Liver function tests:

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

a) Test for hepatic dysfunction bile pigments metabolism.

b) Test for hepatic function test- serum bilirubin, urine bilirubin and urine urobilinogen

c) Dye tests of excretory function.

d) Tests based upon abnormalities of serum proteins. Selected enzyme tests,

11. Lipid profile tests:

Lipoproteins, composition, functions, Determination of serum lipids, total cholesterol, HDL cholesterol, LDL cholesterol and triglycerides.

12. Immunochemical techniques for determination of hormone levels and protein levels in serum for endocrine diseases and infectious diseases. Radio immuno assay (RIA) and Enzyme linked immuno sorbent Assay (ELISA)

13. Electrolytes:

Body water, Compartments, water balance, and electrolyte distribution. Determination of sodium, calcium potassium, chlorides, bicarbonates in the body fluids.

1.3 MEDICINAL BIOCHEMISTRY (PRACTICAL):

Practical : 3 Hrs/week

TITLE OF THE EXPERIMENT :

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

** indicate major experiments & * indicate minor experiments

ASSIGNMENTS:

Format of the assignment

1. Minimum & Maximum number of pages.
2. It shall be computer draft copy.
3. Reference(s) shall be included at the end.
4. Name and signature of the student.
5. Assignment can be a combined presentation at the end of the academic year.
6. Time allotted for presentation may be 8+2 Min.

Scheme of Practical Examination :

Sessionals Annual

Synopsis

Major Experiment

Minor Experiment

Viva

Max Marks 100

1.4.PHARMACEUTICAL ORGANIC CHEMISTRY (THEORY)

Theory : 3 Hrs/Week

1. SCOPE AND OBJECTIVES : This course is designed to impart a very good knowledge about

a. IUPAC/Common system of nomenclature of simple organic compounds belonging to different classes of organic compounds:

b. Some important physical properties of organic compounds:

c. Free radical/nucleophilic [alkyl/acyl/aryl] /electrophilic substitution, free radical/nucleophilic /electrophilic addition, elimination, oxidation and reduction reactions with mechanism, orientation of the reaction, order of reactivity, stability of Compounds.

d. Some named organic reactions with mechanisms:and

e. Methods of preparation , test for purity, Principle involved in the assay. important medicinal uses of some important organic compounds.

2.COURSE MATERIALS:

TEXT BOOKS :

- T.R.Morrison and R.Boyd-Organic chemistry
- Bentley and Driver-Text book of Pharmaceutical Chemistry
- C.I.L.Finer-Organic chemistry, the fundamentals of chemistry

Reference books

- Organic Chemistry- J.M.Cram and D.J.Cram
 - Organic Chemistry – Brown
 - Advanced organic chemistry-Jerry March, wiley,
 - Organic Chemistry- cram and Hammered, Pine Hendrickson
- 3.LECTURE WISE PROGRAMME:

Topics

1. STRUCTURES AND PHYSICAL PROPERTIES :

- Polarity of bonds, polarity of molecules, M.P. Inter molecular forces, B.P. solubility, non ionic solutes, and ionic solutes ,protic and aprotic solvents, ion pairs,
- Acids and bases, Lowry bronsted and lewis theories
- Isomerism

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

3. Free radicals chain reactions of alkane :

Mechanism, relative reactivity and stability

4. Alicyclic compounds :

Preparations of cyclo alkanes, Bayer strain theory and orbital picture of angle strain.

5. Nucleophilic aliphatic substitution mechanism :

Nucleophiles and leaving groups kinetics of second and first order reaction, mechanism and kinetics of SN2 reactions. Stereochemistry and steri hindrance, role of solvents, phase transfer catalysis, mechanism and kinetics of SN1 reactions, stereochemistry, carbocation and their stability, rearrangement of carbocation, role of solvents in SN1 reaction, lon dipole bonds, SN2 versus SN1 solvolyses, nucleophilic assistance by the solvents.

6. Dehydro halogenation of alkyl halides :

1,2 elimination, kinetics, E2 and E1 mechanism, elimination via carbocation, evidence for E2 mechanism, absence of rearrangement isotope effect, absence hydrogen exchange, the element effect, orientation and reactivity, E2 versus E1, elimination versus, substitution, dehydration of alcohol, ease of dehydration, acid catalysis, reversibility orientation.

7. Electrophilic and free radicals addition:

Reactions at carbon-carbon, double bond, electrophile, hydrogenation, heat of hydrogenation and stability of alkenes, markownikoff rule, addition of hydrogen halides, addition of hydrogen bromides. Peroxide effect, electrophilic addition, mechanism, rearrangement, absence of hydrogen exchange, orientation and reactivity, addition of halogen, mechanism, halohydrin formation, mechanism of free radicals addition, mechanism of peroxide initiated addition of hydrogen bromide, orientation of free addition, additions of carbene to alkene, cyclo addition reactions.

8. Carbon-carbon double bond as substituents:

Free radical halogenations of alkenes, comparison of free radical substitution with free radical addition, free radical substitution in alkenes, orientation and reactivity, allylic rearrangements.

9. Theory of resonance:

Allyl radical as a resonance hybrid, stability, orbital picture, resonance stabilisation of allyl radicals, hyper conjugation, allyl cation as a resonance hybrid, nucleophilic substitution in allylic substrate, SN1 reactivity allylic rearrangement, resonance stabilisation of allyl cation, hyper conjugation nucleophilic substitution allylic rearrangement, resonance stabilisation of allyl cation, hyper conjugation nucleophilic substitution in allylic substrate. SN2 nucleophilic substitution in vinylic substrate, vinylic cation, stability of conjugated dienes, resonance in alkenes, hyper conjugation, ease of formation of conjugated dienes, orientation of elimination, electrophilic addition to conjugated dienes, 1,4- addition, 1,2- versus 1,4-addition, rate versus equilibrium, orientation and reactivity of free radical addition to conjugated dienes.

10. Electrophilic aromatic substitution :

Effect of substituent groups , determination of orientation, determination of relative reactivity, classification of substituent group, mechanism of nitration, sulphonation, halogenation, Friedel-Craft alkylation, Friedel-Craft acylation, reactivity and orientation, activating and deactivating O.P.M directing groups, electron release via resonance, effect of halogen on electrophilic aromatic substitution in alkyl benzene, side chain halogenation of alkyl benzene, resonance stabilization of benzyl radical.

11. Nucleophilic addition reaction:

Mechanism, ionisation of carboxylic acids, acidity constants, acidity constants, acidity of acids, structure of carboxylate ions, effect of substituent on acidity, nucleophilic acyl substitution reaction, conversion of acid to acid chloride, esters, amide and anhydride. Role of carboxyl group, comparison of alkyl nucleophilic substitution with acyl nucleophilic substitution.

12. Mechanism of aldol condensation, Claisen condensation, Cannizzaro reaction, crossed aldol condensation, crossed Cannizzaro reaction, benzoin condensation, Perkin condensation. Knoevenagel, Reformatsky reaction, Wittig reaction, Michael addition.

13. Hoffman rearrangement :

Migration to electron deficient nitrogen, Sandmeyer's reaction, basicity of amines, diazotisation and coupling, acidity of phenols, Williamson synthesis. Fries rearrangement, Kolbe reaction, Reimer-Tiemann's reaction.

14. Nucleophilic aromatic substitution:

Bimolecular displacement mechanisms, orientation, comparison of aliphatic nucleophilic substitution with that of aromatic.

15. Oxidation reduction reaction.

16. Study of the following official compounds preparation, test for purity, assay and medicinal uses of chlorbutal, Dimercaprol, Glycerol trinitrate, urea, Ethylene diamine dihydrate, Vanillin, Paraldehyde, Ethylene chloride, Lactic acid, Tartaric acid, citric acid, salicylic acid, aspirin, methyl salicylate, ethyl benzoate, benzyl benzoate, dimethyl phthalate, sodium lauryl sulphate, saccharin sodium. mephensin.

1.4.PHARMACEUTICAL ORGANIC CHEMISTRY (PRACTICAL)

Practical : 3Hrs/week

1.Introduction to the various laboratory techniques through demonstration involving synthesis of the following compounds (at least 8 compounds to be synthesised)

1. Acetanilide / aspirin (Acetylation)
2. Benzanilide/Phenyl benzoate (Benzoylation)
3. P-bromo acetanilide/2,4,6-tribromo aniline (Bromination)
4. Dibenzylidene acetone (Condensation)
5. 1-Phenylazo-2-naphthal (Diazotisation and coupling)
6. Benzoic acid / salicylic acid (Hydrolysis of ester)
7. M-dinitro benzene (Nitration)
8. 9,10-Anthraquinone (Oxidation of anthracene)/preparation of benzoic acid from toluene or benzaldehyde
9. M-phenylene diamine (Reduction of M-dinitrobenzene)/Aniline from nitrobenzene
10. Benzophenone oxime
11. Nitration of salicylic acid
12. Preparation of picric acid
13. Preparation of O-chlorobenzoic acid from O-Chlorotoluene
14. Preparation of cyclohexanone from cyclohexanol

II. Identification of organic compounds belonging to the following classes by:

Systematic qualitative organic analysis including preparation of derivatives Phenols, amides, carbohydrates, amines, carboxylic acids, aldehyde and ketones, Alcohols, esters, hydrocarbons, anilides, nitrocompounds.

III. Introduction to the use of stereo models:

Methane, Ethane, Ethylene, Acetylene, Cis alkene, Trans alkene, inversion of configuration.

Scheme of Practical Examination:

Sessionals Annual

Synopsis

Major Experiment

Minor Experiment

Viva

Max Marks 100

1.5 PHARMACEUTICAL INORGANIC CHEMISTRY (THEORY)

Theory : 2 Hrs./week

1. Scope and objectives:

This course mainly deals with fundamentals of Analytical chemistry and also the study of inorganic pharmaceuticals regarding their monographs and also the course deals with basic knowledge of analysis of various pharmaceuticals.

2. Upon completion of the course student shall be able to:

- a. Under stand the principles and procedures of analysis of drugs and also regarding the application of inorganic pharmaceuticals.
- b. Know the analysis of the inorganic pharmaceuticals their applications: and
- c. appreciate the importance of inorganic pharmaceuticals in preventing and curing the disease.

3.Course materials:

Text books

- a. A text book inorganic medicinal chemistry by Surendra N.Pandya
- b. A.H.Beckett and J.B.Stanlake's Practical Pharmaceutical chemistry Vol-I & Vol-II
- c. Inorganic Pharmaceutical Chemistry III-Edition P.Gundu Rao

Reference books

- a. Inorganic Pharmaceutical Chemistry by Anand& Chetwal
- b. Pharmaceutical Inorganic chemistry by Dr.B.G. Nagavi
- c. Analytical chemistry principles by John H.Kennedy
- d .I.P.1985 and 1996, Govt. of India, Ministry of health

4. Lecture wise Programme: Include detailed syllabus

Topics

1. Errors
2. Volumetric analysis
3. Acid-base titrations
4. Redox titrations
5. Non aqueous titrations
6. Precipitation titrations
7. Complexometric titrations
8. Theory of indicators
- 9, Gravimetry
10. Limit tests
11. Medicinal gases

12. Acidifiers
13. Antacids
14. Cathartics
15. Electrolyte replenishers.
16. Essential Trace elements
17. Antimicrobials
18. Pharmaceutical aids
19. Dental products
20. Miscellaneous compounds
21. Radio Pharmaceuticals.

1.5 PHARMACEUTICAL INORGANIC CHEMISTRY(PRACTICAL)

Practical: 3Hrs./week

1. Limit test (6 exercise)
 - a. Limit test for chlorides
 - b. Limit test for sulphates
 - c. Limit test for iron
 - d. Limit test for heavy metals
 - e. Limit test for arsenic
 - f. Modified limit tests for chlorides and sulphates

2. ASSAYS (10 exercise)

- a. Ammonium chloride-Acid-base titration
- b. Ferrous sulphate-Cerimetry
- c. Copper Sulphate -Iodometry
- d. Calcilugluconate-Complexometry
- e. Hydrogen peroxide -Permanganometry
- f. Sodium benzoate -Nanaqueous titration
- g. Sodium Chloride -Modified volhard's method
- h. Assay of KI-KI₃ titration
- i. Gravimetric estimation of barium as barium sulphate
- j. Sodium antimony gluconate or antimony potassium tartarate

3. Estimation of mixture (Any two exercise)

- a. Sodium hydroxide and sodium carbonate
- b. Boric acid and Borax
- c. Oxalic acid and sodium oxalate.

