

**FACULTY OF PHARMACY**  
**KARPAGAM ACADEMY OF HIGHER EDUCATION**

Deemed to be University

*(Established Under Section 3 of UGC Act 1956)*

Eachanari Post, Pollachi Main Road, Coimbatore – 641021.

**PHARM.D DEGREE COURSE (2024-2025)**  
**(DOCTOR OF PHARMACY)**

+



**REGULATIONS 2024**  
**COURSE OF STUDY AND SCHEME OF EXAMINATION**  
**&**  
**SYLLABUS**

## **CHAPTER-I**

### **1. Short title and commencement**

- (1) These regulations may be called the Pharm.D Regulations 2024.
- (2) They shall come into force from the date of their publication in the official Gazette.

2. Pharm.D shall consist of a certificate, having passed the course of study and examination as prescribed in these regulations, for the purpose of registration as a pharmacist to practice the profession under the Pharmacy Act, 1948.

## **CHAPTER-II**

### **3. 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) full time with each academic year spread over a period of not less than two hundred working days. The period of six years duration is divided into two phases –

Phase I – consisting of First, Second, Third, Fourth and Fifth academic year.

Phase II – consisting of internship or residency training during sixth year involving posting in specialty units. It is a phase of training wherein a student is exposed to actual pharmacy practice or clinical pharmacy services and acquires skill under supervision so that he or she may become capable of functioning independently.

- b) Pharm.D (Post Baccalaureate) : The duration of the course shall be for three academic years (two years of study and one year internship or residency) full time with each academic year spread over a period of not less than two hundred working days. The period of three years duration is divided into two phases:

Phase I – consisting of First and Second academic year.

Phase II – consisting of Internship or residency training during third year involving posting in specialty units. It is a phase of training wherein a student is exposed to actual pharmacy practice or clinical pharmacy services, and acquires skill under supervision so that he or she may become capable of functioning independently.

#### **4. Minimum qualification for admission to:**

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

- (1) 10+2 examination with Physics and Chemistry as compulsory subjects along with one of the following subjects: Mathematics or Biology.
- (2) A pass in D. Pharm course from an institution approved by the Pharmacy Council of India under section 12 of the Pharmacy Act.
- (3) 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 31<sup>st</sup> December of the year of admission to the course.

Provided that 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/Union Territory Administration as the case may be from time to time.

b) Pharm.D. (Post Baccalaureate) Course –

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

Provided that 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/Union Territory Administration as the case may be from time to time.

**5.** Number of admissions in the above said programmes shall be as prescribed by the Pharmacy Council of 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.** 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.

## **7. Attendance and progress:**

A candidate is required to put in at least 80% attendance in individual courses considering Theory and Practical separately. The candidate shall complete the prescribed course satisfactorily to be eligible to appear for the respective examinations.

## **8. Program / Course credit structure:**

As per the philosophy of Credit Based Semester System, certain quantum of academic work viz. Theory classes, tutorial hours, Practical classes, etc., are measured in terms of credits. On satisfactory completion of the courses, a candidate earns credits. The amount of credit associated with a course is dependent upon the number of hours of instruction per week in that course. Similarly, the credit associated with any of the other academic, co/extra-curricular activities is dependent upon the quantum of work expected to be put in for each of these activities per week.

### **Credit assignment:**

#### **Theory and Laboratory courses:**

Courses are broadly classified as Theory and Practical. Theory courses consist of lecture (L) and/or tutorial (T) hours, and Practical (P) courses consist of hours spent in the laboratory. Credits (C) for a course is dependent on the number of hours of instruction per week in that course, and is obtained by using a multiplier of one (1) for lecture and tutorial hours, and a multiplier of half (1/2) for Practical (laboratory) hours. Thus, for example, a Theory course having three lectures and one tutorial per week throughout the semester carries a credit of 4. Similarly, a Practical having four laboratory hours per week throughout semester carries a credit of 2.

### **Minimum credit requirements:**

The minimum credit points required for award of a Pharm.D degree is 160. These credits are divided into Theory courses, Tutorials, Practical, Clerkship and Project over the duration of six years. The credits are distributed year-wise as shown in Table VI. Courses generally progress in sequences, building competencies and their positioning indicates certain academic maturity on the part of the learners. Learners are expected to follow the year-wise schedule of courses given in the syllabus.

## **9. Academic work**

A regular record of attendance both in Theory and Practical shall be maintained by the teaching staff of respective courses.

## 10. Course of study:

The course of study for Pharm.D shall include the subjects as 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 below.

### TABLES

**TABLE I: FIRST YEAR**

Course Code	Name of Subject	No. of hours	Tutorial	Creditpoints
24PD101T	Human Anatomy and Physiology- Theory	3	1	4
24PD102T	Pharmaceutics -Theory	2	1	3
24PD103T	Medicinal Biochemistry -Theory	3	1	4
24PD104T	Pharmaceutical Organic Chemistry -Theory	3	1	4
24PD105T	Pharmaceutical Inorganic Chemistry -Theory	2	1	3
24PD106RMT / 24PD106RBT	Remedial Mathematics*/ RemedialBiology -Theory*	3	1	4
24PD107P	Human Anatomy and Physiology -Practical	3	-	2
24PD108P	Pharmaceutics -Practical	3	-	2
24PD109P	Medicinal Biochemistry -Practical	3	-	2
24PD110P	Pharmaceutical Organic Chemistry -Practical	3	-	2
24PD111P	Pharmaceutical Inorganic Chemistry- Practical	3	-	2
24PD112RBP	Remedial Biology -Practical**	3	-	2
24PD113ET / 24PD114ET	Communication Skills -Theory*** / Yoga for Youth Empowerment -Theory***	2	-	1
	<b>Total Hours</b>	<b>30/33*/ 36**</b>	<b>6</b>	<b>29/33*/ 35**</b>

\* For Remedial Mathematics / Remedial Biology (Non University Exam)

\*\* For Remedial Biology Practical

\*\*\* Two Electives offered, students can choose any one.

**TABLE II: SECOND YEAR**

Course Code	Name of Subject	No. of hours	Tutorial	Creditpoints
24PD201T	Pathophysiology -Theory	3	1	4
24PD202T	Pharmaceutical Microbiology -Theory	3	1	4
24PD203T	Pharmacognosy and Phytopharmaceuticals-Theor	3	1	4
24PD204T	Pharmacology I-Theor	3	1	4
24PD205T	Community Pharmacy -Theory	2	1	3
24PD206T	Pharmacotherapeutics I- Theor	3	1	4
24PD207P	Pharmaceutical Microbiology - P r a c t i c a l	3	-	2
24PD208P	Pharmacognosy and Phytopharmaceuticals- Practical	3	-	2
24PD209P	Pharmacotherapeutics I- Practical	3	-	2
24PD210ET/ 24PD211ET	Health and Lifestyle -Theory*/ NPTEL-1*	2	-	1
	<b>Total Hours</b>	<b>28</b>	<b>6</b>	<b>30</b>

\* Two Electives offered, students can choose any one.

**TABLE III : THIRD YEAR**

Course Code	Name of Subject	No. of hours	Tutorial	Credit points
24PD301T	Pharmacology II -Theory	3	1	4
24PD302T	Pharmaceutical analysis- Theory	3	1	4
24PD303T	Pharmacotherapeutics II - Theory	3	1	4
24PD304T	Pharmaceutical jurisprudence- Theory	2	-	2
24PD305T	Medicinal chemistry -Theory	3	1	4
24PD306T	Pharmaceutical formulations -Theory	2	1	3
24PD307P	Pharmacology II - Practical	3	-	2
24PD308P	Pharmaceutical analysis -Practical	3	-	2
24PD309P	Pharmacotherapeutics II- Practical	3	-	2
24PD310P	Medicinal chemistry- Practical	3	-	2
24PD311P	Pharmaceutical formulations -Practical	3	-	2
24PD312ET/ 24PD313ET	Indian Indigenous Medicine - Theory */ NPTEL-2*	2	-	2
	<b>Total hours</b>	<b>33</b>	<b>5</b>	<b>33</b>

\*Two Electives offered, students can choose any one.

**TABLE IV : FOURTH YEAR**

Course Code	Name of Subject	No. of hours	Tutorial	Credit points
24PD401T	Pharmacotherapeutics III- Theory	3	1	4
24PD402T	Hospital Pharmacy- Theory	2	1	3
24PD403T	Clinical Pharmacy- Theory	3	1	4
24PD404T	Biostatistics and Research Methodology-Theory	2	1	3
24PD405T	Biopharmaceutics and Pharmacokinetics -Theory	3	1	4
24PD406T	Clinical Toxicology -Theory	2	1	3
24PD407P	Pharmacotherapeutics III- Practical	3	-	2
24PD408P	Hospital Pharmacy- Practical	3	-	2
24PD409P	Clinical Pharmacy -Practical	3	-	2
24PD410P	Biopharmaceutics and Pharmacokinetics- Practical	3	-	2
24PD411EP / 24PD412ET	Statistical Software -Practical*/ Ethical Leadership- Theory*	3/1	-	2
		<b>30/28*</b>	<b>6</b>	<b>31</b>

\*Two Electives offered, students can choose any one.

**TABLE V : FIFTH YEAR**

Course Code	Name of Subject	No. of hours	Seminar	Credit points
24PD501T	Clinical Research -Theory	3	1	4
24PD502T	Pharmacoepidemiology and Pharmacoeconomics -Theory	3	1	4
24PD503T	Clinical Pharmacokinetics & Pharmacotherapeutics Drug Monitoring- Theory	2	1	3
24PD504S	Clerkship *	-	1	1
24PD505P	Project work** (Six Months)	20	-	10
24PD506ET / 24PD507EP	Medical Coding -Theory ***/ Pharmaceutical Calculation - Practical****	1/3	-	2
		<b>29/31</b>	<b>4</b>	<b>24</b>

\* Attending ward rounds on daily basis

\*\* Two Electives offered, students can choose any one.

## SIXTH YEAR

Internship or residency training including postings in speciality 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 speciality departments

**TABLE VI: YEAR WISE CREDITS DISTRIBUTION**

Year	Credit Points
I	29*/33**/35***
II	30
III	33
IV	31
V	24
VI	15
<b>Total credit points for the program</b>	162*/166**/168***

### 11. Syllabus:

The syllabus for each subject of study in the said tables shall be as specified in **Chapter-IV** to these regulations.

### 12. Approval of the authority conducting the course of study:

- (1) 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.
  - a. Any person or pharmacy college for the purpose of obtaining permission under sub-section (1) of section 12 of the Pharmacy Act, shall submit a scheme as prescribed by the Pharmacy Council of India.
  - b. The scheme referred to in sub-regulation
- (2) 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 arrangements for teaching in regard to building, accommodation, labs, equipments, teaching staff, non-teaching staff, etc., as specified in Appendix-B to these regulations.

### 13. Examination:

- (1) Every year there shall be an examination to examine the students.
- (2) 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.
- (3) The examinations shall be of written and Practical (including oral nature) carrying maximum marks for each part of a subject as indicated in Tables below:

#### TABLES

#### TABLE VII: FIRST YEAR EXAMINATION

Course Code	Name of Subject	Internal Assessment		Examination		Total Marks
		Marks	Duration	Marks	Duration	
24PD101T	Human Anatomy and Physiology -Theory	30	1Hr	70	3 Hrs	100
24PD102T	Pharmaceutics -Theory	30	1Hr	70	3 Hrs	100
24PD103T	Medicinal Biochemistry -Theory	30	1Hr	70	3 Hrs	100
24PD104T	Pharmaceutical Organic Chemistry -Theory	30	1Hr	70	3 Hrs	100
24PD105T	Pharmaceutical Inorganic Chemistry- Theory	30	1Hr	70	3 Hrs	100
24PD106RMT / 24PD106RBT	Remedial Mathematics - Theory*/ Remedial Biology - Theory*	30	1Hr	70	3 Hrs	100
24PD107P	Human Anatomy and Physiology- Practical	30	3Hrs	70	3 Hrs	100
24PD108P	Pharmaceutics- Practical	30	3Hrs	70	3 Hrs	100
24PD109P	Medicinal Biochemistry -Practical	30	3Hrs	70	3 Hrs	100
24PD110P	Pharmaceutical Organic Chemistry -Practical	30	3Hrs	70	3 Hrs	100
24PD111P	Pharmaceutical Inorganic Chemistry -Practical	30	3Hrs	70	3 Hrs	100
24PD112RBP	Remedial Biology -Practical**	30*	3Hrs	70*	3 Hrs	100*
24PD113ET / 24PD114ET	Communication Skills -Theory** */ Yoga for Youth Empowerment - Theory***	30	1Hrs	70	3 Hrs	100
	<b>Total</b>	<b>360/390 390</b>	<b>25 Hrs</b>	<b>770/84 0/910</b>	<b>39 Hrs</b>	<b>1100/1200 /1300</b>

\* Remedial Mathematics Theory/ Remedial Biology Theory

\*\* For Remedial Biology Practical

\*\*\* Two Electives offered, students can choose any one.



**TABLE VIII: SECOND YEAR EXAMINATION**

Course Code	Name of Subject	Internal Assessment		Examination		Total Marks
		Marks	Duration	Marks	Duration	
24PD201T	Pathophysiology- Theory	30	1 Hr	70	3 Hrs	100
24PD202T	Pharmaceutical Microbiology -Theory	30	1 Hr	70	3 Hrs	100
24PD203T	Pharmacognosy and Phytopharmaceuticals -Theory	30	1 Hr	70	3 Hrs	100
24PD204T	Pharmacology I- Theory	30	1 Hr	70	3 Hrs	100
24PD205T	Community Pharmacy -Theory	30	1 Hr	70	3 Hrs	100
24PD206T	Pharmacotherapeutics I -Theory	30	1 Hr	70	3 Hrs	100
24PD207P	Pharmaceutical Microbiology - Practical	30	3 Hrs	70	3 Hrs	100
24PD208P	Pharmacognosy and Phytopharmaceutical -Practical	30	3 Hrs	70	3 Hrs	100
24PD209P	Pharmacotherapeutics I-Practical	30	3 Hrs	70	3 Hrs	100
24PD210ET/ 24PD211ET	Health and Lifestyle -Theory*/ NPTEL-1*	30	1 Hr	70	3 Hrs	100
<b>Total</b>		<b>300</b>	<b>16 Hrs</b>	<b>700</b>	<b>30 Hrs</b>	<b>1000</b>

\* Two Electives offered, students can choose any one.

**TABLE IX: THIRD YEAR EXAMINATION**

Course Code	Name of Subject	Internal Assessment		Examination		Total Marks
		Marks	Duration	Marks	Duration	
24PD301T	Pharmacology II- Theory	30	1 Hr	70	3 Hrs	100
24PD302T	Pharmaceutical Analysis-Theory	30	1 Hr	70	3 Hrs	100
24PD303T	Pharmacotherapeutics II -Theory	30	1 Hr	70	3 Hrs	100
24PD304T	Pharmaceutical Jurisprudence -Theory	30	1 Hr	70	3 Hrs	100
24PD305T	Medicinal Chemistry- Theory	30	1 Hr	70	3 Hrs	100
24PD306T	Pharmaceutical Formulations -Theory	30	1 Hr	70	3 Hrs	100
24PD307P	Pharmacology II- Practical	30	3 Hrs	70	3 Hrs	100
24PD308P	Pharmaceutical Analysis-Practical	30	3 Hrs	70	3 Hrs	100
24PD309P	Pharmacotherapeutics II-Practical	30	3 Hrs	70	3 Hrs	100
24PD310P	Medicinal Chemistry- Practical	30	3 Hrs	70	3 Hrs	100
24PD311P	Pharmaceutical Formulations- Practical	30	3 Hrs	70	3 Hrs	100
24PD312ET/ 24PD313ET	Indian Indigenous Medicine -Theory*/ NPTEL-2*	30	1 Hr	70	3 Hrs	100

	<b>Total</b>	<b>360</b>	<b>22 Hrs</b>	<b>840</b>	<b>36 Hrs</b>	<b>1200</b>
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\*\* Two Electives offered, students can choose any one.

**TABLE X: FOURTH YEAR EXAMINATION**

Course Code	Name of Subject	Internal Assessment		Examination		Total Marks
		Marks	Duration	Marks	Duration	
24PD401T	Pharmacotherapeutics III-Theory	30	1 Hr	70	3 Hrs	100
24PD402T	Hospital Pharmacy- Theory	30	1 Hr	70	3 Hrs	100
24PD403T	Clinical Pharmacy- Theory	30	1 Hr	70	3 Hrs	100
24PD404T	Biostatistics and Research Methodology- Theory	30	1 Hr	70	3 Hrs	100
24PD405T	Biopharmaceutics and Pharmacokinetics- Theory	30	1 Hr	70	3 Hrs	100
24PD406T	Clinical Toxicology- Theory	30	1 Hr	70	3 Hrs	100
24PD407P	Pharmacotherapeutics III-Practical	30	3 Hrs	70	3 Hrs	100
24PD408P	Hospital Pharmacy -Practical	30	3 Hrs	70	3 Hrs	100
24PD409P	Clinical Pharmacy- Practical	30	3 Hrs	70	3 Hrs	100
24PD410P	Biopharmaceutics and Pharmacokinetics- Practical	30	3 Hrs	70	3 Hrs	100
24PD411EP / 24PD412ET	Statistical Software- Practical**/ Ethical Leadership- Theory**	30	3 Hrs	70	3 Hrs	100
			1 Hr			
	<b>Total</b>	<b>330</b>	<b>21/19 Hrs</b>	<b>770</b>	<b>33 Hrs</b>	<b>1100</b>

\*\* Two Electives offered, students can choose any one.

**TABLE XI: FIFTH YEAR EXAMINATION**

Course Code	Name of Subject	Internal Assessment		Examination		Total Marks
		Marks	Duration	Marks	Duration	
24PD501T	Clinical Research- Theory	30	1 Hr	70	3 Hrs	100
24PD502T	Pharmacoepidemiology and Pharmacoconomics -Theory	30	1 Hr	70	3 Hrs	100
24PD503T	Clinical Pharmacokinetics and Pharmacotherapeutics Drug Monitoring -Theory	30	1 Hr	70	3 Hrs	100
24PD504S	Clerkship *	30	1 Hr	70	3 Hrs	100
24PD505P	Project work** (Six Months)	-	-	100	-	100
24PD506ET / 24PD507EP	Medical Coding -Theory ***/ Pharmaceutical Calculation -Practical***	30	1 Hr	70	3 Hrs	100
			3 Hrs			
	<b>Total</b>	<b>150</b>	<b>5 /7Hrs</b>	<b>450</b>	<b>15 Hrs</b>	<b>600</b>

\*Attending ward rounds on daily basis.

\*\*30 marks – viva-voce (oral)

70 marks – Thesis work

\*\*\* Two Electives offered, students can choose any one.

<b>CIA</b>	1470/1500 <sup>#</sup> /1530*	<b>ESE</b>	5000/5100 <sup>#</sup> /5200*	<b>Grand Total</b>	6470/6600 <sup>#</sup> /6730*
<sup>#</sup> for Remedial Mathematics / Biology			*for Remedial Biology Practicals		

**14. 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.

**15. Mode of examinations:**

- (1) Theory examination shall be of three hours and Practical examination shall be of three hours duration.
- (2) A Student who fails in Theory or Practical examination of a subject shall re-appear both in Theory and Practical of the same subject.
- (3) Practical examination shall also consist of a viva –voce (Oral) examination.
- (4) 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.

**16. Award of sessional marks and maintenance of records:**

A regular record of both Theory and Practical class work and examinations conducted in an institution imparting training for Pharm.D. or as the case may be, Pharm.D. (Post Baccalaureate) course, shall be maintained for each student in the institution and 30 marks for each Theory and 30 marks for each Practical subject shall be allotted as sessional. There shall be at least two periodic sessional examinations during each academic year and the average marks of at least two sessional exams shall be computed for internal assessment. The sessional marks in Practicals shall be allotted on the following basis:-

- i. Actual performance in the sessional examination (20 marks)
- ii. Day to day assessment in the Practical class work, promptness, viva-voce record maintenance, etc. (10 marks)

### **Minimum marks for passing examination:**

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 examinations, including sessional marks and at least 50% marks in each of the Practical examinations including sessional marks. 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 the subjects in a single attempt.

### **Question paper pattern for Theory Sessional examinations**

#### **For 30 marks paper**

I.	Long Answers (Answer 1 out of 2)	=	1 x 15 = 15
II.	Short Answers (Answer 3 out of 4)	=	3 x 5 = 15
			-----
	Total =		<b>30 marks</b>

### **Question paper pattern for Practical Sessional examinations**

#### **For 30 marks paper**

I.	Synopsis	=	5
II.	Experiments	=	13 (10+3)
III.	Viva voce	=	2
			-----
	Total	=	<b>20 marks</b>

A total sessional mark is **30 (20 for Practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).**

### **Question paper pattern for Theory Examinations**

#### **For 70 marks paper**

I.	Long Essay (Answer 2 out of 3)	=	2 x 15 = 30
II.	Short Essay (Answer 6 out of 8)	=	6 x 5 = 30
III.	Short Answers (Answer 5 out of 7)	=	5 x 2 = 10
			-----
	Total	=	<b>70 marks</b>

## Question paper pattern for Practical Examinations

### For 70 marks paper

I.	Synopsis	=	15
II.	Experiments	=	40 (25+15)
III.	Viva voce	=	15
			-----
	Total	=	<b>70 marks</b>

## 17. Grading of performances

### 17.1. Letter grades and grade points allocations:

Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each course. The letter grades and their corresponding grade points are given in Table – XII.

**Table XII: LETTER GRADES AND GRADE POINTS EQUIVALENT TO PERCENTAGE OF MARKS AND PERFORMANCES**

Letter Grade	Marks Range	Grade Point	Description
O	91 – 100	10	OUTSTANDING
A+	81 – 90	9	EXCELLENT
A	71-80	8	VERY GOOD
B+	66-70	7	GOOD
B	61-65	6	ABOVE AVERAGE
C	55-60	5	AVERAGE
D	50-54	4	PASS
RA	<50	0	REAPPEARANCE
AB		0	ABSENT

A learner who remains absent for any end semester examination shall be assigned a letter Grade of AB and a corresponding grade point of zero. He/she should reappear for the said evaluation/examination in due course.

## 18. Grade Sheet

After results are declared, Grade sheet will be issued to each student which will contain the following details:

- The list of courses enrolled during the year and the grade scored,
- The Grade Point Average(GPA) for the year and

- iii. The Cumulative Grade Point Average (CGPA) of all courses enrolled from first years onwards.
- iv. The Cumulative Grade point Average (GPA) of all course enrolled from first year onwards.

GPA is ratio of the sum of the products of the number of credits © of courses enrolled and the Grade Points(GP) corresponding to the grades scored in those courses, taken for all the courses to the sum of the number of credits of all the courses in the year.

$$\text{GPA} = \frac{\text{Sum of [C x GP]}}{\text{Sum of C}}$$

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Sum of C

CGPA will be calculated in a similar manner, considering all the courses enrolled from First year. RA grade and value added course will be excluded for calculating GPA and CGPA.