4. Test for identity (Any three exercises)

- a. Sodium bicarbonate
- b. Barium sulphate
- c. Ferrous sulphate
- d. Potassium chloride

5. Test for purity (Any two exercises)

- a. Swelling power in Bentonite
- b. Acid neutralising capacity in aluminum hydroxide gel
- c. Ammonium salts in potash alum
- d. Adsorption power heavy kaolin
- e. Presence of Iodates in KI

6. Preparations (Any two exercises)

- a. Boric acids
- b. Potashalum
- c. Calcium loctate
- d. Magnesium Sulphate

Scheme of Practical Examination:

Sessionals Annual

Synopsis

Major Experiment

Minor Experiment 1&2

Viva

Max Marks 100

1.6.REMEDICAL MATHEMATICS/BIOLOGY(THEORY):

Theory : 03hrs / week

REMEDICAL MATHEMATICS:

1. Scope and Objectives:

This is an introductory course in mathematics. This subjects deals with the introduction to matrices, determinants, trigonometry, analytical geometry, differential calculus. integral calculus, differential equations, laplace transform.

2. Upon completion of the course the student shall be able to :-

- a. Know Trignometry , Analytical geometry, Matrices, Determinant, integration,Differential equations, laplace transform and their applications:
- b.Solve the problems of different types by applying theory: and
- c. appreciate the important applications of mathematics in pharmacy.

3. Course materials:

Text books

- a. Differential calculus BY Shantinakaran
- b. Text book of Mathemtics for second year pre-University by Prof. B.M.Sreenivas

Reference books

- a. Integral calculus by Shanthinarayan
- b.Engineering mathematics By B.S. Grewal
- C.Trigonometry Part -1 By S.L.Loney

4. Lecture wise programme:

Topics

1. Algebra:

Determinants, Matrices

2. Trigonometry :

Sides and angles of a triangle, solution of triangles

3. Analytical Geometry :

Points, Straight line, circle, parabola

4. Differential calculus:

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

5. Integral Calculas:

Definite integrals, integration by substitution and by parts, Properties of define integrals.

6.Differential equations:

Definition, order, degree, variable separable, homogeneous, Linear, heterogeous, linear, differential equation with constant coefficient, simultaneous linear equation of second order.

7. Laplace transform:

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

BIOLOGY:

1.Scope and objectives :

This is an introductory course in Biology, which gives detailed study of natural sources such as plant and animal origin. This subject has been introduces to the pharmacy course in order to make the student aware of various naturally occurring drugs and its history, sources, classification, distribution and the characters of the plants and animals. This subject gives basic foundation to pharmacognosy.

2. Course materials:

Text books

- a. Text book of Biology by S.B.Gokhale
- b. A Text book of Biology by Dr. Thulajappa and Dr. Seetaram.

Reference books

- a. A Text book of Biology by B.V.Sreenivasa Naidu
- b. A Text book of Biology by naidu and Murthy
- c. Botany for Degree students by A.C.Dutta.
- d. Outlines of Zoology by M.Ekambaranatha ayyer and T.N.Ananthakrishnan.
- e.A manual for pharmaceutical biology practical by S.B.Gokhale and C.K.Kokate

3.Lecture wise programme:

Topic

PART-A

01. Introduction
02. General organization of plants and its inclusions.
03. Plant tissues
04. Plant kingdom and its classification
05. Morphology of Plants
06. Root, stem, Leaf, and its modifications
07. Inflorescence and Pollination of flowers
08. Morphology of fruits and seeds
09. Plant Physiology
10. Taxonomy of Leguminosae, umbelliferae, solanaceae, Lilliacae, Zinziberaceae. Rubiaceae
11. Study of Fungi, yeast, Penicillin and Bacteria

PART-B

01. Study of Animal cell
02. Study animal tissues
03. Detailed study of frog.
04. Study of Pisces, Raptiles, Aves
05. General organization of mammals
06. Study of poisonous animals

1.6 BIOLOGY (PRACTICAL)

Practical : 3 Hrs./week

Title :

1. Introduction of biology experiments
2. Study of cell wall constituents and cell inclusions
3. Study of Stem modifications
4. Study of Root modifications.
5. Study of leaf modifications
6. Identification of fruits and seeds
7. Preparation of Permanent slides
8. T.S. of senna, cassia, Ephedra, Podophyllum
9. Simple plant physiological experiments
10. Identification of animals.
11. Detailed study of Frog.
12. Computer based tutorials.

Scheme of Practical Examination:

Sessionals Annual

Identification

Synopsis

Major Experiment

Minor Experiment

Viva

Max Marks 100

SECOND YEAR

2.1 PATHOPHYSIOLOGY (THEROY)

Theory : 3Hrs. /Week

1. Scope of the Subject :

This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its Pharmacological applications, and understanding of basic pathophysiological mechanisms. Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge of its application in other subject of pharmacy.

2.Objectives of the subject:

- Upon completion of the subject student shall be able to -
- a. describe the etiology and pathogenesis of the selected disease states:
 - b. name the signs and symptoms of the diseases: and
 - c. mention the complications of the diseases.

Text books (Theory)

- a. Pathologic basis of disease by - Cotran, Kumar, Robbins
- b. Text book of Pathology - Hrsh Mohan
- c. Text book of Pathology - Y.M.Bhinde

Reference books (Theory)

- a. Clinical Pharmacy and Therapeutics: Second edition: Roger Walker: Churchill Livingstone Publication

3. Detailed syllabus and lecture wise schedule:

Chapter

1. Basic principles of cell injury and Adaptation
 - a) Causes, Pathogenesis and morphology of cell injury
 - b) Abnormalities in lipoproteinaemia, glycogen infiltration and glycogen infiltration and glycogen infiltration and glycogen storage diseases.

2. Inflammation

- a. Pathogenesis of acute inflammation, Chemical mediators in inflammation, Types of Chronic inflammation
- b. Repairs of wounds in the skin, factors influencing healing of wounds

3. Diseases of immunity

- a) Introduction to T and B cells
- b) MHC proteins or transplantation antigens.
- c) Immune tolerance
- Hypersensitivity

Hypersensitivity type I, II, III, IV Biological significance, Allergy due to food, Chemicals and drugs - Autoimmunity Criteria for autoimmunity, Classifications of autoimmune diseases in man. mechanism of autoimmunity, Transplantation and immunologic tolerance, allograft rejections, transplantation antigens, mechanism of rejection of allograft.

-Acquired immune deficiency syndrome (AIDS)

-Amyloidosis

4. Cancer:

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

5. Types of shock, mechanisms, stages and management

6. Biological effects of radiation

7. Environmental and nutritional diseases.

- i) Air pollution and smoking -SO₂,NO,NO₂, and CO
- ii) Protein calorine mainutrition, Vitamins, Obseity, Pathogenesis of starvation.

8. Pathophysiology of common diseases

- a. Parkinsonism
- b. Schizophrenia
- c. Depression and mania
- d. Hypertension
- e. Stroke (ischaemic and hemorrhage)
- f. Angina, CCF, Atherosclerosis, Myocardial infarction
- g. Diabetes Mellitus
- h. Peptic ulcer and inflammatory bowel diseases
- i. Cirrhosis and Alcoholic liver diseases
- j. Acute and chronic renal failure
- k. Asthma and chronic obstructive airway diseases

9. Infectious diseases:

Sexually transmitted diseases (HIV, Syphilis, Gonorrhoea) Urinary tract infections, Pneumonia, Typhoid, Tuberculosis, Leprosy, Malaria Dysentery (bacterial and amoebic), Hepatitis - infective hepatitis.

4.Assignments:

Title of the Experiment

- 1. Chemical Mediators of inflammation
- 2. Drug Hypersensitivity
- 3. Cigarette smoking & its ill effects.
- 4. Biological Effects of Radiation
- 5. Etiology and hazards of obesity
- 6. Complications of diabetes
- 7. Diagnosis of cancer
- 8. Disorders of vitamins
- 9. Methods in Pathology-Laboratory values of clinical significance
- 10. Pathophysiology of Dengue Hemorrhagic Fever(DHF)

Format of the assignment

- 1. Minimum & Maximum number of pages.
- 2. Reference(s) shall be included at the end.
- 3. Assignment can be a combined presentation at the end of the academic year.
- 4. It shall be computer draft copy.
- 5. Name and signature of the student
- 6. Time allocated for presentation may be 8+2 Min.

2.2. PHARMACEUTICAL MICROBIOLOGY (THEORY)

Theory : 3 hrs./ Week

1. Scope of the subject :

Microbiology has always been an essential component of pharmacy curriculum. This is because of the relevance of microbiology to pharmaceutical sciences and more specifically to pharmaceutical industry. Pharmaceutical biotechnology is the logical extension of pharmaceutical microbiology, which is expected to change the complete drug product scenario in the future. This course deals with the various aspects of microorganisms, its classification, morphology, laboratory cultivation, identification and maintenance, it also discusses with sterilization of pharmaceutical products, equipment, media etc. The course further discusses the immunological preparations, diseases, its transmission, diagnosis, control and immunological tests.

2. Objectives of the Subject :

Upon completion of the subject student shall be able to -

- a. Know the anatomy, identification, growth factors and sterilization of microorganisms:
- b. Know the mode of transmission of disease causing microorganism, symptoms of disease, and treatment aspect:
- c. do estimation of RNA and DNA and thereby identifying the source:
- d. do cultivation and identification of the microorganisms in the laboratory:
- e. do identification of diseases by performing the diagnostic tests: and
- f. appreciate the behaviour of motility and behavioral characteristics of microorganisms.

Text books (Theory)

- a. Vanitha kale and kishor Bhusari" Applied Microbiology" Himalaya Publishing house Mumbai.
- b. Mary Louis Turgeon" Immunology and Serology in Laboratory Medicines" 2nd edition, 1996 Mosby- year book inc St. Louis Missouri 63146.
- c. Harsh Mohan, " Text book of pathology" 3rd edition, 1998, B-3 Ansari road Darya ganj N. Delhi

Reference books (Theory)

- a. Prescott L.M. Jarley G.P. Klein D.A "Microbiology" 2nd edition Mc Graw Hill Company inc
- b. Rawlins E.A. Bentley's Text book of Pharmaceutics" Bailliere Tindals 24-28 London 1988
- c. Forbisher " Fundamentals of Microbiology" Philadelphia W.B. Saunders
- d. Prescott L.M. Jarley G.P. Klein D.A. " Microbiology" 2nd edition WMC Brown Publishers, Oxford 1993.
- e. War Roitt, Jonathan Brostoff, David Male, " Immunology" 3rd edition 1996, Mosby – year book Europe Ltd, London.
- f. Pharmacopoeia of India, Govt of India 1996.

3.Detailed syllabus and lecture wise schedule :

Title of the topic

1. Introduction to the science of microbiology. Major divisions of microbial world and Relationship among them.
2. Different methods of classification of microbes and study of Bacteria Fungi, Virus, Rickettsiae, Spirochetes.
3. Nutritional requirements, growth and cultivation of bacteria and virus. Study of different important media required for the growth of aerobic and anaerobic bacteria & fungi. Differential media, enriched media and selective media, maintenance of lab cultures.
4. Different methods used in isolation and identification of bacteria with emphasis to different staining techniques and biochemical reactions. Counting of bacteria - Total and viable counting techniques.
5. Detailed study of different methods of sterilization including their merits and demerits. Sterilization methods for all pharmaceutical products. Detailed study of sterility testing of different pharmaceutical preparation. Brief information on validation.
6. Disinfectants -Study of disinfectants, antiseptics, fungicidal and virucidal agents factors affecting their activation and mechanism of action. Evaluation of bactericidal, bacteristatic, virucidal activities, evaluation of preservatives in pharmaceutical preparations.
7. Immunology, Immunity, Definition Classification, General principles of natural immunity, phagocytosis, acquired immunity (active and passive). Antigens, Chemical nature of antigens structure and formation of Antibodies, Antigen-Antibody reactions. Bacterial exotoxins and endotoxins. Significance of toxoids in active immunity, Immunization programme, and importance of booster dose.
8. Diagnostic tests:
Schick's Test, Elisa test, Western Blot test, Southern Blot PCR widal, QBC, Mantoux Peripheral smear. Study of malarial parasite.
9. Microbial culture sensitivity Testing:
Interpretation of results Principles and methods of different microbiological assays, microbiological assay of Penicillin, streptomycin and Vitamin B2 and B12, Standardisation of vaccines and sera.
10. Study of infections diseases:
Typhoid, Tuberculosis, malaria, cholera, Hepatitis, Meningitis, Syphilis & Gonorrhoea and HIV

2.2 PHARMACEUTICAL MICROBIOLOGY (PRACTICAL)

Practical : 3 Hrs/week

Title of the Experiment :

1. Study of apparatus used in experimental microbiology*
2. Sterilization of glass ware's Preparation of media and sterilisation*
3. Staining techniques - simple staining : Gram's staining ; Negative staining*
4. Study of motility characters*
5. Enumeration of micro-organisms(Total and viable) *
6. Study of the methods of isolation of pure culture*
7. Bio Chemical testing for the identification of micro* - organisms.
8. Cultural sensitivity testing for some micro-organisms.
9. Sterility testing for powders and liquids*
10. Determination of minimum inhibitory concentration*
11. Microbiological assay of antibiotics by cup plate method*
12. Microbiological assay of vitamins by Tubidometric method**
13. Determination of RWC**
14. Diagnostic tests for some common diseases. Widal, malarial parasite**
* indicate minor experiment & ** indicate major experiment.