### **19. Revaluation**

Revaluation and Re-totaling is allowed on representation. A candidate can apply for revaluation of his/her semester Examination answer paper in a Theory course, within 2 weeks from the declaration of results, on payment of a prescribed fee through proper application to the Controller of Examinations through the Head of the Department and Dean. A candidate can apply for revaluation of answer scripts for not exceeding 4 subjects at a time. The Controller of Examinations will arrange for the revaluation and the results will be intimated to the candidate through the Head of the Department and Dean. Revaluation is not permitted for Supplementary Examinations, Practical Examinations, Technical Seminars, In-plant Training and Project Work.

### **20. Declaration of class**

The class shall be awarded on the basis of CGPA as follows:

First Class with Distinction	=	8 and above
First Class	=	6.50 to 7.99
Second Class	=	5.00 to 6.49

## 21. Eligibility for promotion to next year:

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 as per 2008.

**Amendment:** Ref. No. 14-194/2011-PCI dated 18/04/2012.

- A) There is a provision for supplementary examination under regulation 10 of the Pharm.D. Regulations, 2008.
  - B) Regulation 15 and 10 of the Pharm.D. Regulations, 2008 are interwoven and are to be read together.
  - C) Hence the failed students of annual examination are eligible to appear for supplementary examination under regulation 10 of the Pharm.D. Regulations, 2008 and if the failed students of annual examination pass in the supplementary examination they are eligible for promotion to next higher class without losing additional six months. However, failure in more than 2 subjects in the supplementary examination shall debar the students from promotion to the next year classes.
- C1]. Candidates of I Pharm.D are permitted to carry not more than any two subjects (Two Theory/ Two Practicals/ One Theory & one Practical of same or different subjects) to II Pharm.D and appear for II Pharm.D examination concurrently along with failed subjects of I Pharm.D. However, these candidates have to pass all the failed subjects of I Pharm.D to become eligible to III Pharm.D.
- C2]. Similarly, candidates of II Pharm.D who have completely passed all the subjects of I Pharm.D but have failed in II Pharm.D are permitted to carry not more than any two subjects (Two Theory/ Two Practicals/ One Theory & one Practical of same or different subjects) of II Pharm.D to III Pharm.D and appear for III Pharm.D concurrently along with failed subjects of II Pharm.D. However, these candidates have to pass all the failed subjects of II Pharm.D to become eligible to proceed to IV Pharm.D.
- C3]. Candidates of III Pharm.D who have completely passed all the subjects of II Pharm.D but have failed in III Pharm.D are permitted to carry not more than any two subjects (Two Theory/ Two Practicals/ One Theory & one Practical of same or different subjects) of III Pharm.D to IV Pharm.D and appear for IV Pharm.D examination concurrently along with failed subjects of III Pharm.D. However, these candidates have to pass all the failed subjects of III Pharm.D to become eligible to proceed to V Pharm.D.

C4]. Candidates of IV Pharm.D who have completely passed all the subjects of III Pharm.D but have failed in IV Pharm.D are permitted to carry not more than any two subjects (Two Theory/ Two Practicals/ One Theory & one Practical of same or different subjects) of IV Pharm.D to V Pharm.D and appear for V Pharm.D examination concurrently along with failed subject of IV Pharm.D. However, these candidates have to pass all the failed subjects of IV and V Pharm. D to become eligible to proceed to VI Pharm. D., to undergo internship.

## **22. Internship:**

- (1) Internship 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.
- (2) Every student has to undergo one year internship as per Appendix-C to these regulations.

## **23. Approval of examinations:**

Examinations mentioned in regulations 10 to 12 and 14 shall be held by the examining authority hereinafter 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 to these regulations.

## **24. 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.



## CHAPTER - III

### PRACTICAL TRAINING

#### 25. 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 200 working days in each of second, third & 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.

#### 26. Project work:

(1) 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.

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

#### 27. Objectives of project work:

The main objective 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.

#### 28. 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 authorised lectures;

- (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 utilisation reviews, pharmacoepidemiology, Pharmacovigilance or Pharmacoeconomics;
- (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.

## **29. Reporting:**

- (1) 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 authorised lecturer, Head of the Department as well as by the Head of the Institution.
- (2) Project report shall be computer typed in double space using Times New 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.
- (3) Submission of the project report shall be done at least one month prior to the commencement of annual or supplementary examination.

## **30. 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 students shall be evaluated for twenty marks each and the average of best two shall be forwarded to the university with marks of other subjects.

(iv) Evaluation shall be done on the following items:	<b>Marks</b>
a) Write up of the seminar	(7.5)
b) Presentation of work	(7.5)
c) Communication skills	(7.5)
d) Question and answer skills	(7.5)
<b>Total</b>	<b>(30 marks)</b>

(v) Final evaluation of project work shall be done on the following items: **Marks**

a) Write up of the seminar	(17.5)
b) Presentation of work	(17.5)
c) Communication skills	(17.5)
d) Question and answer skills	(17.5)

**Total** **(70 marks)**

***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.

**31. a. Elective / Online Courses**

Students shall study the value added elective courses / online courses are designed to enhance the capability of students beyond the general academic curriculum, which may help to improve the employability and equip the students with essential skills to succeed. The program offers five categories of elective courses such as Human value, Social Responsibility, Indian Knowledge system, Skill based and online course from NPTEL courses. All elective /online courses carry 2 credit points. Students can select any one elective courses offered in each year of study from the list. Examination shall be conducted at the end of the respective year of study. The student shall produce a pass certificate from the respective NPTEL organizations. The credit(s) earned by the students will be considered as additional credit(s) over and above the required credits earned from programme concerned.

### **31. b. Online Course Co-ordinator**

To help students in planning their online courses and for general advice on online courses, the HOD shall nominate a co-ordinator for the online courses. The Online course co-ordinator shall identify the courses which students can select for their programme from the available online courses offered by the different agencies periodically and inform the same to the students. Further, the co-ordinator shall advise the students regarding the online courses and monitors their course.

### **32. Award of Ranks**

Ranks and Medals shall be awarded on the basis of final CGPA. However, candidates who fail in one or more courses during the Pharm.D program shall not be eligible for award of ranks. Moreover, and the candidates should have completed the Pharm.D program in minimum prescribed number of years, (six years) for the award of Ranks.

### **33. Award of degree**

Candidates who fulfill the requirements mentioned above shall be eligible for award of degree during the ensuing convocation.

### **34. Duration for completion of the program of study**

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

### **35. Re-admission after break of study**

Candidate who seeks re-admission to the program after break of study has to get the approval from the university by paying a condonation fee.

No condonation is allowed for the candidate who has more than 2 years of breakup period and he/she has to rejoin the program by paying the required fees.

### **36. Credit Transfer For Online Courses Through NPTEL, MOOCs Platform/ International Institutions**

Students are encouraged to enroll in courses offered by MOOC platforms and international institutions of higher learning, either virtually or in person. The equivalent credits for these courses will be determined by a committee named Subject Equivalency Committee comprising the Dean, Head of Department (HoD), and one faculty member nominated by the Vice Chancellor. The committee's decision will be submitted for ratification/approval by the Board of Studies (BoS) and the Academic Council. Additionally, the equivalent grade points for marks/grades/grade points awarded by various MOOC platforms and international institutions of higher learning will be determined by a committee named Grade Equivalency Committee duly constituted by the Vice-Chancellor. The decisions of this committee will also be submitted for ratification/approval by the Academic Council. This shall be approved to be implemented from the even semester of the academic year 2024-25.

**FACULTY OF PHARMACY**  
**PHARM.D PROGRAMME**  
**(2024–2025 Batch and onwards)**

Course code	Name of the course	Objectives and outcomes		Instruction hours / week			Credit(s)	Maximum Marks			Page no
		PEOs	POs	L	T	P		CIA	ESE	Total	
								30	70	100	
<b>YEAR – I</b>											
24PD101T	Human Anatomy and Physiology- Theory	2	a, k	3	1	-	4	30	70	100	1-4
24PD102T	Pharmaceutics- Theory	3	a	2	1	-	3	30	70	100	7-8
24PD103T	Medicinal Biochemistry -Theory	2	a,k	3	1	-	4	30	70	100	11-13
24PD104T	Pharmaceutical Organic Chemistry- Theory	3	a	3	1	-	4	30	70	100	16-19
24PD105T	Pharmaceutical Inorganic Chemistry- Theory	2	a	2	1	-	3	30	70	100	23-23
24PD106RM T/ 24PD106RBT	Remedial Mathematics**/ Remedial Biology**- Theory	6	c/a	3	1	-	4	30	70	100	26-27 28-29
24PD107P	Human Anatomy and Physiology- Practical	2	b,c	-	-	3	2	30	70	100	5-6
24PD108P	Pharmaceutics- Practical	3	a,b	-	-	3	2	30	70	100	9-10
24PD109P	Medicinal Biochemistry -Practical	2	b,k	-	-	3	2	30	70	100	14-15
24PD110P	Pharmaceutical Organic Chemistry- Practical	2	b	-	-	3	2	30	70	100	20-21
24PD111P	Pharmaceutical Inorganic Chemistry- Practical	2	b	-	-	3	2	30	70	100	24-25
24PD112RBP	Remedial Biology -Practical**	2	b	-	-	3*	2*	30	70	100	30-31
24PD113ET / 24PD114ET	Communication Skills - Theory*** / Yoga for Youth Empowerment -Theory***	4 6	f,h f, i, k	2	-	-	1	30	70	100	
<b>Total</b>				<b>18</b>	<b>6</b>	<b>15/ 18*</b>	<b>36/ 38*</b>	<b>390</b>	<b>910</b>	<b>1300</b>	

\*Applicable for Remedial Biology Practical

\*\* For Remedial Mathematics / Remedial Biology (Non University Exam)

\*\*\* Two Electives offered, students can choose any one.

**YEAR – II**

24PD201T	Pathophysiology- Theory	6	b,f,i	3	1	-	4	30	70	100	32-35
24PD202T	Pharmaceutical Microbiology - Theory	3	k	3	1	-	4	30	70	100	36-38
24PD203T	Pharmacognosy and Phytopharmaceuticals- Theory	2	a	3	1	-	4	30	70	100	41-42
24PD204T	Pharmacology I- Theory	3	a.d.k	3	1	-	4	30	70	100	45-48
24PD205T	Community Pharmacy -Theory	1,4	a,f,i	2	1	-	3	30	70	100	49-51
24PD206T	Pharmacotherapeutics I -Theory	3	a,f,k	3	1	-	4	30	70	100	52-54
24PD207P	Pharmaceutical Microbiology- Practical	3	a,b	-	-	3	2	30	70	100	39-40

Course code	Name of the course	Objectives and out comes		Instruction hours / week			Credit(s)	Maximum Marks			Page no
		PEOs	POs	L	T	P		CIA	ESE	Total	
								30	70	100	
24PD208P	Pharmacognosy and Phytopharmaceuticals - Practical	2	a,b	-		3	2	30	70	100	43-44
24PD209P	Pharmacotherapeutics I-Practical	3	b,c,g	-	-	3	2	30	70	100	55-56
24PD210ET / 24PD211ET	Health and Lifestyle -Theory* NPTEL-1*	4	g, j,k	2	-	-	2	30	70	100	
		6	i,								
<b>Total</b>				<b>19</b>	<b>6</b>	<b>9</b>	<b>31</b>	<b>330</b>	<b>770</b>	<b>1000</b>	