Assignments:

1. Visit to some pathological laboratories & study the activities and equipment/instruments used and reporting the same.
2. Visit to milk dairies (Pasturization) and microbial laboratories (other sterilization method) & study the activities and equipment/instruments used and reporting the same.
3. Library assignments
 - a. Report of recent microbial techniques developed in diagnosing some common diseases.
 - b. Latest advancement developed in identify, cultivating & handling of microorganisms.

Format of the assignment:

1. Minimum & Maximum number of pages.
2. It shall be computer draft copy.
3. Reference(s) shall be included at the end.
4. Name and signature of the student.
5. Assignment can be a combined presentation at the end of the academic year.
6. Time allocated or presentation may be 8+2 Min.

Scheme of Practical Examination:

Sessionals Annual

Synopsis

Major Experiment

Minor Experiment

viva

Max marks 100

2.3.PHARMACOGNOSY & PHYTOPHARMACEUTICALS (THEORY)

Theory : 3 Hrs./week

1. Scope and objectives:

This subject has been introduced for the pharmacy course in order to make the student aware of medicinal uses of various naturally occurring drugs its history, sources, distribution, method of cultivation, active constituents, medicinal uses, identification tests, preservation methods, substitutes and adulterants.

2. Upon completion of the course student shall be able to:

- a. Under stand the basic principles of cultivation, collection and storage of crude drugs
- b. know the source, active constituents and uses of crude drugs: and
- c. appreciate the applications of primary and secondary metabolites of the plant.

3. Course Materials:

Text books

- a. Pharmacognosy by G.E.Trease & W.C.Evans.
- b. Pharmacognosy by C.K.Kokate, Gokhale & A.C.Purohit

Reference books

- a. Pharmacognosy by Brady & TyG.E.Trease & W.C.Evans.
- b. Pharmacognosy by T.E.Wallis
- a. Pharmacognosy by C.S. Shah & Qadery.
- b. Pharmacognosy by M.A. Iyengar.

4. Lecture wise Programme:

Topics

1. Introduction
2. Definition, history and scope of Pharmacognosy.
3. Classification of crude drugs.
4. Cultivation, collection, processing and storage of crude drugs.
5. Detailed method of cultivation of crude drugs.
6. Study of cell wall constituents and cell inclusions.
7. Microscopical and powder Microscopical study of crude drugs.
8. Study of natural pesticides.
9. Detailed study of various cell constituents.

10. Carbohydrates and related products.
11. Detailed study carbohydrates containing drugs (11 drugs)
12. Definition sources, method extraction, chemistry and method of analysis of lipids.
13. Detailed study of oils
14. Definition, classification, chemistry and method of analysis of protein
15. Study of plants fibers used in surgical dressings and related products.
16. Different methods of adulteration of crude drugs.

2.3. PHARMACOGNOSY & PHYTOPHARMACEUTICALS **(PRACTICAL)**

Practical : 3 Hrs/week

General Requirements :

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

List of experiments:

1. Introduction of Pharmacognosy laboratory and experiments.
2. Study of Cell wall constituents and cell inclusions.
3. Macro, powder and microscopic study of Datura.
4. Macro, powder and microscopic study of Senna.
5. Macro, powder and microscopic study of Cassia.Cinnamon
6. Macro, powder and microscopic study of Cinchona.
7. Macro, powder and microscopic study of Ephedra.
8. Macro, powder and microscopic study of Quassia.
9. Macro, powder and microscopic study of Clove.
10. Macro, powder and microscopic study of Fennel.
11. Macro, powder and microscopic study of Coriander..
12. Macro, powder and microscopic study of Isapgol.
13. Macro, powder and microscopic study of Nux vomica.
14. Macro, powder and microscopic study of Rauwolfia.
15. Macro, powder and microscopic study of Liquorice.
16. Macro, powder and microscopic study of Ginger
17. Macro, powder and microscopic study of Podophyllum.
18. Determination of Iodine value.
19. Determination of Saponification value and unsaponifiable matter.
20. Determination of ester value.
21. Determination of Acid value.
22. Chemical tests for Acacia.
23. Chemical tests for Tragacanth.
24. Chemical tests for Agar.
25. Chemical tests for Starch.
26. Chemical tests for Lipids (caster oil, sesame oil, shark liver oil, bees wax).
27. Chemical tests for Gelatin.

Scheme of Practical Examination:

Sessionals Annual

Identification

Synopsis

Major Experiment

Minor Experiment

viva

Max Marks 100

2.4. PHARMACOLOGY-1 (THEORY)

Theory : 3 Hrs./week

1.Scope of the Subject :

This subject will Provide an opportunity for the student to learn about the drug with regard to classification, Pharmacodynamic and pharmacokinetic aspects, adverse effects, uses, dose route of administration, precautions, contraindications and interaction with other drugs. In this subject, apart from general pharmacology, drugs acting on autonomic nervous system, Cardiovascular system, central nervous system, blood and blood forming agents and renal system will be taught . In addition to theoretical knowledge , the basic practical knowledge relevant to therapeutics will be imparted.

2. Objectives of the Subject:

Upon completion of the subject student shall be able to (know, do, appreciate)-

- a. understand the pharmacological aspects of drugs falling under the above mentioned chapters:
- b. handle and carry out the animal experiments:
- c. appreciate the importance of pharmacology subject as a basis of therapeutic and
- d. correlate and apply the knowledge therapeutically.

Text books (Theory)

(Author, Title, Edition, Publication Place, Publisher, year of Publication)

- a. Tripathi, K.D. Essentials of medical pharmacology, 4th edition, 1999
Publisher : Jaypee, Delhi.
- b. Satoskar, R.S. and Bhadarkar, S.D.Pharmacology and
Pharmacotherapeutics 16th edition (Single volume), 1999, Publisher :
Popular, Dubai
- c. Rang, H.P.& Dale, M.M.Pharmacology 4th edition 1999,Publisher :
Churchill livingstone.

Reference books (Theory) (Author, Title, Edition, Publication Place, Publisher, Publication year)

- a. Goodman Gilman, A., Roll, T.W.Niles, A.I.S. and Taylor, P.Goodman and Gilman's The phrmacological basis of therapeutics, 9th Edition 1996 Publisher MC Graw Hill, Pergamon press.
- b. Craig, C.R.& Stitzel, R.E.Modern Pharmacology, Latest edition , Publisher : Little Brown co
- c. Katzung, B.G. Basic and clinical pharmacology, Latest edition, Publisher :Prentice Hall, Int.
- d. Shargel and leon. Applied Biopharmaceutics and Pharmacokinetics.
Latest edition, Publisher: Prentice Hall, London.

Text books (Practical):

Kulkarni, S.K. and Dandia, P.C.Hand book of experimental Pharmacology, Latest edition, Publishers: vallab, Delhi

Reference books (Practical)

- a. Macleod, L.J. Pharmacological experiments on intact preparations. Latest edition, Publisher: Churchill livingstone.
- b. Macleod, L.J. Pharmacological experiments on isolated preparations. Latest edition, Publisher: Churchill livingstone.
- c. Ghosh, M.N. Fundamentals of experimental pharmacology, Latest edition, Publisher: Scientific book agency, Kolkata.
- d. Ian kitchen . Textbook of in vitro practical Pharmacology, Latest edition Publishers: Black well Scientific

3. Detailed syllabus and lecture wise schedule:

Title of the topic

1. General Pharmacology

- a) Introduction, definitions and scope of Pharmacology
- b) Routes of administration of drugs
- c) Pharmacokinetics (absorption, distribution, metabolism and excretion)
- d) Pharmacodynamics
- e) Factors modifying drug effects
- f) Drug toxicity - Acute, Sub-acute and chronic toxicity.
- g) Pre-clinical evaluations
- h) Drug interactions

Note : The term pharmacology used here refers to the classification, mechanism of action, pharmacokinetics, adverse effects, contraindications, Therapeutic uses, interactions and route of administration.

2. Pharmacology of drugs acting on ANS

- a) Adrenergic and antiadrenergic drugs
- b) Cholinergic and anticholinergic drugs
- c) Neuromuscular blockers
- d) Mydriatics and miotics
- e) Drugs used in myasthenia gravis
- f) Drugs used in Parkinsonism

3. Pharmacology of drugs acting on cardiovascular system

- a) Antihypertensives
- b) Anti-anginal drugs
- c) Anti-arrhythmic drugs
- d) Drugs used for therapy of Congestive Heart Failure.
- e) Drugs used for hyperlipidaemias

4. Pharmacology of drugs acting on Central Nervous System

- a) General anesthetics
- b) Sedatives and hypnotics
- c) Anticonvulsants
- d) Analgesic and anti-inflammatory agents.
- e) Psychotropic drugs
- f) Alcohol and methyl alcohol
- g) CNS stimulants and cognition enhancers
- h) Pharmacology of local anaesthetics

5. Pharmacology of Drugs acting on Respiratory tract

- a) Bronchodilators
- b) Mucolytics
- c) Expectorants
- d) Antitussives
- e) Nasal Decongestants

6. Pharmacology of Hormones and Hormone antagonists

- a) Thyroid and Antithyroid drugs
- b) Insulin, Insulin analogues and oral hypoglycemic agents
- c) Sex hormones and oral contraceptives.
- d) Oxytocin and other stimulants and relaxants

7. Pharmacology of autocolids and their antagonists

- a) Histamines and Antihistaminics
- b) 5-Hydroxytryptamine and its antagonists
- c) Lipid derived autocolids and platelet activating factor

2.5 COMMUNITY PHARMACY (THEORY)

Theory: 2 Hrs./week

1.Scope :

In the changing scenario of pharmacy practice in India, Community Pharmacists are expected to offer various pharmaceutical case services. In order to meet this demand students will be learning various skills such as dispensing of drugs responding to minor ailments by providing suitable safe modification, patient counselling, health screening services for improved patient care in the community set up.

2. Objectives :

Upon completion of the course, the student shall be able to

- a. Know pharmaceutical care services:
- b. Know the business and Professional practice management skills in community pharmacies :
- c. do patient counselling & provide health screening services to public in community pharmacy :
- d. respond to minor ailments and provide appropriate medication:
- e. show empathy and sympathy to patients : and
- f. appreciate the concept of Rational drug therapy.

Text Books:

- a. Health Education and Community pharmacy by N.S.Parmar.
- b.WHO consultative group report
- c. Drug store & Business Management by Mohammed Ali & Jyoti

Reference books:

- a. Hand book of pharmacy - health care. Edt.Robin J Harman. The Pharmaceutical press.
- b. Comprehensive pharmacy Review - Edt. Leon Sharegel. Lippincott williams wilkins.

Special requirements :

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

3. Scheme of evaluation

1. Synopsis
2. Major Experiment
(Counselling of patients with specific diseases - emphasis should be given on counselling introduction, content, process and conclusion)
3. Minor Experiment (Ability to measure B.P./CBG/Lung function)
4. Prescription Analysis (Analyzing the prescriptions for probable drug interaction and ability to tell the management)
5. Viva-Voce

4. Lecture wise programme:

Topics

1. Definition , scope, of Community pharmacy

Roles and responsibilities of Community pharmacists

2. Community Pharmacy Management

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

3. Prescriptions -

Parts of prescription, legality & identification of medication related problems like drug interactions.

4. Inventory control in community pharmacy

Definition, Various methods of Inventory control
ABC,VED,EOQ,Lead time , safety stock

5. Pharmaceutical care

Definition and Principles of Pharmaceutical care

6. Patient counsellings

Definition, Outcomes, various stages, barriers, Strategies to overcome barriers.
Patient information leaflets-content, design & layouts, advisory labels.