**\* Two Electives offered, students can choose any one.**

<b>YEAR – III</b>											
24PD301T	Pharmacology II -Theory	3	a,d,k	3	1	-	4	30	70	100	57-60
24PD302T	Pharmaceutical Analysis -Theory	2	c	3	1	-	4	30	70	100	63-66
24PD303T	Pharmacotherapeutics II -Theory	3	a,f,k	3	1	-	4	30	70	100	69-70
24PD304T	Pharmaceutical Jurisprudence-Theory	5	a,e,g	2	-	-	2	30	70	100	73-75
24PD305T	Medicinal Chemistry- Theory	2	a,k	3	1	-	4	30	70	100	76-78
24PD306T	Pharmaceutical Formulations-Theory	4	a,c,k	2	1	-	3	30	70	100	81-82
24PD307P	Pharmacology II- Practical	3	a,d,k			3	2	30	70	100	61-62
24PD308P	Pharmaceutical Analysis - Practical	2	c	-	-	3	2	30	70	100	67-68
24PD309P	Pharmacotherapeutics II- Practical	3	a,f,k	-	-	3	2	30	70	100	71-72
24PD310P	Medicinal Chemistry -Practical	2	a,b	-	-	3	2	30	70	100	79-80
24PD311P	Pharmaceutical Formulations- Practical	4	a,c	-	-	3	2	30	70	100	83-84
24PD312ET/ 24PD313ET	Indian Indigenous Medicine -Theory*/ NPTEL-2*	6	i, j				2	30	70	100	
		6	i								
<b>Total</b>				<b>16</b>	<b>5</b>	<b>15</b>	<b>33</b>	<b>360</b>	<b>840</b>	<b>1200</b>	

**\*Two Electives offered, students can choose any one.**

<b>YEAR – IV</b>											
24PD401T	Pharmacotherapeutics III- Theory	3	a,f,k	3	1	-	4	30	70	100	85-86
24PD402T	Hospital Pharmacy- Theory	1,6	a,f,g,i,k	2	1	-	3	30	70	100	89-91
24PD403T	Clinical Pharmacy- Theory	1,6	a,f,g,i,k	3	1	-	4	30	70	100	94-96
24PD404T	Biostatistics and Research Methodology- Theory	2	b,c,d,k	2	1	-	3	30	70	100	99-101
24PD405T	Biopharmaceutics and Pharmacokinetics -Theory	5	a,c,k	3	1	-	4	30	70	100	102-104
24PD406T	Clinical Toxicology- Theory	3	a,g,k,i	2	1		3	30	70	100	107-109
24PD407P	Pharmacotherapeutics III- Practical	3	a,f,k	-	-	3	2	30	70	100	87-88
24PD408P	Hospital Pharmacy- Practical	1,6	a,f,g,i,k	-	-	3	2	30	70	100	92-93
24PD409P	Clinical Pharmacy- Practical	6	a,f,g,i,k	-	-	3	2	30	70	100	97-98

24PD410P	Biopharmaceutics and Pharmacokinetics- Practical	3,5	a,c,k	-	-	3	2	30	70	100	105-106
Course code	Name of the course	Objectives and out comes		Instruction hours / week			Credit(s)	Maximum Marks			Page no
		PEOs	POs	L	T	P		CIA	ESE	Total	
								30	70	100	
24PD411EP/ 24PD412ET	Statistical Software -Practical* / Ethical Leadership- Theory *	4	c,d,k		-	3	2	30	70	100	
		2	e,g,k	2		-	2				
<b>Total</b>				<b>17</b>	<b>5</b>	<b>15</b>	<b>33</b>	<b>330</b>	<b>770</b>	<b>1100</b>	

\* Two Electives offered, students can choose any one.

<b>YEAR V</b>											
24PD501T	Clinical Research -Theory	1,4,6	a,f,i,g, k	3	1	-	4	30	70	100	110-112
24PD502T	Pharmacoepidemiology and Pharmacoeconomics -Theory	3,6	a,d,j	3	1	-	4	30	70	100	113-115
24PD503T	Clinical Pharmacokinetics & Pharmacotherapeutic Drug Monitoring -Theory	3,5	a,c,k	2	1	-	3	30	70	100	116-118
24PD504S	Clerkship *	1,3,5,6	c,e,f,g, h,i k	-	-	1	1	30	70	100	119
24PD505P	Project work (Six Months)	1,3,5, 6	a,b,c,d, e,f,g, h,i,j,k	-	-	20	10	-	100**	100	120
24PD506ET/ 24PD507EP	Medical Coding -Theory***/ Pharmaceutical Calculation	4	f	1	-	-	2	30	70	100	
	-Practical***	6	c,d	-	-	3	2				
<b>Total</b>				<b>10</b>	<b>4</b>	<b>23</b>	<b>24</b>	<b>150</b>	<b>450</b>	<b>600</b>	

\*Attending ward rounds on daily basis

\*\* 30 marks – Viva- Voice (oral)

70 marks – Thesis work

\*\*\*

## YEAR VI

Internship or residency training including postings in speciality 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 speciality departments.



## PROGRAM OUTCOMES (PO's)

- a. **Pharmacy Knowledge:** Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and practice of pharmacy.
- b. **Planning Abilities:** Demonstrate effective planning abilities including timemanagement, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.
- c. **Problem analysis:** Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.
- d. **Modern tool usage:** Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations and adherence to regulatory standards.
- e. **Leadership skills:** Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and wellbeing.
- f. **Professional Identity:** Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).
- g. **Pharmaceutical Ethics:** Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.
- h. **Communication:** Communicate effectively with patients, healthcare professionals, and the community, providing clear and accurate information on medications, treatments, and health promotion and able to comprehend and write effective reports, make effective documentation.
- i. **The Pharmacist and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.

- j. **Environment and sustainability:** Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- k. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

### **PROGRAM SPECIFIC OUTCOMES (PSOs)**

**PSO i:** Understand different classes of drugs, their mechanism of action, dynamics, kinetics, structure activity relationships, pathophysiology and pharmacotherapeutics of various diseases, ability to synthesize, develop and/or evaluate various pharmaceuticals and their formulations and cosmeceuticals products.

**PSO m:** Develop skills in qualitative and quantitative analysis of various pharmaceuticals. Acquire technical knowledge and hands on training on equipments, instruments and software used in the field of pharmaceutical sciences.

**PSO n:** To inculcate the practice of pharmacy and train pharmacists to play an important role in patient care, health and wellness and population-based care as members of the health care team

**PSO o:** To exhibit behaviors and values that are consistent with the trust given to the profession, professionalism in interactions with patients, professionalism in interactions with other healthcare providers, professionalism in interactions with society

**PSO p:** To strengthen the professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach, and an ability to relate pharmaceutical sciences issues to broader social context.

**PSO q:** To stream a lifelong career of personal and practicing professional growth with ethical codes and self-esteem.

### **PROGRAM EDUCATIONAL OBJECTIVES (PEOs)**

**PEO 1:** Synthesize population-based drug information to address patient medication adherence, prescribing patterns, and treatment protocol adherence to document issues, alert prescribers, design interventions, and assess intervention effectiveness.

**PEO 2:** To provide students with a strong and well defined concepts in the various fields of pharmaceutical sciences viz., pharmaceutics, pharmaceutical chemistry, pharmacology and pharmacognosy according to the requirement of pharmaceutical industries, community and hospital pharmacy and also to develop a sense of teamwork and awareness amongst students towards the importance of interdisciplinary approach for developing competence in solving complex problems in the area of Pharmaceutical Sciences.

**PEO 3:** Identify physicochemical properties of drug substances that affect solubility, pharmacodynamic and pharmacokinetic properties, pharmacologic actions, and stability when designing patient-specific care plans.

**PEO 4:** Formulate and implement a care plan in cooperation with patients and other healthcare providers based on established, evidence-based standards of practice; provide medication therapy management services for patients with acute & chronic health problems.

**PEO 5:** Integrate knowledge of chemical, physical, and biopharmaceutical principles to prepare safe and effective prescriptions (sterile and non-sterile) in conformity with all applicable federal and state laws and regulations.

**PEO 6:** Provide health care information regarding nutrition, lifestyle, and other non-drug measures that promote health or prevent the progression of a disease or medical condition. Demonstrate a comprehensive approach to practice and care, includes problem solving, educator, patient advocacy, inter-professional collaboration, cultural sensitivity, communication.

## MAPPING

PO	a	b	c	d	e	f	g	h	i	j	k	PSO l	PSO m	PSO n	PSO o	PSO p	PSO q
<b>PEO 1</b>	X	X		X	X	X	X	X	X		X	X		X	X	X	X
<b>PEO 2</b>	X		X		X	X					X	X	X			X	X
<b>PEO 3</b>	X	X	X			X			X		X	X	X				
<b>PEO 4</b>	X	X	X			X	X	X		X	X			X	X	X	X
<b>PEO 5</b>	X						X	X	X	X	X		X		X		
<b>PEO 6</b>	X		X			X	X	X	X	X	X			X	X	X	X



## **SYLLABUS**

24PD101T

FIRST YEAR

**HUMAN ANATOMY AND PHYSIOLOGY - THEORY 4H 4C**

Instruction hours/ week: L: 3 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Theory: 4 Hrs / Week****Course Objectives:** Students can able to

- Impart a fundamental knowledge on the structure and functions of the human body.
- Understanding both homeostasis mechanisms and homeostatic imbalances of various body systems.
- Know the metabolic process of biomolecules in health and illness (metabolic disorders);
- Understanding of how the drugs act on the various body systems in correcting the disease state of the organs.
- Appreciate coordinated working pattern of different organs of each system;
- Know the biochemical principles of organ function tests of kidney, liver and endocrine gland.

**Course Outcomes (CO's):** On successful completion of the course the student will

Cos	Course Outcomes	Blooms Level
CO1	Describe the structure (gross and histology) and functions of various organs of the human body	Knowledge
CO2	Describe the various homeostatic mechanisms and their imbalances of various systems	Analyze
CO3	Discuss the various tissues and organs of the different systems in the human body	Understand
CO4	Perform the hematological tests and also record blood pressure, heart rate, pulse and respiratory volumes	Knowledge
CO5	Understand the coordinated working pattern of different organs of each system	Understand
CO6	Explain the interpret the various organ function tests.	Apply

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2	S	M										
CO3	S			M								
CO4			S	M								
CO5				S	M							
CO6										S		

S-Strong; M-Medium; L-Low

**Course Content:****UNIT I**

- Scope of anatomy and physiology, basic terminologies used in this subject (Description of the body as such planes and terminologies)
- Structure of cell – its components and their functions.
- Elementary tissues of the human body: epithelial, connective, Muscular and nervous tissues-their sub-types and characteristics

**UNIT II**

- Osseous system - structure, composition and functions of the skeleton Classification of joints, Types of movements of joints and disorders of joints(Definitions only)

**UNIT III****Haemopoetic System**

- Composition and functions of blood
- Haemopoiesis and disorders of blood components (definition of disorder)
- Blood groups
- Clotting factors and mechanism
- Platelets and disorders of coagulation

**Lymph**

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

**UNIT IV****Cardiovascular system**

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

**Respiratory system**

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

**UNIT V****Digestive system**

- Anatomy and physiology of GIT
- Anatomy and functions of accessory glands of GIT
- Digestion and absorption
- Disorders of GIT (definitions only)

**UNIT VI****Nervous system**

- Definition and classification of nervous system
- Anatomy, physiology and functional areas of cerebrum
- Anatomy and physiology of cerebellum
- Anatomy and physiology of mid brain
- Thalamus, hypothalamus and Basal Ganglia
- Spinal cord: Structure & reflexes – mono-poly-planter
- Cranial nerves – names and functions
- ANS – Anatomy & functions of sympathetic & parasympathetic N.S.