7. Patient medication counselling

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

8. Health screening Services

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

9.OTC Medication -Definition OTC medication list of Counselling

10. Health Education

- WHO Definition of health, and health promotion, care for children, pregnant & breast feeding women, and geriatric patients. Clinical presentations and prevention of communicable diseases. - Tuberculosis, Hepatitis, Typhoid, Amoebiasis, Malaria, Leprosy

Syphilis, Gonorrhoea and AIDS. Balance diet, and treatment & prevention of deficiency disorders Family planning - role of pharmacist

11. Responding to symptoms of minor ailments

Relevant pathophysiology, common drug therapy to, pain, GI disturbances (Nausea, Vomiting, Dyspepsia, diarrhea, constipation), Pyrexia, Ophthalmic symptoms, worms infestations.

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

13. Code of ethics for community pharmacists

2.6. PHARMACOTHERAPEUTICS -1(THEORY)

Theory : 3Hrs./week

1. Scope of the Subject :

This course is designed to impart knowledge and skills necessary for contribution to quality use of medicines. Chapters dealt cover briefly pathophysiology and mostly therapeutics of various diseases. This will enable the student to understand the pathophysiology of common diseases and their management.

2.objectives :

At completion of this subject it is expected that students will be able to understand-

- a. The pathophysiology of selected disease states and the rationale for drug therapy:
- b. The therapeutic approach to management of these diseases:
- c. The controversies in drug therapy.
- d. The importance of preparation of individualised therapeutic plans based on diagnosis:
- e. needs to identify the patient -specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutics response and adverse effects):
- f. describe the pathophysiology of selected disease states and explain the rationale for drug therapy:
- g. Summarise the therapeutic approach to management of these disease including reference to the latest available evidence:
- h. discuss the controversies in drug therapy:
- i. discuss the preparation of individualised therapeutic plans based on diagnosis: and
- j. identify the patient - specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects).

Text Books

- a. Clinical Pharmacy and Therapeutics - Roger and walker, Churchill Livingstone publication.
- b. Pharmacotherapy: A pathophysiologic approach - Joseph T. Dipiro etal
Appleton & Lange.

Reference books

- a. Pathologic basis of disease - Robins SI.W.B. Saunders publication.
- b. Pathology and therapeutics for pharmacists : A Basic for clinical pharmacy practice - Green and harris, Chapman and Hall publication.
- c. Clinical Pharmacy and Therapeutics - ERic. T.Herfindal, williams and wilkins publication.

d. Applied Therapeutics :

The clinical use of Drugs. Lloyd young and Koda-kimble MA

e. Avery's Drug Treatment , 4th Edn,1997, Adis International Limited.-

f. Relevant review articles from recent medical and pharmaceutical literature .

3. Detailed syllabus and lecture wise schedule :

Ethiopathogenesis and pharmacotherapy of diseases associated with following systems/ diseases

Title of the Topic

1. Cardiovascular system:

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

2. Respiratory System:

Introduction to pulmonary function test, Asthma, Chronic obstructive airways disease, Drug induced pulmonary diseases

3. Endocrine system:

Diabetes, Thyroid diseases, Oral contraceptives, Hormone replacement therapy, Osteoporosis

4. General prescribing guidelines for

a. Paediatric patients

b. Geriatric patients

c. Pregnancy and breast feeding

5. Ophthalmology :

Glaucoma, Conjunctivitis - Viral & bacterial

6. Introduction to rational drug use:

Definition, Roll of Pharmacist Essential drug concept Rational drug concept Rational drug formulations

2.6.PHARMACOTHERAPEUTICS -1 (PRACTICAL)

Practical : 3Hrs/week

Practical :

Hospital postings in various departments designed to complement the lectures by providing practical clinical discussion attending ward rounds : follow up the progress and changes made in drug therapy in allotted patients case presentation upon discharge. Students are required to maintain a record of cases. Presented and the same should be submitted at the end of the course for evaluation . A minimum of 20 cases should be presented and recorded covering most common diseases.

Assignments:

Students are required to submit written assignments on the topics given to them. Topics allotted should cover recent developments in drug therapy of various diseases. A minimum of THREE assignments.

[1500-2000 words] should be submitted for evaluation.

Format of the assignment:

1. Minimum & Maximum number of pages.
- 2.Reference(s) shall be included at the end.
3. Assignment can be a combined presentation at the end of the academic year.
4. It shall be computer draft copy.
5. Name and signature of the student .
6. Time allotted for presentation may be 8+2 Min.

Scheme of Practical Examination :

Sessionals Annual

Synopsis

Major Experiment

Minor Experiment

viva

Max Marks

100

THIRD YEAR

3.1. PHARMACOLOGY - II (THEORY)

Theory : 3Hrs./week

1. Scope of the subject :

This subject will provide an opportunity for the student to learn about the drug with regard to classification, Pharmacodynamic and pharmacokinetic aspects adverse effects, uses, dose, route of administration, precautions contraindications and interaction with other drugs. In this subject, drug acting on autacoids, respiratory system, GIT, Immune system and hormones, and pharmacology of autacoids and hormones will be concentrated. In addition, pharmacology of chemotherapeutic agents, vitamins, essential minerals and principles of toxicology are also taught in addition to theoretical knowledge, the basic practical knowledge relevant to therapeutics will be imparted.

2.objectives of the Subject upon completion of the subject student shall be able to :

- a. Understand the Pharmacological aspects of drugs falling under the above mentioned chapters.
- b. Carry out the animal experiments confidently.
- c. Appreciate the importance of pharmacology subject as a basis of therapeutics, and
- d. correlate and apply the knowledge therapeutically.

Text books (Theory)

- a. Tripathi, K.D. Essentials of medical pharmacology. 4th edition 1999. Publisher : Jaypee, Delhi.
- b. Satoskar, R.S. and Bhadarkar, S.D. Pharmacology and pharmacotherapeutics. 16th edition (single volume), 1999, publisher : popular, Dubai.
- c. Rang, H.P. and Date, M.M. Pharmacology, 4th edition, 1999
Publisher: Churchill living stone.

Reference books(Theory)

- a. Goodman Gilman, A., Rall, T.W. Niles, A.I.S. and Taylor P. Goodman and Gilman's. The Pharmacological Basis of therapeutics, 9th edition, 1996, Publisher: Mc Graw Hill, pergamon press.
- b. Craig, C.R. and stitzel, R.E. Modern Pharmacology, latest edition, Publisher: Little Brown and company.
- c. Katzung, B.G. Basic and clinical pharmacology, Latest edition, Publisher Prentice Hall, International.
- d. Gupta, P.K. and salunkhe, D.K. Modern Toxicology, Volume I, II and III. Latest edition, Publisher:

B.V. Gupta, Metropolitan Book Co. (p) Ltd, New Delhi

Text books (Practical)

Kulkarni S.K. and Dandia, P.C. Hand book of experimental Pharmacology latest edition,
Publisher : Vallab, Delhi

Reference books(Practical):

a. Macleod, L.J. Pharmacological experiments on intact preparations. Latest edition,
Publisher: Churchill livingstone.

b. Macleod, L.J. Pharmacological experiments on isolated preparations. Latest edition,
Publisher: Churchill livingstone.

c. Ghosh, M.N. Fundamentals of experimental pharmacology, Latest edition, Publisher:
Scientific book agency, Kolkata.

d. Lan Kitchen. Textbook of in vitro practical pharmacology, Latest edition publisher: Black
well Scientific

3. Detailed syllabus and lecture wise schedule :

Title of the topic

1. Pharmacology of Drugs acting on blood and blood forming agents

- a) Anticoagulants
- b) Thrombolytics and antiplatelet agents
- c) Haemopoietics and plasma expanders

2. Pharmacology of drugs acting on Renal System

- a) Diuretics
- b) Antidiuretics

3. Chemotherapy

- a) Introduction
- b) Sulfonamides and co-trimoxazole
- c) Penicillins and Cephalosporins
- d) Tetracyclins and Chloramphenicol
- e) Macrolides, Aminoglycosides, Polyene & Polypeptide antibiotics
- f) Quinolones and Fluoroquinolones
- g) Antifungal antibiotics
- h) Antiviral agents
- i) Chemotherapy of tuberculosis and leprosy
- j) Chemotherapy of Malaria
- k) Chemotherapy of Protozoal infections (Amoebiasis, Giardiasis)
- l) Pharmacology of Anthelmintic drugs

m) Chemotherapy of cancer (Neoplasms)

4. Immunopharmacology

Pharmacology of immunosuppressants and stimulants.

5. Principles of Animal toxicology

Acute, Sub acute and chronic toxicity

6. The dynamic cell: The structures and functions of the components of the cell.

a) Cell and macromolecules : Cellular classification, sub cellular organelles, macromolecules, large macromolecule assemblies.

b) Chromosome structure: Pro and eukaryotic chromosome structures, Chromatin structure, genome complexity, the flow of genetic information ,

c) DNA replication m: General, bacterial and eukaryotic DNA replication.

d) The cell cycle : Restriction point, cell cycle regulators and modifiers.

e) Cell signaling: Communication between cell and their environment, ionchannels, signals transduction pathways (MAP kinase, P38kinase, JNK, Ras and P13- kinase pathways, biosensors.

The Gene: Genome structure and function:

a) Gene structure :

Organization and elucidation of genetic code.

b) Gene expression :

Expression systems (pro and eukaryotic), genetic elements that control gene expression (nucleosomes), histones, acetylation, HDACS, DNA binding protein families.

c) Transcription and Transcription factors :

Basic Principles of transcription in pro and eukaryotes. Transcription factors that regulate transcription in pro and eukaryotes.

RNA Processing : rRNA, tRNA and mRNA processing.

Protein synthesis :

Mechanisms of protein synthesis, initiation in eukaryotes, translation control and post -translation events. Altered gene functions. Mutations, deletions, amplifications, LOH, translocations, trinucleotide repeats and other genetic abnormalities. Oncogenes and tumor suppressor genes. The gene sequencing, mapping and cloning of human disease genes. Introduction to gene therapy and targeting. Recombinant DNA technology: principles, Process (gene transfer technology) and applications

Books:

1. Molecular Biology of the cell by Alberts B., Bray, D., Lewis, J., Raff M., Roberts, K. and Watson, JD , 3rd edition
2. Molecular Cell Biology By Lodish, H., Baltimore, D., Berk, A et al., 5th edition.
3. Molecular Biology by Turner, PC., McLennan, AG., Bates, AD and White MRH 2nd edition.
4. Genes VIII by Lewin, B., (2004)
5. Pharmaceutical Biotechnology, by Crommelin, CJA and Sindelar RD (1997)
6. Recombinant DNA by Watson, JD., Gilman, M., et al., (1996)
7. Biopharmaceutical: Biochemistry and biotechnology, by Walsh, G., (1998)

3.1.PHARMACOLOGY - 11 (PRACTICAL)

Practical : 3Hrs./week

List of Experiments :

1. Study of laboratory animals and their handling (a. Frogs, b. Mice, c. Rats, d. Guinea pigs e. Rabbits)
2. Study of Physiological salt solutions used in experimental pharmacology.
3. Study of laboratory appliances used in experimental pharmacology.
4. Study of use of anesthetics in laboratory animals.
5. To record the dose response curve of Ach using isolated ileum/rectus abdominis muscle preparation.
6. To carry out bioassay of Ach using isolated ileum/rectus abdominis muscle preparation by interpolation metho.
7. To carry out bioassay of Ach using isolated ileum/rectus abdominis muscle preparation by three point method.
8. To record the dose response curve of Histamine using isolated guinea- pig ileum preparation.
9. Study of agonistic and antagonistic effects of drugs using isolated guinea - pig ileum preparation.
10. To carry out bioassay of Histamine using isolated guinea - pig ileum preparation by interpolation method.
11. To carry out bioassay of Histamine using guinea - pig ileum preparation by three point method.
12. To study the routes of administration of drugs in animals (Rats, Mice, Robbits).
13. Study of theory, Principle, procedure involved and interpretation of given result for the following experiments :
 - a. Analgesic property of drug using analgesiometer.
 - b. Antiinflammatory effect of drugs using rat-paw edema method.
 - c. Anticonvulsant activity of drugs using maximal electroshock and pentylene tetrazole methods.
 - d. Antidepressant activity of drugs using pole climbing apparatus and pentobarbitone induced sleeping time methods.
 - e) Locomotor activity evaluation of drugs using actophotometer and rotorod.
 - f) Cardiotoxic activity of drugs using isolated frog heart and mammalian heart preparations.

Scheme of Practical Examination :
Sessionals Annual

Identification

Synopsis

Major Experiment (Bioassay)

Major Experiment (Interpretation of given Graph or simulated experiment)

Viva

Max Marks

100

3.2 PHARMACEUTICAL ANALYSIS (THEORY)

Theory : 3 Hrs./week

1. Quality Assurance:

- a. Introduction, source of quality variation , control of quality variation.
- b. Concept of statistical quality control.
- c. Validation methods quality of equipment, validation of equipment and validation of analytical instruments and calibration.
- d. GLP, ISO 9000
- e. Total quality management quality review and documentation.
- f. ICH - International conference for harmonization guidelines.
- g. Regulatory control.

2.Chromatography:

Introduction, history, classification, separation techniques, choice of methods. The following techniques be discussed with relevant examples of pharmaceutical products involving principles and techniques of separation of drugs from excipients .

a. Column Chromatography :

Adsorption column chromatography, Operational technique. frontal analysis and elution analysis. Factors affecting column efficiency. Applications and partition chromatography.

b. TLC :

Introduction, Principle, techniques, Rf value and applications.

c. PC :

Introduction, Principle, type of paper chromatography, preparation techniques , development techniques, applications.

d. Ion- exchange chromatography:

Introduction , Principles, types of ion exchange synthetic resins, Physical properties, factors affecting ion exchange, methodology and applications.

e. Gas Chromatography:

Introduction , theory, instrumentation carrier gases, types of columns, stationary phases in GLC&GSC. Detectors- Flame ionization detectors, electron capture detector , thermal conductivity detector, Typical gas chromatogram, derivation techniques, programmed temperature gas chromatography, applications.

h. Electrophoresis :

Principles of Separation, equipment for paper and gel electrophoresis and application .

i. Gel filtration and affinity chromatography:

Introduction , technique, applications.

3. Electrometric Methods :

Theoretical aspects, instrumentation, interpretation of data /spectra and analytical applications be discussed on the following topics.

a. Potentiometry :

Electrical potential, electrochemical cell, reference electrodes indicator electrodes , measurement of potential and PH , construction and working of electrodes. Potentialmetric titration, methods of detecting end point. Karl Fischer titration.

b. Conductometry:

Introduction, conductivity cell, conductometric titrations and application.

c. Polarography :

Instrumentation, DME, residual current. diffusion current and limiting current, Polarographic wave, likovic's equation, Effect of oxygen on polarographic wave Polarographic maxima and suppressors and applications.

d. Amperometric Titrations:

Introduction, types of electrodes used, reference and indicator electrode, instrumentation, titration procedure, advantages and disadvantages of Amperometry over potentiometry ,Pharma applications.

4. Spectroscopy :

Theoretical aspects instrumentation, elements of interpretation of data /spectra and application of analytical techniques be discussed on:

a. Absorption Spectroscopy:

Theory of electronic ,atomic and molecular spectra, Fundamental laws of Photometry, Beer-Lambert's Law, application and its deviation, limitation of Beer law, application and its deviation, limitation of beer law, application of the law to single and multiple component analysis, measurement of equilibrium constant and rate constant by spectroscopy. Spectra of isolated chromophores. Auxochromes, batho-chromic shift, hypsochromic shift, hyperchromic and hypochromic effect , effect of solvent on absorption spectra, molecular structure and infrared spectra.

Instrumentation -

Photometer, U.V- Visible spectrophotometer - sources of U.V.- Visible radiations, collimating systems, monochromators, samples cells and following detectors-photocell, barrier layer cell, Phototube , Diode array, applications of U.V.-Visible spectroscopy in pharmacy and spectrophotometric titrations.

Infrared Spectroscopy

Vibrational transitions, frequency -structure correlations, infrared absorption bands, Instrumentation- IR Spectro – meter - sources of the Collimating systems, monochromators, sample cells, sample handling in IR, spectroscopy and detectors-Thermocouple, Galay Cells, Thermistor, Bolometer Pyroelectric detector, Applications of IR in pharmacy.

Fluorimetric Analysis: Theory, Luminescence, factors affecting fluorescence, quenching, Instrumentation, Applications, fluorescent indicators, study of pharmaceutically important compounds estimated by fluorimetric.

b) Flame Photometry :

Theory, nebulisation, flame and flame temperature, interferences, flame spectrometric techniques and instrumentation pharmaceutical applications.

c. Atomic Absorption Spectrometry :

Introduction, Theory, types of electrodes instrumentation and applications.

d. Atomic Emission Spectroscopy:

Spectroscopic sources, atomic emission spectrometers. Photographic and photoelectric detection.

e. Nmr& Esr (introduction only):

Introduction , theoretical aspects and applications.

f. Mass Spectroscopy: (Introduction only):

Fragmentation, types of ions produced mass spectrum and applications.

g. Polarimetry : (Introduction only):

Introduction to optical rotatory dispersion, circular dichroism, polarimeter.

h. X- ray Diffraction : (Introduction only)

Theory, reciprocal lattice concept, diffraction patterns and applications.

i. Thermal Analysis :

Introduction, instrumentation, applications, and DSC and DTA.

3.2 PHARMACEUTICAL ANALYSIS(PRACTICAL)

Practical : 3 Hrs/week.

List of Experiments:

1. Separation and identification of Amino Acids by Paper Chromatography.
2. Separation and identification of Sulpha drugs by TLC technique.
3. Effect of PH and solvent on the UV spectrum of given compound.
4. Comparison of the UV spectrum of a compound with that of its derivatives.
5. Determination of dissociation constant of indicators using UV-Visible spectroscopy.
6. Conductometric titration of mixture of acids with a strong base.
7. Potentiometric titration of an acid with a strong base.
8. Estimation of drugs by Fluorimetric technique.
9. Study of quenching effect in fluorimetry.
10. Colourimetric estimation of sulpha drugs using BMR reagent.
11. Simultaneous estimation of two drugs present in given formulation
12. Assay of Salicylic Acid by colourimetry.
13. Determination of Chlorides and sulphates in Calcium gluconate by Nepheloturbidimetric Method.
14. Determination of Na/K by Flame Photometry.
15. Determination of Pka using PH meter.
16. Determination of specific rotation.
17. Comparison of the IR spectrum of a compound with that of its derivatives.
18. Demonstration of HPLC
19. Demonstration of HPTLC
20. Demonstration of GC-MS
21. Demonstration of DSC.
22. Interpretation of NMR spectra of any one compound.

Reference Books:

1. Text Book of Pharm, Analysis by Higuchi. T and Hasen, E.B., New York Inter science publishers.
2. Quantitative Pharma, Analysis by Jenkins, The Blakiston division, New York.
3. Quantitative Drug Analysis, by Garrot. D. Chapman & Hall Ltd., London.
4. Undergraduate Instrumental Analysis by James. E., CBS Publishers.
5. Instrumental Analysis by Willard and Merritt, EWP East west Press Ltd., Delhi/Madras.
6. Pharm Analysis by Skoog and West, Sounders Maniplal College Publishing .
7. Text book of Chemical Analysis, by A.I. Vogel, ELBS with Macmillan press, Hampshire.
8. Textbook of Pharm. Analysis by K.A. Connors, John Wiley & Sons, New York. Brisbane, Singapore.
9. Text book of Drug Analysis (Practical) by Beckett & Stenlake, CBS Publishers, New Delhi.
10. Text book of Drug Analysis by P.D. Sethi, CBS Publishers. Delhi
11. Spectroscopy by Silverstein, John & Wiley & Sons. Inc., Canada & Singapore.
12. How to practise GMP-A plan for total quality control by P.P. Sharma, Vandana Publications, Agra.
13. The Science & Practice of Pharmacy by Remington Vol-I&II, Mack publishing Co. Pennsylvania.
14. TLC by Stahl, Springer Verlag
15. Text Book of Pharm, Chemistry by Chatten, CBS Publication.

16. Spectroscopy by William Kemp, ELBS with Macmillan Press, Hampshire .
17. I.P.-1996, The Controller of Publications, New Delhi.
18. BPC-Dept. Of Health, U.K. for HMSO.
19. USP – Mack Publishing co., Easton, PA.
20. The Extra Pharmacopoeia – The Pharm. Press, London.

Practicals

Title of the Experiment :

1. Study of agonistic and antagonistic effects of drugs using Guinea – pig ileum preparation**.
2. To study the effects of drugs on intestinal motility using frog's esophagus model*
3. To Study the effects of drugs using rat uterus preparation**
4. To Study anticonvulsant property of drugs (any one model)*
5. To Study antihistaminic property of drug using histamine induced anaphylactic reaction in guinea pigs.
6. To study the apomorphine -induced compulsive behaviour (Sterotypy) in mice.
7. To study the muscle relaxant property of diazepam in mice using rotarod apparatus *
8. To Study the anti inflammatory property of indomethacin against carrageenan induced paw oedema **
9. To Study the anxiolytic effect of diazepam in mice using mirrored -Chamber apparatus**
10. To demonstrate the effect of various drugs on the blood pressure and respiration of anaesthetized dog.
11. To study the effect of anthelmintics on earthworms
12. To study the taming effect of chlorpromazine.
13. To study the effects of drugs on vas deferens of the male rat**
14. To study the effect of drugs on pesticide toxicity using rats as model.
15. To study the effect of drugs on heavy metal toxicity.

** indicate major experiment & * indicate minor experiment

Scheme of Practical Examination :

Sessionals Annual

Synopsis

Major Experiment

Minor Experiment

viva

Max Marks 100

3.3PHAMACOTHERAPEUTICS-II (THEORY)

Theory : 3 Hrs./week

1.Scope of the Subject :

This Course is designed to impart knowledge and skills necessary for contribution to quality use of medicines. Chapters dealt cover briefly pathophysiology and mostly therapeutics of various diseases. This will enable the student to understand the pathophysiology of common diseases and their management .

2.Objectives to the Subject upon completion of the subject student shall be able to -

- a. Know the pathophysiology of selected disease states and the rationale for drug therapy
- b. Know the therapeutic approach to management of these diseases.
- c. Know the controversies in drug therapy:
- d. Know the importance of preparation of individualized therapeutic plans based on diagnosis: and
- e. appreciate the needs to identify the patient – Specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects).

Text books (Theory)

Clinical Pharmacy and Therapeutics – Roger and walker, Churchill Livingstone Publication

Reference Books (Theory)

- a. Pharmacotherapy : A Pathophysiologic approach – Joseph T.Dipiro et al. Appleton & Lange
- b. Clinical Pharmacy and Therapeutics – Eric T.Herfindal, williams and wilkins Publications
- c.Applied Therapeutics The clinical use of Drugs. Lloyd Young and koda. Kimble MA]

3.Detailed Syllabus and lecture wise schedule :

Etiopathogenesis and pharmacotherapy of diseases associated with following systems/diseases

Title of the topic

1.Infectious diseases :

Guidelines for the rational use of antibiotics and surgical prophylaxis, Tuberculosis, Meningitis, Respiratory tract infections, Gastroenteritis, Endocarditis, Septicemia, Urinary tract infections, Protozoal infection -Malaria, HIV & Opportunistic infections, Fungal infections , Viral infections, Gonorrhoea and syphilis

2.Musculoskeletal disorders:

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

3.Renal system

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

4.Oncology :

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

5.Dermatology :

Psoriasis, Scabies, Eczema, Impetigo

3.3.PHARMACOTHERAPEUTICS – II (PRACTICAL)

Practical : 3 Hrs./Week

Practicals :

Hospital postings in various departments designed to complement the lecturers by providing practical clinical discussion: attending ward rounds : follow up the progress and changes made in drug therapy in allotted patients : case presentation upon discharge. Students are required to maintain a record of cases presented and the same should be submitted at the end of the course for evaluation.

The student shall be trained to understand the principle and practice involved in selection of drug therapy including clinical discussion.

A minimum of 20 cases should be presented and recorded covering most common diseases.

Assignments :

Students are required to submit written assignments on the topics given to them, Topics allotted should cover recent developments in drug therapy of various diseases. A minimum of THREE assignments [1500-2000 wards] should be submitted for evaluation.

Format of the assignment :

- 1.Minimum & maximum number of pages.
- 2.Reference (s) shall be included at the end.
- 3.Assignment can be a combined presentation at the end of the academic year.
4. It shall be computer draft copy.
- 5.Name and signature of the student.
- 6.Time allocated for presentation may be 8+2 Min.

Scheme of Practical Examination :

Sessionals Annual

Synopsis

Major Experiment

Minor Experiment

Viva

Max Marks 100

3.4.PHARMACEUTICAL JURISPRUDENCE (THEORY)

Theory : 2 Hrs/week

1. Scope of the subject : (4-6)lines: This course exposes the student to several important legislations related to the profession of Pharmacy in India. The Drugs and Cosmetics Act, along with its amendments are the core of this Course. Other acts, which are covered, include the Pharmacy Act, dangerous drugs, medicinal and toilet preparation Act etc. Besides this the new drug policy, professional ethics, DPCO, patent and design Act will be discussed.