**UNIT VII****Urinary system**

- Anatomy and physiology of urinary system
- Formation of urine
- Renin Angiotensin system – Juxtaglomerular apparatus - acid base Balance
- Clearance tests and micturition

**Endocrine system**

- Pituitary gland
- Adrenal gland



- Thyroid and Parathyroid glands
- Pancreas and gonads

### UNIT VIII

#### **Reproductive system**

- Male and female reproductive system
- Their hormones – Physiology of menstruation
- Spermatogenesis & Oogenesis
- Sex determination (genetic basis)
- Pregnancy and maintenance and parturition
- Contraceptive devices

### UNIT IX

#### **Sense organs**

- Eye
- Ear
- Skin
- Tongue & Nose

#### **Skeletal muscles**

- Histology
- Physiology of Muscle contraction
- Physiological properties of skeletal muscle and their disorders (definitions)

### UNIT X

#### **Sports physiology**

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

#### **Suggested Readings:**

1. Tortora Gerard J. and Nicholas P. Principles of Anatomy and Physiology Publisher Harpercollins College New York.
2. Wilson, K.J.W. Ross and Wilson's foundations of Anatomy and Physiology Publisher: Churchill Livingstone, Edinburg.

**Reference Books (Latest Editions):**

1. Guyton Arthur, C. Physiology of human body. Publisher: Holtsaunders.
2. Chatterjee C C. Human physiology. Volume 1&11. Publisher: Medical Allied Agency, Calcutta.
3. Agency, Calcutta.
4. Peter L. Williams, Roger Warwick, Mary Dyson and Lawrence, H.
5. Gray's Anatomy. Publisher: Churchill Livingstone, London.

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FIRST YEAR  
3H 3C**PHARMACEUTICS - THEORY**

Instruction hours/ week: L: 2 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Theory : 3 Hrs /Week****Course Objectives:** Students can able to

- Impart a fundamental knowledge on the preparatory pharmacy with arts of preparing the different conventional dosage forms.
- Understand the history of profession of pharmacy
- Formulate the basics of different dosage forms.
- Appreciate the importance of good formulation for effectiveness.
- Do different pharmaceutical calculation involved in formulation
- Develop a clear idea about Pharmaceutical incompatibility and different pharmaceutical calculations in pharmacy.

**Course Outcomes (CO's):** On successful completion of the course the student will

COs	Course Outcomes	Blooms Level
CO1	Understand and describe the formulation principles and characteristics of various pharmaceutical dosage forms	Understand
CO2	Understand the professional way of handling the prescription	Apply
CO3	Develop and prepare different types of pharmaceutical dosage forms using appropriate techniques and standards	Create
CO4	Accurately perform and apply pharmaceutical calculations essential for the formulation process	Analyze
CO5	Comprehend the regulatory guidelines and quality assurance protocols governing pharmaceutical formulation practices to ensure compliance and product safety	Apply
CO6	Predict the instability & incompatibility problems in pharmaceutical	Apply

**Mapping with Programme Outcomes**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1		S					M				
CO2		S					M		M	L	M
CO3	S		S	S	M	M	M	S	M		M
CO4		M	M	M	M	M	M		M	M	S
CO5			M	S			S		M		M
CO6			M	M	M						

S-Strong; M-Medium; L-Low

**Course Content:****UNIT I**

- Introduction to dosage forms - classification and definitions
- Prescription: definition, parts and handling

**UNIT II**

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

**UNIT III**

Historical back ground and development of profession of pharmacy and pharmaceutical industry in brief.

**UNIT IV**

Development of Indian Pharmacopoeia and introduction to other Pharmacopoeias such as BP, USP, European Pharmacopoeia, Extra pharmacopoeia and Indian national formulary.

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

**UNIT V**

**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.

**UNIT VI**

**Monophasic Dosage forms:** Theoretical aspects of formulation including adjuvant like stabilizers, colorants, flavors with examples. Study of Monophasic liquids like gargles, mouth washes, Throat paint, Ear drops, Nasal drops, Liniments and lotions, Enemas and collodions.

**UNIT VII**

**Biphasic dosage forms:** Suspensions and emulsions, Definition, advantages and disadvantages, classification, test for the type of emulsion, formulation, stability and evaluation.

**UNIT VIII**

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

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

**UNIT IX**

Pharmaceutical calculations.

Surgical aids: Surgical dressings, absorbable gelatin sponge, sutures, ligatures and

medicated bandages.

## **UNIT X**

Incompatibilities: Introduction, classification and methods to overcome the incompatibilities.

### **Suggested Readings:**

1. Cooper and Gunn's Dispensing for pharmacy students.
2. A text book Professional Pharmacy by N.K.Jain and S.N.Sharma.

### **Reference Books (Latest Editions):**

1. Introduction to Pharmaceutical dosage forms by Howard C. Ansel.
2. Remington's Pharmaceutical Sciences. Register of General Pharmacy by Cooper and Gunn.
3. General Pharmacy by M.L.Schroff.

**MEDICINAL BIOCHEMISTRY - THEORY****4H****4C**

Instruction hours/ week: L: 3 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

**Theory: 4 Hrs. /Week****Course Objectives:** Students can able to

- Understand of the molecular level of the chemical process associated with living cells.
- Know the 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.
- Understand the catalytic activity of enzymes and importance of isoenzymes in diagnosis of diseases;
- Know the metabolic process of biomolecules in health and illness (metabolic disorders);
- Understand the genetic organization of mammalian genome; protein synthesis; replication; mutation and repair mechanism;
- Know the biochemical principles of organ function tests of kidney, liver and endocrine gland

**Course Outcomes** At the end of this course, students will be able to

<b>Cos</b>	<b>Course Outcomes</b>	<b>Blooms Level</b>
CO1	Understand the catalytic activity of enzymes and importance of isoenzymes in diagnosis of diseases;	Understand
CO2	Know the metabolic process of biomolecules in health and illness (metabolic disorders);	Apply
CO3	Understand the genetic organization of mammalian genome; protein synthesis; replication; mutation and repair mechanism;	Understand
CO4	Know the biochemical principles of organ function tests of kidney, liver and endocrine gland.	Apply
CO5	Perform the qualitative analysis and quantitative analysis of body fluids.	Apply
CO6	Understand the basic concepts of biological oxidation.	Understand

**Mapping with Programme Outcomes**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
CO1	M										M	
CO2	M										M	
CO3	S										S	
CO4	M										M	
CO5	S										S	
CO6	S										M	

**S-Strong; M-Medium; L-Low**

**Course content:****UNIT I**

- **Introduction to biochemistry:** Cell and its biochemical organization, transport process across the cell membranes. Energy rich compounds; ATP, Cyclic AMP and their biological significance.
- **Enzymes:** Definition; Nomenclature; IUB classification; Factor affecting enzyme activity; Enzyme action; enzyme inhibition. Isoenzymes and their therapeutic and diagnostic applications; Coenzymes and their biochemical role and deficiency diseases.

**UNIT II**

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

**UNIT III**

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

**UNIT IV**

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

**UNIT V**

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

**UNIT VI**

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

**UNIT VII**

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

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

**UNIT VIII**

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

- Test for hepatic dysfunction-Bile pigments metabolism.
- Test for hepatic function test- Serum bilirubin, urine bilirubin, and urineurobilinogen.
- Dye tests of excretory function.
- Tests based upon abnormalities of serum proteins.

**UNIT IX**

- **Lipid profile tests:** Lipoproteins, composition, functions. Determination of serum lipids, total cholesterol, HDL cholesterol, LDL cholesterol and triglycerides.
- **Immunochemical techniques** for determination of hormone levels and protein levels in serum for endocrine diseases and infectious diseases. Radio immuno assay (RIA) and Enzyme Linked Immuno Sorbent Assay (ELISA)

**UNIT X**

**Electrolytes:** Body water, compartments, water balance, and electrolyte distribution. Determination of sodium, calcium potassium, chlorides, bicarbonates in the bodyfluids.

**Suggested Readings:**

1. Harpers Review of Biochemistry – Martin
2. Text book of Biochemistry – D. Satyanarayana
3. Text book of Clinical Chemistry- Alex Kaplan & Laverve L.Szabo

**Reference Books (Latest Editions):**

1. Principles of Biochemistry -- Lehninger
2. Text book of Biochemistry -- Ramarao
3. Practical Biochemistry-David T.Plummer



**PHARMACEUTICAL ORGANIC CHEMISTRY - THEORY 4H 4C**

Instruction hours/ week: L: 3 T:1 P:0

Marks: Internal: 30 External: 70 Total:  
100

External Semester Exam: 3 Hours

**Theory: 4 Hrs. /Week****Course Objectives:** Students can able to

- Master organic chemistry fundamentals, covering polarity, solubility, acids and bases, and isomerism.
- Learn organic compound nomenclature and classification, including alkanes, alkenes, alcohols, and functional groups.
- Understand reaction mechanisms like nucleophilic substitution, elimination, and electrophilic addition.
- Explore resonance, allylic rearrangements, and electrophilic aromatic substitution.
- Gain proficiency in oxidation-reduction and nucleophilic aromatic substitution reactions.
- Study official compounds, focusing on preparation, purity tests, assay, and medicinal uses.

**Course Outcomes:** At the end of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Develop a strong foundation in organic chemistry principles, enabling accurate analysis of chemical structures and reactions.	Understand
CO2	Acquire proficiency in naming and categorizing organic compounds, enhancing communication and comprehension within the field.	Analyse
CO3	Demonstrate understanding of reaction mechanisms, facilitating design of synthetic pathways and prediction of chemical transformations.	Understand
CO4	Gain insight into advanced concepts like resonance and substitution reactions, enriching problem-solving skills.	Apply
CO5	Apply knowledge to analyze and predict outcomes of chemical reactions, contributing to synthesis of novel compounds.	Understand
CO6	Understand Practical applications in pharmaceutical science, improving ability to synthesize and analyze medicinal compounds.	Understand

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M										M	
CO2	M										M	
CO3	M										M	
CO4	M										M	
CO5	M										M	
CO6	M										M	

S-Strong; M-Medium; L-Low

**Course Content:****UNIT I****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.

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. Free radicals chain reactions of alkane: Mechanism, relative reactivity and stability

**UNIT II**

- **Alicyclic compounds:** Preparations of cyclo alkanes, Bayer strain Theory and orbital picture of angle strain.
- **Nucleophilic aliphatic substitution mechanism:** Nucleophiles and leaving groups, kinetics of second and first order reaction, mechanism and kinetics of SN<sub>2</sub> reactions. Stereochemistry and steric hindrance, role of solvents, phase transfer catalysis, mechanism and kinetics of SN<sub>1</sub> reactions, stereochemistry, carbocation and their stability, rearrangement of carbocation, role of solvents in SN<sub>1</sub> reaction, Ion dipole bonds, SN<sub>2</sub> versus SN<sub>1</sub> solvolyses, nucleophilic assistance by the solvents.

**UNIT III**

**Dehydro halogenation of alkyl halides:** 1,2 elimination, kinetics, E<sub>2</sub> and E<sub>1</sub> mechanism, elimination via carbocation, evidence for E<sub>2</sub> mechanism, absence of rearrangement isotope effect, absence hydrogen exchange, the element effect, orientation and reactivity, E<sub>2</sub> versus E<sub>1</sub>, elimination versus substitution, dehydration of alcohol, ease of dehydration, acid catalysis, reversibility, orientation.

**UNIT IV**

**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.

#### UNIT V

- **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.

- **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 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.

#### UNIT VI

**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 craftacylation, 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.

#### UNIT VII

**Nucleophilic addition reaction:** Mechanism, ionisation of carboxylic acids, 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. 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.

**UNIT VIII**

- **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 tieman's reactions.

**UNIT IX**

- **Nucleophilic aromatic substitution:** Bimolecular displacement mechanisms, orientation, comparison of aliphatic nucleophilic substitution with that of aromatic.
- Oxidation reduction reaction.

**UNIT X**

- Study of the following official compounds- preparation, test for purity, assay and medicinal uses of Chlorbutol, Dimercaprol, Glyceryl 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.