2. objectives of the subject :

Upon completion of the subject student shall be able to (know, do, and appreciate) -

- a. Practice the Professional ethics:
- b. Understand the various concepts of the pharmaceutical legislation in India:
- c. Know the various parameters in the Drug and Cosmetic Act and rules :
- d. Know the Drug Policy, DPCO, Patent and design act:
- e. Understand the labeling requirements and packaging guidelines for drugs and cosmetics.
- f. Be able to understand the concepts of Dangerous Drugs Act, Pharmacy Act and Excise duties Act: and
- g. Other laws as prescribed by the Pharmacy Council of India from time to time including international Laws.

Text books (Theory)

Mithal, B.M. Text book of Forensic Pharmacy. Calcutta : National : 1988,

Reference books (Theory)

- a. Singh, KK, editor. Beitra's the Laws of Drugs, Medicines & cosmetics .
Allahabad : Law Book House: 1984
- b. Jain, NK. A text book of forensic pharmacy. Delhi : Vallabh prakashan: 1995
- c. Reports of the Pharmaceutical enquiry committee.
- d. I.D.M.A. Mumbai DPCO 1995
- e. Various reports of Amendments.
- f. Deshapande, S.W. The drugs and magic remedies act 1954 and rules 1955
Mumbai : Susmit Publications: 1998
- g. Eastern Book Company. The narcotic and psychotropic substances act 1985 Lucknow :
Eastern: 1987

3.Detailed syllabus and lecture wise schedule :

Title of the topic

- 1.Pharmaceutical Legislations _ A brief review
- 2.Principle and Significance of Professional ethics. Critical study of the code of pharmaceutical ethics drafted by PCI.
- 3.Drugs and cosmetics Act, 1940, and its rules 1945

Objectives , Legal definition, study of schedule's with reference to Schedule B, C&C1, D,E1,F&F1, F2,F3,FF,G,H,J,K,M,N,P,R,W.X,Y.

Sales, import, labeling and packaging of Drugs And Cosmetics Provisions Relating to Indigenous systems.

Constitution and Functions of DTAB, DCC, CDL.

Qualification and duties – Govt. analyst and Drugs Inspector.

4.Pharmacy Act – 1948

Objectives Legal Definition, General Study, Constitution and Functions of State & Central Council, Registration & Procedure, ER.

5. Medicinal and Toilet Preparation Act 1955.

Objectives, Legal Definitions, Licensing, Bonded and Non Bonded Laboratory, Ware Housing, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary preparations.

6. Narcotic Drugs and Psychotropic substances Act -1985 and Rules.

Objectives, Legal Definitions, General study Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for controlling the Drug Abuse. Prohibition , Control and regulations, Schedules to the Act.

7.Study of salient Features of Drugs and magic remedies Act and its rules.

8.Study of essentials Commodities Act Relevant to drugs price control order.

9.Drug price control order & National Drug Policy (Current).

10.Prevention of Cruelty to animals Act – 1960.

11.Patents & design Act- 1970

12.Brief study of prescription and Non prescription products.

4.Assignments :

Format of the assignment

1.Minimum& Maximum number of pages

2.It shall be a computer draft copy

3.Reference(s) shall be included at the end.

4.Name and Signature of the Student

5.Assignment can be a combined presentation at the end of the academic year.

6.Time allocated for presentation may be 8+2 Min

Case studies relating to

1. Drugs and Cosmetics Act and rules along with its amendments, Dangerous Drugs Act, Medicinal and Toilet preparation Act, New Drug Policy, Professional Ethics, Drugs (Price Control) Order, patent and Design Act.
2. Various prescription and non - prescription products.
3. Medical and Surgical accessories.
4. Diagnostic aids and appliances available in the market.

3.5.MEDICINAL CHEMISTRY (THEORY)

Theory : 3 Hrs./week

1.Modern concept of rational drug design:

A brief introduction to Quantitative Structure Activity Relationship (QSAR), prodrug . Combinational chemistry and computer aided drug design (CADD) and concept of antisense molecules.

A study of the development of the following classes of drugs including SAR mechanism of action synthesis of important compounds, Chemical nomenclature, brand names of important marketed products and their side effects.

2. Anti - infective agents
 - a. Local anti - infective agents
 - b. Preservatives
 - c. Antifungal agents
 - d. Urinary tract anti infectives
 - e. Anti tubercular agents
 - f. Antiviral agents and Anti AIDS agents
 - g. Antiprotozoal agents
 - h. Anthelmintics
 - i. Antiscabes and Antipedicular agents
3. Sulphonamides and sulphones
4. Antimalarials
5. Antibiotics agents
6. Antineoplastic agents
7. Cardiovascular agents
 - a) Anti hypertensive agents
 - b) Antianginal agents and vasodilators
 - c) Antiarrhythmic agents
 - d) Antihyperlipidemic agents
 - e) Coagulants and Anticoagulants
 - f) Endocrine
- 8) Hypoglycemic agents
- 9) Thyroid and Antithyroid agents
- 10) Diuretics
- 11) Diagnostic agents
- 12) Steroidal Hormones and Adrenocorticoids

3.5.MEDICINAL CHEMISTRY (PRACTICAL)

Practical :3 Hrs./week

- 1.Assays of important drugs from the course content.
- 2.preparation of medicinally important compounds or intermediates required for synthesis of drugs.
- 3.Monograph analysis of important drugs
- 4.Determination of partition coefficients, dissociation constants and molar refractivity of compounds for QSAR analysis.

Reference Books:

- a. Wilson and Gisvold's Text book of Organic, Medicinal and Pharmaceutical Chemistry, Lippincott_Raven Publishers – New York, Philadelphia.
- b. William O.Foye, Principles of Medicinal Chemistry, B.I.Waverly Pvt.Ltd., New Delhi.
- c. Burgers, Medicinal Chemistry, M.E.Welly Med. Chemistry M.E, Walfred Johnwilley and Sons, Wiley-interscience Publication, New York, Toronto
- d. A Text book of Medicinal Chemistry , Vol I and II by Surendra N. Pandeya, S.G.Publisher,6, Dildayal Nagar , Varanasi – 10.
- e. Indian Pharmacopoeia 1985 and 1996. The Controller of Publications, Civil Lines, Delhi – 54.
- f. Current Index of Medical Specialities (CIMS) and MIMS India, MIMS, A.E. Morgan Publications (1)Pvt.Ltd, New Delhi – 19.
- g. Organic Drug Synthesis – Ledniser Mitzher Vol. 1 and II.
- h. Pharmaceutical Chemistry drug synthesis Vol I aand II by H.J.Roth and A. Kleemann.
- i. The Science and Practice of Pharmacy Vol.1 and 2, Remington, MACK Publishing Company, Easton, Pennsylvania.

3.6.PHARMACEUTICAL FORMULATIONS (THEORY)

Theory : 2 Hrs./Week

1.Scope of the Subject :

Scope and objectives of the Course: Subject deals with the formulation and evaluation of various pharmaceutical dosage forms.

2. Objectives of the Subject :

Upon completion of the subject student shall be able to (Know, do, appreciate)-

- a. Understand the Principle involved in formulation of various Pharmaceutical dosage forms;
- b. Prepare various Pharmaceutical formulation:
- c.Perform evaluation of -pharmaceutical dosage forms: and
- d. Understand and appreciate the concept of bioavailability and bioequivalence, their role in clinical situations.

Text books (Theory)

- a. Phamaceutical dosage forms, Vol, I, II and III by lachman
- b. Rowlings Text book of Pharmaceutics
- c.Tutorial Pharmacy – Cooper & Gun

Reference books (Theory)

- a. Remington's Pharmaceutical Sciences
- b.USP/BP/IP

3.Detailed syllabus and lecture wise schedule:

Title of the topic

- 1.Pharmaceutical dosage form-concept and classification
- 2.Tablets : Formulation of different types of tablets, tablet excipients, graduation techniques quality control and evaluation of tablets. Tablet coating, Type of coating, quality control tests for soft gelatin capsules.
- 3.Capsules : Production and filling of hard gelatin capsules, Raw material for shell, finishing, quality control tests for capsules. Production and filing of soft gelatin capsules, quality control tests for soft gelatin capsules.
- 4.Liquid orals : Formulation and evaluation of suspensions, emulsions and solutions. Stability of these preparations.

5. Parenterals : Introduction Containers used for Parenterals (including official tests)
Formulation of large and small volume Parenterals Sterilization

6. Ophthalmic Preparations (semi-Solids): Introduction and classification Factors affecting absorption and anatomy of skin Packaging storage and labeling Ointments. Types of Ointment Base Preparation of ointment , Jellies Types of jellies Formulation of jellies Suppositories, Method of Preparations, Types Packaging

7. Definition and concept of controlled and novel Drug delivery systems with available examples, Viz, Parenteral, trans dermal, buccal, rectal, nasal, implants, ocular.

3.6PHARMACEUTICAL FORMULATIONS (PRACTICAL)

Practical : 3 Hrs./week

List of Experiments:

1.Manufacture of Tablets

- a. Ordinary compressed tablet - wet granulation
- b. Tablets prepared by direct compression.
- c.Soluble tablet.
- d. Chewable tablet.

2.Formulation and filling of hard gelatin capsules

3.Manufacture of parenterals

- a. Ascorbic acid injection
- b. Calcium gluconate injection
- c.Sodium chloride infusion
- d.Dextrose and sodium chloride injection/infusion

4.Evaluation of Pharmaceutical formulations (QC tests)

- a. Tablets
- b. Capsules
- c.Injections

5.Formulation of two liquid oral preparations and evaluation by assay

- a. Solution : paracetamol syrup
- b. Antacid suspensions: Aluminum hydroxide gel

6.Formulation of semisolids and evaluation by assay

- a. Salicylic acid and benzoic acid ointment
- b. Gel formulation Diclofenac gel

7.Cosmetic Preparations

- a. Lipsticks
- b. cold cream and vanishing cream
- c.Clear liquid shampoo
- d. Tooth paste and tooth powders.

8. Tablet coating (demonstration)

Scheme of Practical Examination :

Sessionals Annual

Synopsis	05	25
Major Experiment	10	25
Minor Experiment	03	25
Viva	02	25
Max Marks	20	100
Duration	03 hrs	04 hrs

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness. Viva-voce and record maintenance).

FOURTH YEAR

4.1.PHARMACOTHERAPEUTICS – III (THEORY)

THEORY : 3 Hrs./ week

1.Scope :

This course is designed to impart knowledge and skills necessary for contribution to quality use of medicines . Chapters dealt cover briefly pathophysiology and mostly therapeutics of various disease. This will enable the student to understand the pathophysiology of common diseases and their Management.

2.Objectives :

At completion of this subject it is expected that students will be able to understand -

- a. the pathophysiology of selected disease states and the rationale for drug therapy :
- b. the therapeutic approach to Management of these diseases:
- c.the controversies in drug therapy:
- d.the importance of preparation of individualised therapeutic plans based on diagnosis:
- e. needs to identify the patient – specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives , time-course of clinical and laboratory indices of therapeutic response and adverse effects):
- f. describe the pathophysiology of selected disease states and explain the rationale for drug therapy :
- g. to summarize the therapeutic approach to management of these diseases including reference to the latest available evidence.
- h. to discuss the controversies in drug therapy:
- I.to discuss the preparation of individualized therapeutic plans based on diagnosis : and
- j. identify the patient – specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives , time – course of clinical and laboratory indices of therapeutic response and adverse effects).

Text Books

- a. Clinical Pharmacy and Therapeutics – Roger and walker, Chruchill Livingstone publication
- b. Pharmacotherapy : A pathophysiologic approach – Joseph T. Dipiro et al. Appleton & Lange

Reference Books

- a. Pathologic Basis of disease – Robins SL, W.B. Saunders publication
- b. Pathology and therapeutics for Pharmacists: A Basis for clinical Pharmacy Practice – Green and Harris, Champman and Hall publication.
- c. Clinical Pharmacy and Therapeutics – Eric T. Herfindal, Williams and Wilkins Publication
- d. Applied Therapeutics: The clinical Use of Drugs, Lloyd Young and Kodakimble MA
- e. Avery's Drug Treatment , 4th Edn.1997, Aids International Limited
- f. Relevant review articles from recent medical and Pharmaceutical literature

4.1.PHARMACOTHERAPEUTICS – III (PRACTICAL)

Practical : 3 Hrs/week

Practicals:

Hospital postings for a period of at least 50 hours is required to understand the Principles and Practice involved in ward round participation and clinical discussion on selection of drug therapy. Students are required to maintain a record of 15 cases observed in the ward and the same should be submitted at the end of the course for evaluation. Each student should present at least two Medical cases they have observed and followed in the wards.