**Suggested Readings:**

1. T.R.Morrison and R. Boyd - Organic chemistry
2. Bentley and Driver-Text book of Pharmaceutical chemistry
3. I.L.Finar- Organic chemistry, the fundamentals of chemistry

**Reference Books (Latest Editions):**

1. Organic chemistry – J.M.Cram and D.J.Cram
2. Organic chemistry- Brown
3. Advanced organic chemistry- Jerry March, Wiley
4. Organic chemistry- Cram and Hammered, Pine Hendrickson

**PHARMACEUTICAL INORGANIC CHEMISTRY - THEORY 3H 3C**

Instruction hours/ week: L: 2 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Theory : 3 Hrs. /Week****Course Objectives:** Students can able to

- Understand the fundamentals of analytical chemistry and monographs of inorganic compounds.
- Understand the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs
- Understand the basic concepts and Pharmacopoeial standards of pharmaceutical analysis
- Understand the principles of volumetric analysis and explore advanced analytical techniques for the detection and quantification of drug compounds
- Understand the real-world applications and challenges of utilizing inorganic pharmaceuticals in disease prevention and treatment strategies.

**Course Outcome (CO's):** At the end of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Understand the principles and procedures of analysis of drugs and also regarding the application of inorganic pharmaceuticals	Understand
CO2	Know the analysis of the inorganic pharmaceuticals their applications	Apply
CO3	Appreciate the importance of inorganic pharmaceuticals in preventing and curing the disease.	Apply
CO4	Identify the errors in analysis	Apply
CO5	Understand the principles of volumetric analysis and electrochemical analysis	Understand
CO6	Applications of volumetric analysis.	Apply

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	M										
CO2	M										
CO3	M										
CO4	M										
CO5	M										
CO6	M										

S-Strong; M-Medium; L-Low

**Course Content:****UNIT I**

- Errors

**UNIT II**

- Volumetric analysis

**UNIT III**

- Acid-base titrations
- Redox titrations

**UNIT IV**

- Non aqueous titrations
- Precipitation titrations
- Complexometric titrations

**UNIT V**

- Theory of indicators

**UNIT VI**

- Gravimetry

**UNIT VII**

- Limit tests

**UNIT VIII**

- Medicinal gases

**UNIT IX**

- Acidifiers
- Antacids
- Cathartics
- Electrolyte replenishers
- Essential Trace elements
- Antimicrobials
- Pharmaceutical aids
- Dental Products
- Miscellaneous compounds

**UNIT X**

- Radio Pharmaceuticals

**Suggested Readings:**

1. A text book Inorganic medicinal chemistry by Surendra N. Pandeya
2. A. H. Beckett and J. B. Stanlake's Practical Pharmaceutical chemistry Vol -I & Vol-II
3. Inorganic Pharmaceutical Chemistry III-Edition P. Gundu Rao

**Reference Books (Latest Editions):**

1. Inorganic Pharmaceutical Chemistry by Anand & Chetwal
2. Pharmaceutical Inorganic chemistry by Dr.B.G.Nagavi
3. Analytical Chemistry Principles by John H. Kennedy
4. I.P.1985 and 1996, Govt. of India, Ministry of Health

**REMEDIAL MATHEMATICS - THEORY****4H****4C**

Instruction hours/ week: L: 3 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

**Theory : 4 Hrs. /Week****Course Objectives:** Students can able to

- Understand the Trigonometry, Analytical geometry, Matrices, Determinant, Integration, Differential equation, Laplace transform and their applications.
- Solve the problems of different types by applying Theory.
- Understand important applications of mathematics in pharmacy.
- Proficiently use diverse mathematical tools for solving complex pharmaceutical problems.
- Analyze the mathematical theories to analyze pharmaceutical data, fostering critical thinking.
- Recognize mathematics' role in pharmaceutical applications, aiding understanding and decision-making in pharmacy

**Course Outcome (CO's):** On successful completion of the course the student will

COs	Course Outcomes	Blooms Level
CO1	Understand and perform the partial fraction, logarithms, function and limits. matrices and determinants differential and integral calculus	Understand
CO2	Apply Theory to solve diverse problems.	Knowledge
CO3	Appreciate and analyze the math's importance in pharmacy.	Apply
CO4	Use math proficiently for complex pharmaceutical problem-solving.	Apply
CO5	Apply math theories for critical analysis of pharmaceutical data.	Apply
CO6	Appreciate the important application of mathematics in Pharmacy.	Apply

**Mapping with Programme Outcomes**

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2			M									
CO3			M									
CO4				M								
CO5			M									
CO6								M				

S- Strong; M-Medium; L-Low



**Course Content:****UNIT I****Algebra:** Determinants, Matrices**UNIT II****Trigonometry:** Sides and angles of a triangle, solution of triangles**UNIT III****Analytical Geometry:** Points, Straight line, circle, parabola**UNIT IV****Differential calculus:** Limit of a function, Differential calculus, Differentiation of a sum, Product, Quotient Composite, Parametric, exponential, trigonometric and Logarithmic function.**UNIT V****Differential calculus:** Successive differentiation, Leibnitz's theorem, Partial differentiation, Euler's theorem on homogeneous functions of two variables**UNIT VI****Integral Calculus:** Definite integrals, integration by substitution and by parts, Properties of definite integrals.**UNIT VII****Differential equations:** Definition, order, degree, variable separable, homogeneous, Linear, heterogeneous, linear.**UNIT VIII****Differential equations:** Differential equation with constant coefficient, simultaneous linear equation of second order.**UNIT IX****Laplace transform:** Definition, Laplace transform of elementary functions**UNIT X****Laplace transform:** Properties of linearity and shifting.**Suggested Readings:**

1. Differential calculus By Shantinayakan
2. Text book of Mathematics for second year pre-university by Prof.B.M.Sreenivas

**Reference Books (Latest Editions):**

1. Integral calculus By Shanthinarayan
2. Engineering mathematics By B.S.Grewal
3. Trigonometry Part-I By S.L.Loney

Instruction hours/ week: L: 3 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Theory : 4 Hrs. /Week****Course Objectives:** Students can able to

- Understand the components of living world, structure and functional system of plant and animal kingdom.
- Know the classification and salient features of five kingdoms of life and morphology of flowering plants.
- Identify and differentiate various natural drugs to build a foundational understanding of Pharmacognosy.
- Know the significance of natural sources in pharmaceuticals, considering their diversity and potential therapeutic applications.
- Understand the photosynthesis and plant and mineral nutrition.
- Develop awareness of the ecological, ethical, and cultural aspects associated with the utilization of natural sources in pharmacy

**Course Outcomes (CO's):** On successful completion of the course the student will

<b>Cos</b>	<b>Course Outcomes</b>	<b>Blooms Level</b>
CO1	Explain the classification and salient features of five kingdoms of life and morphology of flowering plants.	Understand
CO2	Develop awareness of the ecological, ethical, and cultural aspects associated with the utilization of natural sources in pharmacy.	Understand
CO3	Develop the ability to identify and distinguish various natural drugs, forming a foundational knowledge base in Pharmacognosy.	Knowledge
CO4	Analyze the significance of natural sources in pharmaceuticals, considering their diverse range and potential therapeutic benefits.	Understand
CO5	Evaluate the roles of plants and animals in providing in traditional and modern medicine.	Knowledge
CO6	Foster awareness of the ecological, ethical, and cultural dimensions associated with utilizing natural sources in pharmacy practice.	Knowledge

## Mapping with Programme Outcomes

Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
Cos											
CO1	S										
CO2	S										
CO3	S										
CO4	S										
CO5	S										
CO6	S										

S-Strong; M-Medium; L-Low

**Course Content****UNIT I**

- Introduction
- General organization of plants and its inclusions

**UNIT II**

- Plant tissues
- Plant kingdom and its classification
- Morphology of plants

**UNIT III**

- Root, Stem, Leaf and its modifications
- Inflorescence and Pollination of flowers
- Morphology of fruits and seeds

**UNIT IV**

- Plant physiology and Taxonomy of Leguminosae, Umbelliferae, Solanaceae, Liliaceae, Zinziberaceae, Rubiaceae

**UNIT V**

- Study of Fungi, Yeast, Penicillin and Bacteria

**UNIT VI**

- Study of Animal cell
- Study animal tissues

**UNIT VII**

- Detailed study of frog

**UNIT VIII**

- Study of Pisces, Raptiles, Aves

**UNIT IX**

- General organization of mammals

**UNIT X**

- Study of poisonous animal

**Suggested Readings:**

1. Text book of Biology by S.B.Gokhale
2. A Text book of Biology by Dr.Thulajappa and Dr. Seetaram.

**Reference Books (Latest Editions):**

1. A Text book of Biology by B.V.Sreenivasa aidu
2. A Text book of Biology by Naidu and Murthy
3. Botany for Degree students By A.C.Dutta.
4. Outlines of Zoology by M.Ekambaranatha ayyer and T.N.Ananthkrishnan.
5. A manual for pharmaceutical biology Practical by S.B.Gokhale and C.K.Kokate.

**HUMAN ANATOMY AND PHYSIOLOGY- PRACTICAL 3H 2C**

Instruction hours/ week: L: 0 T:0 P:3

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Practical : 3 Hrs/Week****Course Objectives:** Students can able to

- Practical physiology is complimentary to the theoretical discussions in physiology.
- Practicals allow the verification of physiological processes discussed in Theory through experiments on living tissue, intact animals or normal human beings.
- To Identify epithelial, connective tissue, muscular, nervous tissues Microscopically and the axial, appendicular bones.
- Know about the bleeding time and clotting time.
- Know to Record the heart rate, pulse rate, blood pressure.
- Understand the WBC count and RBC count

**Course Outcomes (CO's):** On successful completion of the course the student will

COs	Course Outcomes	Blooms Level
CO1	Identify different types of tissues under microscope	Knowledge
CO2	Identify different types of bones	Knowledge
CO3	Identify different types of organs	Knowledge
CO4	Demonstration of blood analysis.	Apply
CO5	Demonstration of BP/heart rate/pulse rate	Apply
CO6	Explain different family planning techniques.	Understand

**Mapping with Programme Outcomes**

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
COs											
CO1	S		S	S							
CO2	S		S								
CO3	S		S								
CO4	S		S	S							
CO5	S										
CO6	S										

S-Strong; M-Medium; L-Low

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

1. Study of tissues of human body
  - (a) Epithelial tissue
  - (b) Muscular tissue

2. Study of tissues of human body
  - (a) Connective tissue
  - (b) Nervous tissue
3. Study of appliances used in hematological experiments
4. Determination of W.B.C. count of blood
5. Determination of R.B.C. count of blood
6. Determination of differential 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.

**Suggested Readings:**

1. Goyal, R. K, Natvar M.P, and Shah S.A, Practical Anatomy, Physiology and Biochemistry, Latest Edition, Publisher: B.S Shah Prakashan, Ahmedabad.

**Reference books**

2. Ranade VG, Text Book of Practical Physiology, Latest Edition, Publisher: PVG,Pune.
3. Anderson Experimental Physiology, Latest Edition, Publisher: NA



**PHARMACEUTICS- PRACTICAL****3H 2C**

Instruction hours/ week: L: 0 T:0 P:3

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

**Practical : 3 Hrs./Week****Course Objectives: Students can able to**

- Know various internal liquid dosage forms preparations.
- Know various external liquid dosage forms.
- Prepare various solid dosage forms.
- Perform quality control tests for various dosage forms
- Know various formulations for body cavities.
- Pharmaceutical calculations in pharmacy.

**Course Outcomes (CO's):** At the end of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Prepare various internal liquid dosage forms	Analyze
CO2	Prepare various solid dosage forms	Analyze
CO3	Perform quality control tests for various dosage forms	Analyze
CO4	Prepare various formulations for body cavities	Analyze
CO5	Develop a clear idea about Pharmaceutical incompatibility and different pharmaceutical calculations in pharmacy.	Apply

**Mapping with Programme Outcomes**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	S	M	M								
CO2	S	M	M	M					L		
CO3			S								
CO4	S	M		M					M		
CO5	S	M	S	M							

S-Strong; M-Medium; L-Low

**List of Experiments:****Syrups**

- Simple Syrup I.P
- Syrup of Ephedrine Hcl NF
- Syrup Vasaka IP
- Syrup of ferrous Phosphate IP
- Orange Syrup

**Elixir****Linctus****Solutions**

- Piperizine citrate elixir BP
- Cascara elixir BPC
- Paracetamol elixir BPC

- Simple Linctus BPC
- Pediatric simple Linctus BPC
- Solution of cresol with soap IP
- Strong solution of ferric chloride BPC
- Aqueous Iodine Solution IP
- Strong solution of Iodine IP
- Strong solution of ammonium acetate IP

**Liniments**

- Liniment of turpentine IP\*
- Liniment of camphor IP

**Suspensions\***

- Calamine lotion
- Magnesium Hydroxide mixture BP

**Emulsions\***

- Cod liver oil emulsion
- Liquid paraffin emulsion

**Powders<sup>#</sup>**

- Eutectic powder
- Explosive powder
- Dusting powder
- Insufflations

**Suppositories<sup>#</sup>**

- Boric acid suppositories
- Chloral suppositories

**Incompatibilities**

- Mixtures with Physical
- Chemical & Therapeutic incompatibilities

\* Colorless bottles required for dispensing

# Paper envelope (white), butter paper and white paper required for dispensing.

**Suggested Readings:**

1. Cooper and Gunn's Dispensing for pharmacy students.
2. A text book Professional Pharmacy by N.K.Jain and S.N.Sharma.

**Reference Books (Latest Editions):**

1. Introduction to Pharmaceutical dosage forms by Howard C. Ansel.
2. Remington's Pharmaceutical Sciences. Register of General Pharmacy by Cooper and Gunn.
3. General Pharmacy by M.L.Schroff.

**MEDICINAL BIOCHEMISTRY -PRACTICAL 3H 2C**

Instruction hours/ week: L: 0 T:0 P:3

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Practical : 3 Hrs./Week****Course Objectives:** Students can able to

- Know the Qualitative analysis of the biomolecules.
- Quantitatively analyze biochemical parameters and their importance in diagnosis of disease.
- Understand how to analyse the urine for abnormal constituents.
- Understand how to identify the biomolecules using chemical tests.
- Determine the enzymatic activity.
- Study the effect of physical parameters on the enzymatic activity.

**Course Outcomes:** At the end of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	To perform the qualitatively analysis of biomolecules	Apply
CO2	To perform the Quantitatively analysis of biomolecules in blood,urine and serum	Apply
CO3	Quantitative analysis of biomolecules by colorimetric method.	Apply
CO4	Quantitative analysis of biomolecules by titrimetric method.	Apply
CO5	Determine the enzymatic activity.	Apply
CO6	Study the effect of physical parameters on the enzymatic activity.	Apply

**Mapping with Programme Outcomes**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S									M	
CO2		S									M	
CO3		S									M	
CO4		S									M	
CO5		S									M	
CO6		S									M	

S-Strong; M-Medium; L-Low

**List of Experiments:**

- 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 allocated for presentation may be 8+2 Min.

**Suggested Readings:**

1. Harpers Review of Biochemistry – Martin
2. Text book of Biochemistry – D. Satyanarayana
3. Text book of Clinical Chemistry- Alex Kaplan & Laverve L.Szabo

**Reference Books (Latest Editions):**

1. Practical Biochemistry-David T.Plummer
2. Practical Biochemistry-Pattabhiraman

**PHARMACEUTICAL ORGANIC CHEMISTRY -PRACTICAL 3H 2C**

Instruction hours/ week: L: 0 T:0 P: 3

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

**Practical : 3 Hrs./Week****Course Objectives:** Students can able to

- Understand the qualitative analysis of unknown organic compounds.
- Understand the special elements in an organic sample.
- Understand and confirm unknown compounds by m.p./b.p.
- Prepare derivatives of organic compounds.
- To know how to prepare the solid derivatives from organic compounds.
- Construct molecular models.

**Course Outcomes (CO's):** On successful completion of the course the student will

COs	Course Outcomes	Blooms Level
CO1	Synthesis of compounds using acetylation, Benzoylation and coupling reactions.	Apply
CO2	Synthesis of compounds using Bromination, Nitration and condensation reactions.	Apply
CO3	Synthesis of compounds using Oxidation, reduction and Hydrolysis reactions.	Apply
CO4	Systematically perform qualitative analysis of unknown organic compounds.	Apply
CO5	Prepare derivatives of organic compounds.	Apply
CO6	Construct molecular models.	Apply

**Mapping with Programme Outcomes**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S										
CO2		S										
CO3		M										
CO4		M										
CO5		S										
CO6		S										

**S- Strong; M-Medium; L-Low**

**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-naphthol (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

**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.

**Introduction to the use of stereo models:**

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

**Suggested Readings:**

1. T.R.Morrison and R. Boyd - Organic chemistry
2. Bentley and Driver-Text book of Pharmaceutical chemistry
3. I.L.Finar- Organic chemistry, the fundamentals of chemistry

**Reference Books (Latest Editions):**

1. Organic chemistry – J.M.Cram and D.J.Cram
2. Organic chemistry- Brown
3. Advanced organic chemistry- Jerry March, Wiley
4. Organic chemistry- Cram and Hammered, Pine Hendrickson

**PHARMACEUTICAL INORGANIC CHEMISTRY -PRACTICAL 3H 2C**

Instruction hours/ week: L: 0 T:0 P:3

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

**Practical : 3 Hrs./Week****Course Objectives:** students can able to

- Understand the limit test for samples.
- Understand how to prepare the solutions for volumetric and electro-analytical methods.
- Standardize the solutions by volumetric and electro-analytical methods.
- Know how to Perform the assay for chemical substances.
- Standardize the titrant used for the assay.
- Determine the strength of the solutions by electro-analytical methods.

**Course Outcomes:** At the end of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Analyze the limit test for samples.	Understand
CO2	Prepare the solutions for volumetric and electro-analytical methods.	Apply
CO3	Standardize the solutions by volumetric and electro-analytical methods.	Apply
CO4	Perform the assay for chemical substances.	Apply
CO5	Standardize the titrant used for the assay.	Apply
CO6	Determine the strength of the solutions by electro-analytical methods.	Understand

**Mapping with Programme Outcomes**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M										
CO2		M										
CO3		M										
CO4		L										
CO5		L										
CO6		L										

**S-Strong; M-Medium; L-Low****List of experiments:****Limit test (6 exercises)**

- Limit test for chlorides
- Limit test for sulphates
- Limit test for iron
- Limit test for heavy metals

- e. Limit test for arsenic
- f. Modified limit tests for chlorides and sulphates

**Assays (10 exercises)**

- g. Ammonium chloride- Acid-base titration
- h. Ferrous sulphate- Cerimetry
- i. Copper sulphate- Iodometry
- j. Calcilugluconate- Complexometry
- k. Hydrogen peroxide – Permanganometry
- l. Sodium benzoate – Nonaqueous titration
- m. Sodium chloride – Modified volhard's method
- n. Assay of KI – KIO<sub>3</sub> titration
- o. Gravimetric estimation of barium as barium sulphate
- p. Sodium antimony gluconate or antimony potassium tartarate

**Estimation of mixture (Any two exercises)**

- q. Sodium hydroxide and sodium carbonate
- r. Boric acid and Borax
- s. Oxalic acid and sodium oxalate

**Test for identity (Any three exercises)**

- t. Sodium bicarbonate
- u. Barium sulphate
- v. Ferrous sulphate
- w. Potassium chloride

**Test for purity (Any two exercises)**

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

**Preparations (Any two exercises)**

- f. Boric acids
- g. Potash alum
- h. Calcium lactate
- i. Magnesium sulphate



**Suggested Readings:**

1. A text book Inorganic medicinal chemistry by Surendra N. Pandeya
2. Inorganic Pharmaceutical Chemistry III-Edition P. Gundu Rao

**Reference Books (Latest Editions):**

1. Pharmaceutical Inorganic chemistry by Dr.B.G.Nagavi
2. Analytical Chemistry Principles by John H. Kennedy
3. I.P.1985 and 1996, Govt. of India, Ministry of Health

**REMEDIAL BIOLOGY - PRACTICAL****3H 2C**

Instruction hours/ week: L: 0 T:0 P:3

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Practical : 3 Hrs./Week****Course Objectives:**

- Students will be able to understand the microscope, cutting sections, mount, stain and slide preparation.
- To know about cell and its organelles
- To understand the parts of plant and their modifications
- Able to know the system using software
- Able to Identify types of bones.
- To determine blood group, blood pressure and tidal volume.

**Course Outcomes (CO's):** On successful completion of the course the student will

Cos	Course Outcomes	Blooms Level
CO1	Understand the microscope, cutting sections, mount, stain and slide preparation.	Understand
CO2	Study cell and its organelles	Knowledge
CO3	Study the parts of plant and their modifications	Understand
CO4	Study the system in from using software	Knowledge
CO5	Identify types of bones.	Knowledge
CO6	Determine blood group, blood pressure and tidal volume.	Analyze

## Mapping with Programme Outcomes

Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
Cos											
CO1	S										
CO2	S										
CO3	S										
CO4	S										
CO5	S										
CO6				M							

S-Strong; M-Medium; L-Low

**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

**Suggested Readings:**

1. Text book of Biology by S.B.Gokhale
2. A Text book of Biology by Dr.Thulajappa and Dr. Seetaram.

**Reference Books (Latest Editions):**

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

Instruction hours/ week: L: 3 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Theory : 3 Hrs. /Week****Course Objectives:**

- Pathophysiology is the study of causes of diseases and reactions of the body to such disease producing causes.
- This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications
- Understanding of basic pathophysiological mechanisms
- Hence it will not only help to study the syllabus of pathology,
- To get baseline knowledge required to practice medicine safely, confidently, rationally and effectively.
- To understand the etiology and pathogenesis of diseases.

**Course Outcomes (CO's):**

On successful completion of the course the student will

COs	Course Outcomes	Blooms Level
CO1	Describe the etiology and pathogenesis of the selected disease states;	Knowledge
CO2	Name the signs and symptoms of the diseases;and	Knowledge
CO3	Mention the complications of the diseases.	Knowledge
CO4	Describe the mechanism of the diseases.	Knowledge
CO5	Understand the etiology and pathogenesis of diseases.	Understand
CO6	Discuss about the Sexually transmitted diseases	Understand

## Mapping with Programme Outcomes

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
COs											
CO1	S										
CO2	S										
CO3	S										
CO4	S										
CO5	S										
CO6	S										

S-Strong; M-Medium; L-Low

**UNIT I****Basic principles of cell injury and Adaptation**

- Causes, Pathogenesis and morphology of cell injury
- Abnormalities in lipoproteinaemia, glycogen infiltration and glycogen infiltration and glycogen infiltration and glycogen storage diseases

**UNIT II****Inflammation**

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

**UNIT III****Diseases of Immunity**

- Introduction to T and B cells
- MHC proteins or transplantation antigens

**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

**UNIT IV**

**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.
- Types of shock, mechanisms, stages and management
- Biological effects of radiation

**UNIT V****Environmental and nutritional diseases**

- Air pollution and smoking- SO<sub>2</sub>, NO, NO<sub>2</sub>, and CO
- Protein calorie malnutrition, vitamins, obesity, pathogenesis of starvation.