Etiopathogenesis and Pharmacotherapy of diseases associated with following systems/diseases:

Title of the topic

Assignments:

Students are required to submit written assignments on the topics given to them Topics allotted should cover recent developments in drug therapy of various diseases. A minimum of THREE assignments.

[1500-2000 words] should be submitted for evaluation

Format of the assignment :

- 1.Minimum & Maximum number of pages.
- 2.Reference(s) shall be included at the end.
- 3.Assignment can be a combined presentation at the end of the academic year
- 4.It shall be computer draft copy
- 5.Name and signature of the student
- 6.Time allocated for presentation may be 8+2 Min.

Scheme of Practical Examination :

1.Gastrointestinal System : Peptic ulcer disease, Gastro Esophageal Reflux Disease, inflammatory bowel disease, Liver disorders – Alcoholic liver disease, viral hepatitis including jaundice and Drug induced liver disorders.

2.Haematological system:

Anaemias, Venous thromboembolism, Drug induced blood disorders.

3.Nervous System :

Epilepsy, Parkinsonism, Stroke, Alzheimer's disease,

4. Psychiatry disorders :

Schizophrenia, Affective disorders, Anxiety disorders sleep disorders, Obsessive Compulsive disorders

5. Pain Management including Pain pathways, neuralgias, headaches.

6. Evidence Based Medicine

Sessionals Annual

Synopsis	05	25
Major Experiment	10	25
Minor Experiment	03	25
Viva	02	25
Max Marks	20	100
Duration	03 Hrs	04 Hrs

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness , Viva-voce and record maintenance)

4.2.HOSPITAL PHARMACY (THEORY)

Theory : 2 Hrs/week

1.Scope :

In the changing scenario of Pharmacy practice in India, for successful practice of Hospital Pharmacy, the students are required to learn various skills like drug distribution, drug dispensing, manufacturing of parenteral preparations, drug information, patient counseling, and therapeutic drug monitoring for improved patient care.

2.Objectives :

Upon completion of the course, the student shall be able to -

- a. Know various drug distribution methods:
- b. Know the professional practice management skills in hospital pharmacies
- c. Provide unbiased drug information to the doctors:
- d. Know the manufacturing practices of various formulations in hospital set up.
- e. appreciate the Practice based research methods: and
- f. appreciate the stores management and inventory control.

Text books: (latest editions)

- a. Hospital pharmacy by William E. Hassan
- b. A text book of Hospital Pharmacy by S.H. Merchant & Dr.J.S. Qadry. Revised by R.K.Goyal & R.K. Parikh

References :

- a. WHO consultative group report.
- b. R.P.S. Vol .2 Part -B Pharmacy Practice section.
- c. Hand book of Pharmacy- health care. Edst. Robin J Harman. The Pharmaceutical Press.

3.Lecture wise Programme :

Topics

- 1.Hospital – Its Organisation and functions
- 2.Hospital Pharmacy – Organisation and Management

- a) Organizational structure staff, infrastructure & work load statistics
- b) Management of materials and finance
- c) Roles & responsibilities of hospital pharmacist

- 3.The Budget – Preparation and implementation

4. Hospital drug policy

- a. Pharmacy and Therapeutic committee (PTC)
- b) Hospital formulary
- c) Hospital Committees infection committees – infection committee
- d) developing therapeutic guidelines
- e) Hospital Pharmacy communication – Newsletter

5. Hospital pharmacy services

- a. Procurement & warehousing of drugs and Pharmaceuticals
- b. Inventory control

Definition, various methods of inventory Control

ABC, VED, EOQ, Lead time, safety stock

c) Drug distribution in the hospital

- i) individual Prescription method
- ii) Floor stock method
- iii) Unit dose drug distribution method

d) Distribution of Narcotic and other controlled substances

e) Central sterile supply services _ Role of pharmacists

6) Manufacture of Pharmaceutical preparations

- a. Sterile formulations – large and small volume parenterals
- b) Manufacture of Ointments, Liquids, and creams
- c) Manufacturing of Tablets, granules. Capsules , and powders
- d) Total parenteral nutrition

7) Continuing professional development programs

Edition and training

8. Radio Pharmaceuticals – Handling and packaging

9. Professional Relations and practices of hospital pharmacist

4.2 HOSPITAL PHARMACY (PRACTICAL)

Practical : 3 Hrs/week

1. Assessment of drug interactions in the given prescriptions
2. Manufacture of Parenteral formulations, Powders.
3. Drug information queries.
4. Inventory control

List of Assignments :

1. Design and management of Hospital Pharmacy department for a 300 bedded hospital
2. Pharmacy and Therapeutics committee – Organization, functions, and limitations.
3. Development of a hospital formulary for 300 bedded teaching hospital
4. Preparation of ABC analysis of drugs sold in one month from the Pharmacy
5. Different phases of clinical trials with elements to be evaluated
6. Various sources of drug information and systematic approach to provide unbiased drug information.
7. Evaluation of prescriptions generated in hospital for drug interactions and find out the suitable management

8. Special requirements :

1. Each college should sign MoU with nearby local hospital having minimum 150 beds for providing necessary training to the students on hospital pharmacy activities.
2. Well equipped with various resources of drug information.

Scheme of Practical Examination :

Sessionals Annual

Synopsis	05	25
Major Experiment	10	25
Minor Experiment	03	25
Viva	02	25

Max Marks 20 100

Duration 03 hrs 04 hrs

Note : Total Sessional marks is 30 (20 for Practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance)

4.3.CLINICAL PHARMACY (THEORY)

Theory : 3 Hrs/ week

1.Objectives of the subject:

Upon completion of the subject student shall be able to (know, do, appreciate)

- a. monitor drug therapy of patient through medication chart review and clinical review :
- b. Obtain medication history interview and counsel the patients:
- c. identify and resolve drug related problems:
- d. detect, assess and monitor adverse drug reaction.
- e. interpret selected laboratory results (as monitoring parameters in therapeutics)
as specific disease states : and
- f. retrieve , analyse, interpret and formulate drug or medicine information.

Text books (Theory)

- a. Practice Standards and Definitions – The Society of Hospital Pharmacists of Australia.
- b. Basic skills in interpreting laboratory data – Scott LT, American Society of Health System Pharmacists inc
- c. Biopharmaceutics and Applied Pharmacokinetics – Leon Shargel, Prentice Hall publication
- d. A text book of Clinical Pharmacy Practice ; Essential concepts and skills, Dr. G.Parthasarathi etal, Orient Orient Langram Pvt Ltd.ISSBN8125026

References

- a. Australian drug information Procedure manual, The Society of Hospital Pharmacists of Australia
- b. Clinical Pharmacokinetics – Rowland and Tozer, williams and wilkins Publication.
- C. Pharmaceutical statistics. Practical and clinical applications. Sanford Bolton, Marcel Dekker, Inc.

2.Detailed Syllabus and lecture wise schedule :

Title of the topic

- 1.Definitions, development and scope of clinical pharmacy
- 2.Introduction to daily activities of a clinical pharmacist

- a. Drug therapy monitoring (medication chart review , clinical review , Pharmacist interventions)
- b. ward round participation
- c. Adverse drug reaction management
- d. Drug information and poisons information
- e. Medication history
- f. Patient counseling
- g. Drug utilisation evaluation (DUE) and review (DUR)
- h. Quality assurance of clinical Pharmacy services

3. Patient data analysis

The Patient's case history, its structure and use in evaluation of drug therapy & Understanding common medical abbreviations and terminologies used in clinical practices.

4. Clinical laboratory tests used in the evaluation of disease states, and interpretation of test results

- a. Haematological. Liver function, Renal function, thyroid function tests
- b. Tests associated with cardiac disorders
- c. Fluid and electrolyte balance
- d. Microbiological culture sensitivity tests
- e. Pulmonary Function tests.

5. Drug & Poisons information

- a. Introduction to drug information resources available.
- b. Systematic approach in answering D1 queries.
- c. Critical evaluation of drug information and literature.
- d. Preparation of written and verbal reports
- e. Establishing a Drug information Centre.
- f. Poisons information – organization & information resources.

6. Pharmacovigilance

- a. Scope, definition and aims of pharmacovigilance.
- b. Adverse drug reactions – Classification, Mechanism, predisposing factors, causality assessment [different scales used]
- c. Reporting, evaluation, monitoring, preventing & management of ADRs.
- d. Role of pharmacist in management of ADR.

7. Communication skills, including patient counselling techniques, medication history interview, presentation of cases.

8. Pharmaceutical care concepts.

9. Critical evaluation of biomedical literature.

10. Medication errors.

4.3 CLINICAL PHARMACY [PRACTICAL]

Practical : 3 Hrs./ Week

Students are expected to perform 15 practicals in the following areas covering the topics dealt in theory class.

- a. Answering drug information questions [4 Nos.]
- b. Patient medication counselling [4 Nos.]
- c. Case studies related to laboratory investigations [4 Nos.]
- d. Patient medication history interview [3 Nos.]

Assignment:

Students are expected to submit THREE written assignments [1500-2000 words] on the topics given to them covering the following areas dealt in theory class.

Drug information, Patient medication history interview, Patient medication counselling, Critical appraisal of recently published articles in the biomedical literature which deals with a drug or therapeutic issue.

Format of the assignment:

1. Minimum & Maximum number of pages.
2. References(s) shall be included at the end.
3. Assignment can be a combined presentation at the end of the academic year.
4. It shall be computer draft copy.
5. Name and signature of the student.
6. Time allocated for presentation may be 8+2 Min.

4.4 BIOSTATISTICS AND RESEARCH METHODOLOGY [THEORY]

Theory : 2 Hrs./Week

1. Detailed syllabus and lecture wise schedule

1. Research Methodology

a. Types of clinical study designs:

Case studies, observational studies, interventional studies,

b. Designing the methodology

c. Sample size determination and Power of a study

Determination of sample size for simple comparative experiments, determination of sample size to obtain a confidence interval of specified width, power of a study.

d. Report writing and presentation of data.

2. Biostatistics

2.1 a. Introduction

b. Types of data distribution

c. Measures describing the central tendency distributions – average, median, mode.

d. Measurement of the spread of data-range, variation of mean, standard deviation, variance, coefficient of variation, standard error of mean.

2.2 Data graphics

Construction and labeling of graphs, histogram, piecharts, scatter plots, semilogarithmic plots.

2.3 Basics of testing hypothesis

a. Null hypothesis, level of significance, power of test, P value, statistical estimation of confidence intervals.

b. Level of significance (Parametric data) – students t test (paired and unpaired), chi Square test, Analysis of Variance (one-way and two-way)

c. Level of significance (Non-parametric data)-Sign test, Wilcoxon's signed rank test, Wilcoxon rank sum test, Mann Whitney U test, Kruskal-Wallis test (one way ANOVA)

d. Linear regression and correlation-Introduction, Pearson's and Spearman's correlation and correlation co-efficient.

e. Introduction to statistical software:SPSS, Epi Info, SAS.

2.4 Statistical methods in epidemiology

Incidence and prevalence, relative risk, attributable risk

3. Computer applications in pharmacy

Computer System in Hospital Pharmacy: Patterns of Computer use in Hospital Pharmacy - Patient record database management, Medication order entry - Drug labels and list - Intravenous solution and admixture, patient medication profiles, Inventory control, Management report & Statistics.

Computer In Community Pharmacy

Computerizing the Prescription Dispensing process
Use of Computers for Pharmaceutical Care in community pharmacy
Accounting and General ledger system

Drug Information Retrieval & Storage:

Introduction - Advantages of Computerized Literature Retrieval
Use of Computerized Retrieval

Reference books:

- a. Pharmaceutical statistics-practical and clinical applications, Sanford Bolton 3rd edition, publisher Marcel Dekker Inc. NewYork.
- b. Drug Information-A Guide for Pharmacists, Patrick M Malone, Karen L Kier, John E Stanovich, 3rd edition, McGraw Hill Publications 2006

4.5 BIOPHARMACEUTICS AND PHARMACOKINETICS [THEORY]

Theory: 3 Hrs. / Week

1. Biopharmaceutics

1. Introduction to Biopharmaceutics

- a. Absorption of drugs from gastrointestinal tract.
- b. Drug Distribution.
- c. Drug Elimination.

2. Pharmacokinetics

2. Introduction to Pharmacokinetics.

- a. Mathematical model
- b. Drug levels in blood.
- c. Pharmacokinetic models
- d. Compartment models
- e. Pharmacokinetic study.

3. One compartment open model.

- a. Intravenous Injection (Bolus)
- b. Intravenous infusion.

4. Multicompartment models.

- a. Two compartment open model.
- b. IV bolus, IV infusion and oral administration

5. Multiple - Dosage Regimens.

- a. Repetitive Intravenous injections - One Compartment Open Model
- b. Repetitive Extravascular dosing - One Compartment Open Model
- c. Multiple Dose Regimen - Two Compartment Open Model

6. Nonlinear Pharmacokinetics.

- a. Introduction
- b. Factors causing Non-linearity
- c. Michaelis-menton method of estimating parameters.

7. Noncompartmental Pharmacokinetics.

- a. Statistical Moment Theory.
- b. MRT for various compartment models.
- c. Physiological Pharmacokinetic model.

8. Bioavailability and Bioequivalence.

- a. Introduction.
- b. Bioavailability study protocol.
- c. Methods of Assessment of Bioavailability

4.5 BIOPHARMACEUTICS AND PHARMACOKINETICS [PRACTICAL]

Theory: 3 Hrs. / Week

- 1.Improvement of dissolution characteristics of slightly soluble drugs by some methods.
- 2.Comparison of dissolution studies of two different marketed products of same drug.
- 3.Influence of polymorphism on solubility and dissolution.
- 4.Protein binding studies of a highly protein bound drug and poorly protein bound drug.
- 5.Extent of plasma-protein binding studies on the same drug (i.e. highly and poorly protein bound drug) at different concentrations in respect of constant time.
- 6.Bioavailability studies of some commonly used drugs on animal/human model.
- 7.Calculation of K_a , K_e , $t_{1/2}$, C_{max} , AUC, AUMC, MRT etc. from blood profile data.
- 8.Calculation of bioavailability from urinary excretion data for two drugs.
- 9.Calculation of AUC and bioequivalence from the given data for two drugs.
- 10.In vitro absorption studies.
- 11.Bioequivalency studies on the different drugs marketed. (eg) Tetracycline, Sulphamethoxazole, Trimethoprim, Aspirin etc., on animals and human volunteers.
- 12.Absorption studies in animal inverted intestine using various drugs.
- 13.Effect on contact time on the plasma protein binding of drugs.
- 14.Studying metabolic pathways for different drugs based on elimination kinetics data.
- 15.Calculation of elimination half – life for different drugs by using urinary elimination data and blood level data.
- 16.Determination of renal clearance.

References:

- a. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi
- b. Remington's Pharmaceutical Sciences, By Mack Publishing Company, Pennsylvania.
- c. Pharmacokinetics: By Milo Gibaldi Donald, R. Mercei Dekker Inc.
- d. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.
- e. Biopharmaceutics and Pharmacokinetics; By Robert F Notari
- f. Biopharmaceutics; By Swarbrick
- g. Bio phamaceutics andPharmacokinetics-A Treatise, By D. M. Brahmkar and Sunil B. Jaiswal, Vallabh Prakashan Pitampura, Delhi
- h. Cilinal Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and Thomas, N.Tozen, Lea and Febrger, Philadelphia, 1955.
- l. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, publishing Company, Pennsylvania 1989.
- j. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Rebert F Notari Marcel Dekker Inn, New York and Basel, 1987.
- k. Encyclopedia of Pharmaceutical Technology, Vol 13, James Swarbrick, James, C. Roylan, Marcel Dekker Inc, New York 1996.

4.6 CLINICAL TOXICOLOGY [THEORY]

Theory : 2 Hrs./Week

1. General principles involved in the management of poisoning
2. Antidotes and the clinical applications.
3. Supportive care in clinical Toxicology.
4. Gut Decontamination
5. Elimination Enhancement.
6. Toxicokinetics.
7. Clinical symptoms and management of acute poisoning with the following agents -
 - a. Pesticide poisoning: organophosphorous compounds, carbamates, organochlorines, pyrethroids.
 - b. Opiates overdose.
 - c. Antidepressants
 - d. Barbiturates and benzodiazepines.
 - e. Alcohol: ethanol, methanol.
 - f. Paracetamol and salicylates.
 - g. Non-steroidal anti-inflammatory drugs.
 - h. Hydrocarbons: Petroleum products and PEG.
 - i. Caustics: inorganic acids and alkali.
 - j. Radiation poisoning.
8. Clinical symptoms and management of chronic poisoning with the following agents-Heavy metals Arsenic, lead, mercury, iron, copper
9. Venomous snake bites: Families of venomous snakes, clinical effects of venoms, general management as first aid, early manifestations, complications and snake bite injuries.
10. Plants poisoning. Mushrooms, Mycotoxins.
11. Food poisonings.
12. Envenomations – Arthropod bites and stings.

Substance abuse:

Signs and symptoms of substance abuse and treatment of dependence

- a. CNS stimulants : amphetamine
- b. Opioids
- c. CNS depressants
- d. Hallucinogens:LSD
- e. Cannabis group
- f. Tobacco

References:

a. Matthew J Ellenhorn. ELLENHORNS MEDICAL TOXICOLOGY – DIAGNOSIS AND TREATMENT OF POISONING. Second edition. Williams and Willkins publication, London

b. V V Pillay. HANDBOOK OF FORENSIC MEDICINE AND TOXICOLOGY. Thirteenth edition 2003 Paras Publication, Hyderabad

** PHARMACOTHERAPEUTICS I & II(only for Pharm-D (Post Baccalaureate))

Ethiopathogenesis and pharmacotherapy of diseases associated with following systems/ diseases

1. Cardiovascular system:

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

2. Respiratory System:

Introduction to pulmonary function test, Asthma, Chronic obstructive airways disease, Drug induced pulmonary diseases

3. Endocrine system:

Diabetes, Thyroid diseases, Oral contraceptives, Hormone replacement therapy, Osteoporosis

4. General prescribing guidelines for

- a. Paediatric patients
- b. Geriatric patients
- c. Pregnancy and breast feeding

5. Ophthalmology :

Glaucoma, Conjunctivitis - Viral & bacterial

6. Introduction to rational drug use:

Definition, Role of Pharmacist Essential drug concept Rational drug concept Rational drug formulations

7. Infectious disease:

Guidelines for the rational use of antibiotics and surgical prophylaxis, Tuberculosis, Meningitis, Respiratory tract infections, Gastroenteritis, Endocarditis, Septicemia, Urinary tract infections, Protozoal infection -Malaria, HIV & Opportunistic infections, Fungal infections , Viral infections, Gonorrhoea and syphilis

8. Musculoskeletal disorders:

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

9. Renal system:

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

10. Oncology :

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

11. Dermatology :

Psoriasis, Scabies, Eczema, Impetigo

PHARMACOTHERAPEUTICS – I & II (PRACTICAL)

Practicals: 3 Hrs./Week

Hospital postings in various departments designed to complement the lectures by providing practical clinical discussion; attending ward rounds: follow up the progress and changes made in drug therapy in allotted patients; case presentation upon discharge. Students are required to maintain a record of cases presented and the same should be submitted at the end of the course for evaluation. A minimum of 20 cases should be presented and recorded covering most common diseases.

Assignments:

Students are required to submit written assignments on the topics given to them. Topics allotted should cover recent developments in drug therapy of various diseases. A minimum of THREE assignments (1500-2000 words) should be submitted for evaluation.

**It was resolved 39th SAB held on 21.06.2010

FIFTH YEAR

5.1 CLINICAL RESEARCH [THEORY]

Theory : 3 Hrs./Week

1. Drug development process:

Introduction:

Various Approaches to drug discovery

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

2. Clinical development of drug:

1. Introduction to Clinical trials
2. Various phases of clinical trial.
3. Methods of post marketing surveillance
4. Abbreviated New Drug Application submission.
5. Good Clinical Practice – ICH, GCP, Central drug standard control organisation (CDSCO) guidelines
6. Challenges in the implementation of guidelines
7. Ethical guidelines in Clinical Research
8. Composition, responsibilities, procedures of IRB/IEC
9. Overview of regulatory environment in USA, Europe and India.
10. Role and responsibilities of clinical trial personnel as per ICH GCP
 - a. Sponsor
 - b. Investigators
 - c. Clinical research associate
 - d. Auditors
 - e. Contract research coordinators
 - f. Regulatory authority
11. Designing of clinical study documents (protocol, CRF, ICF, PIC with assignment)
12. Informed consent Process
13. Data management and its components
14. Safety monitoring in clinical trials.

References:

- a. Central Drugs Standard Control Organization. Good Clinical Practices- Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health; 2001.

- b. International Conference on Harmonisation of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonised Tripartite Guideline. Guideline for Good Clinical Practice. E6; May 1996.
- c. Ethical Guidelines for Biomedical Research on Human subjects 2000. Indian Council of Medical Research, New Delhi.
- d. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green March 2005, John Wiley and Sons.
- e. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.
- f. Clinical Data Management edited by R.K.Rondels, S A Varley, C F Webbs, Second Edition, Jan 2000, Wiley Publications.
- G. Goodman & Gilman: JG Hardman, LE Limbard, 10th Edn. McGraw Hill Publications, 2001.

5.2 PHARMACOEPIDEMOLOGY AND PHARMACOECONOMICS [THEORY]

Theory: 3 Hrs./ Week

1. Pharmacoepidemiology:

Definition and scope:

Origin and evaluation of pharmacoepidemiology need for pharmacoepidemiology, aims and applications.

Measurement of outcomes in pharmacoepidemiology

Outcome measure and drug use measures

Prevalence, incidence and incidence rate, Monetary units, number of prescriptions, units of drugs dispensed, defined daily doses and prescribed daily dose, medication adherence measurement.

Concept of risk in pharmacoepidemiology

Measurement of risk, attributable risk and relative risk, time-risk relationship and odds ratio

Pharmacoepidemiological methods

Includes theoretical aspects of various methods and practical study of various methods with the help of case studies for individual methods

Drug utilization review, case reports, case series, surveys of drug use, cross – sectional studies, cohort studies, case control studies, case – cohort studies, meta – analysis studies, spontaneous reporting, prescription event monitoring and record linkage system.

Sources of data for pharmacoepidemiological studies

Ad Hoc data sources and automated data systems.

Selected special applications of pharmacoepidemiology

Studies of vaccine safety, hospital pharmacoepidemiology, pharmacoepidemiology and risk management, drug induced birth defects.

2. Phrmacoconomics:

Definition, history, needs of pharmaco-economic evaluations

Role in formulary management decisions

Pharmaco-economic evaluation

Outcome assessment and types of evaluation Includes theoretical aspects of various methods and practical study of various methods with the help of case studies for individual methods:

Cost-minimization, cost-benefit, cost – effectiveness, cost utility

3. Applications of Pharmacoconomics

Software and case studies

5.3 CLINICAL PHARMACOKINETICS AND PHARMACOTHERAPEUTIC DRUG MONITORING [THEORY]

Theory : 2 Hrs./Week

1. Introduction to Clinical pharmacokinetics:
2. Design of dosage regimens:
Nomograms and Tabulations in designing dosage regimen, Conversion from intravenous to oral dosing, Determination of dose and dosing intervals, Drug dosing in the elderly and pediatrics and obese patients.
3. Pharmacokinetics of Drug Interaction:
 - a. Pharmacokinetic drug interactions
 - b. Inhibition and Induction of Drug metabolism
 - c. Inhibition of Biliary Excretion.
4. Therapeutic Drug monitoring:
 - a. Introduction
 - b. Individualization of drug dosage regimen (variability – Genetic, Age and Weight, disease, Interacting drugs).
 - c. Indications for TDM. Protocol for TDM.
 - d. Pharmacokinetic/Pharmacodynamic correlation in drug therapy.
 - e. TDM of drugs used in the following disease conditions: cardiovascular disease, Seizure disorders, Psychiatric conditions, and Organ transplantation.
5. Dosage adjustment in Renal and hepatic Disease.
 - a. Renal impairment
 - b. Pharmacokinetic considerations
 - c. General approach for dosage adjustment in Renal disease.
 - d. Measurement of Glomerular Filtration rate and creatinine clearance.
 - e. Dosage adjustment for uremic patients.
 - f. Extracorporeal removal of drugs.
 - g. Effect of Hepatic disease on pharmacokinetics.
6. Population Pharmacokinetics.
 - a. Introduction to Bayesian Theory.
 - b. Adaptive method or Dosing with feed back.
 - c. Analysis of Population pharmacokinetic Data.
7. Pharmacogenetics
 - a. Genetic polymorphism in Drug metabolism: Cytochrome P-450 Isoenzymes.
 - b. Genetic Polymorphism in Drug Transport and Drug Targets.
 - c. Pharmacogenetics and Pharmacokinetics/Pharmacodynamic considerations.