**UNIT VI****Pathophysiology of common diseases**

- Parkinsonism

- Schizophrenia
- Depression and mania

**UNIT VII****Pathophysiology of common diseases**

- Hypertension,
- Stroke (ischaemic and hemorrhage)
- Angina, CCF, Atherosclerosis, Myocardial infarction

**UNIT VIII****Pathophysiology of common diseases**

- Diabetes Mellitus
- Peptic ulcer and inflammatory bowel diseases

**UNIT IX****Pathophysiology of common diseases**

- Cirrhosis and Alcoholic liver diseases
- Acute and chronic renal failure
- Asthma and chronic obstructive airway diseases

**UNIT X****Infectious diseases :**

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

**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.

**Suggested Readings:**

1. Pathologic basis of disease by- Cotran, Kumar, Robbins
2. Text book of Pathology- Harsh Mohan
3. Text book of Pathology- Y.M. Bhide

**Reference Books (Latest Editions):**

1. Clinical Pharmacy and Therapeutics; Second edition; Roger Walker;  
Churchill Livingstone publication

**PHARMACEUTICAL MICROBIOLOGY -THEORY****4H****4C**

Instruction hours/ week: L: 3 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Theory: 4 Hrs. /Week Course****Objectives:**

- Know the anatomy, identification, growth factors and sterilization of microorganisms;
- Know the mode of transmission of disease causing microorganism, symptoms of disease, and treatment aspect;
- Do estimation of RNA and DNA and there by identifying the source;
- Do cultivation and identification of the microorganisms in the laboratory;
- Do identification of diseases by performing the diagnostic tests; and
- Appreciate the behavior of motility and behavioral characteristics of microorganisms

**Course Outcomes (CO's):**

Upon completion of the subject student shall be able to

COs	Course Outcomes	Blooms Level
CO1	Know the anatomy, identification, growth factors and sterilization of microorganisms.	Understand
CO2	Know the mode of transmission of disease causing microorganism, symptoms of disease, and treatment aspect.	Understand
CO3	Do estimation of RNA and DNA and there by identifying the source.	Understand
CO4	Do cultivation and identification of the microorganisms in the laboratory.	Understand
CO5	Do identification of diseases by performing the diagnostic tests.	Apply
CO6	Appreciate the behavior of motility and behavioral characteristics of microorganisms.	Knowledge

## Mapping with Programme Outcomes

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	S										
CO2	S										
CO3	S										
CO4	S										
CO5	S										
CO6	M										

S-Strong; M-Medium; L-Low



**Course Content:****UNIT I**

- Introduction to the science of microbiology. Major divisions of microbial world and Relationship among them.

**UNIT II**

- Different methods of classification of microbes and study of Bacteria, Fungi, virus, Rickettsiae, Spirochetes.

**UNIT III**

- 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.
- 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.

**UNIT IV**

- 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 preparations.
- Brief information on Validation.

**UNIT V**

- **Disinfectants-** Study of disinfectants, antiseptics, fungicidal and virucidal agents factors affecting their activation and mechanism of action. Evaluation of bactericidal, bacteriostatic, virucidal activities, evaluation of preservatives in pharmaceutical preparations.

**UNIT VI**

- Immunology-Immunity, Definition, Classification, General principles of natural immunity, Phagocytosis, acquired immunity (active and passive)

**UNIT VII**

- 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.

**UNIT VIII**

- Diagnostic tests : Schick's Test, Elisa test, Western Blot test, Southern Blot PCR Widal, QBC, Mantoux Peripheral smear. Study of malarial parasite.

**UNIT IX**

- Microbial culture sensitivity Testing: Interpretation of results Principles and methods of different microbiological assays, microbiological assay of
  - Penicillin, Streptomycin and vitamin B<sub>2</sub> and B<sub>12</sub>.
  - Standardization of vaccines and sera.

**UNIT X**

- Study of infectious diseases: Typhoid, Tuberculosis, Malaria, Cholera, Hepatitis, Meningitis, Syphilis & Gonorrhoea and HIV.

**Reference Books (Latest Editions):**

1. Vanitha Kale and Kishor Bhusari — Applied Microbiology | Himalaya Publishing house Mumbai.
2. Mary Louis Turgeon — Immunology and Serology in Laboratory Medicines | 2<sup>nd</sup> edition, 1996 Mosby- Year book inc St. Louis Missouri 63146.
3. Harsh Mohan, — Text book of Pathology | 3<sup>rd</sup> edition, 1998, B-3 Ansari road Daryaganj N. Delhi.

**Reference books ( Theory)**

1. Prescott L.M., Jarley G.P Klein D.A — Microbiology | 2<sup>nd</sup>- edition Mc Graw Hill Company Inc
2. Rawlins E.A. | Bentley's Text Book of Pharmaceutics | B ailliere Tindals 24-28 London 1988
3. Forbisher — Fundamentals of Microbiology | Philadelphia W.B. Saunders.
4. Prescott L.M. Jarley G.P., Klein.D.A. — Microbiology. | 2<sup>nd</sup> edition WMC Brown Publishers, Oxford. 1993
5. War Roitt, Jonathan Brostoff, David male, — Immunology | 3<sup>rd</sup> edition 1996, Mosby-year book Europe Ltd, London.
6. Pharmacopoeia of India, Govt of India, 1996.

**PHARMACOGNOSY AND PHYTOPHARMACEUTICALS -THEORY****4H 4C**

Instruction hours/ week: L: 3 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Theory: 4 Hrs. /Week****Course 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, and distribution
- To know its method of cultivation,
- To know active constituents, medicinal uses
- To understand its preservation methods, identification tests, substitutes and adulterants.
- To understand the traditional system of medicine.
- To explain the Plant Products Primary metabolites Proteins, Enzymes, Lipids, Marine drugs.

**Course Outcomes (CO's):**

COs	Course Outcomes	Blooms Level
CO1	Explain the concepts and importance of Pharmacognosy.	Analyze
CO2	Illustrate the classification, Quality control of natural drugs & cultivation of crude drugs.	Apply
CO3	Explain the applications of primary and secondary metabolites of the plant.	Analyze
CO4	Demonstrate the basic concepts of plant tissue culture.	Apply
CO5	Summarize the Traditional system of medicine.	Evaluate
CO6	Explain the importance of plant product sprmary metabolites Proteins, Enzymes, Lipids, Marine drugs.	Analyze

## Mapping with Programme Outcomes

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	M										
CO2			M								
CO3						M					
CO4				M							
CO5						M					
CO6				M							

S-Strong; M-Medium; L-Low

**UNIT I**

- Introduction.
- Definition, history and scope of Pharmacognosy.

**UNIT II**

- Classification of crude drugs.
- Cultivation, collection, processing and storage of crude drugs.
- Detailed method of cultivation of crude drugs.

**UNIT III**

- Study of cell wall constituents and cell inclusions.
- Microscopical and powder Microscopical study of crude drugs.

**UNIT IV**

- Study of natural pesticides.

**UNIT V**

- Detailed study of various cell constituents.

**UNIT VI**

- Carbohydrates and related products.
- Detailed study carbohydrates containing drugs.(11 drugs)

**UNIT VII**

- Definition sources, method extraction, chemistry and method of analysis of lipids.
- Detailed study of oils.

**UNIT VIII**

- Definition, classification, chemistry and method of analysis of protein.

**UNIT IX**

- Study of plants fibers used in surgical dressings and related products.

**UNIT X**

- Different methods of adulteration of crude drugs.

**Suggested Readings:**

1. Pharmacognosy by G.E. Trease & W.C.Evans.
2. Pharmacognosy by C.K.Kokate,Gokhale & A.C.Purohit.

**Reference Books (Latest Editions):**

1. Pharmacognosy by Brady & Tyler.E.
2. Pharmacognosy by T.E.Wallis.
3. Pharmacognosy by C.S. Shah & Qadery.
4. Pharmacognosy by M.A. Iyengar.

24PD204T

SECOND YEAR

**PHARMACOLOGY I -THEORY****4H 4C**

Instruction hours/ week: L: 3 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

**Theory: 4 Hrs. /Week****Course Objectives:**

- This subject will provide an opportunity for the student to learn about the drug with regard to classification, pharmacodynamic and pharmacokinetic aspects
- To know adverse effects, uses, dose
- To understand the 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
- To know the 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.

**Course Outcome (CO's):**

On successful completion of the course the student will

COs	Course Outcomes	Blooms Level
CO1	Understand the pharmacological aspects of drugs.	Understand
CO2	Handle and carry out the animal experiments.	Apply
CO3	Appreciate the importance of pharmacology subject as a basis of therapeutics.	Knowledge
CO4	Correlate and apply the knowledge therapeutically.	Analyze
CO5	Demonstrate the Pharmacology of drugs acting on various cardiovascular diseases.	Apply
CO6	Illustrate the Pharmacology of Autocoids, Non-steroidal anti-inflammatory agents, Anti-gout drugs and Antirheumatic drugs	Apply

**Mapping with Programme Outcomes**

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
COs											
CO1	S										
CO2	S	S	S				S				
CO3	S						S				
CO4	S		S								
CO5	S		S								
CO6	S										

S-Strong; M-Medium; L-Low

**UNIT I****General Pharmacology**

- Introduction, definitions and scope of pharmacology
- Routes of administration of drugs
- Pharmacokinetics (absorption, distribution, metabolism and excretion)

**UNIT II**

- Pharmacodynamics
- Factors modifying drug effects
- Drug toxicity - Acute, sub- acute and chronic toxicity.
- Pre-clinical evaluations
- Drug interactions

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

**UNIT III****Pharmacology of drugs acting on ANS**

- Adrenergic and antiadrenergic drugs
- Cholinergic and anticholinergic drugs
- Neuromuscular blockers
- Mydriatics and miotics

**UNIT IV**

- Drugs used in myasthenia gravis
- Drugs used in Parkinsonism

**UNIT V****Pharmacology of drugs acting on cardiovascular system**

- Antihypertensives
- Anti-anginal drugs
- Anti-arrhythmic drugs
- Drugs used for therapy of Congestive Heart Failure
- Drugs used for hyperlipidaemias

**UNIT VI****Pharmacology of drugs acting on Central Nervous System**

- General anesthetics
- Sedatives and hypnotics
- Anticonvulsants

- Analgesic and anti-inflammatory agents

#### **UNIT VII**

- Psychotropic drugs
- Alcohol and methyl alcohol
- CNS stimulants and cognition enhancers
- Pharmacology of local anaesthetics

#### **UNIT VIII**

##### **Pharmacology of Drugs acting on Respiratory tract**

- Bronchodilators
- Mucolytics
- Expectorants
- Antitussives
- Nasal Decongestants

#### **UNIT IX**

##### **Pharmacology of Hormones and Hormone antagonists**

- Thyroid and Antithyroid drugs
- Insulin, Insulin analogues and oral hypoglycemic agents
- Sex hormones and oral contraceptives
- Oxytocin and other stimulants and relaxants

#### **UNIT X**

##### **Pharmacology of autocooids and their antagonists**

- Histamines and Antihistaminics
- 5-Hydroxytryptamine and its antagonists
- Lipid derived autocooids and platelet activating factor
- The following details shall be submitted for any 25 selected drugs in the form of assignment/PPT.

\*\*Name of the Drug, Brand name, Category, Therapeutic uses, Dose, Pharmacological action, Route of administration, Side effects, Contraindications, Drug Interactions with drug/food, Pharmacokinetics

**Suggested Readings( Theory):**

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

1. Tripathi, K. D. Essentials of medical pharmacology. 4<sup>th</sup> Ed, 1999. Publisher: Jaypee, Delhi.
2. Satoskar, R.S. and Bhadarkar, S.D. Pharmacology and pharmacotherapeutics. 16<sup>th</sup> edition (single volume), 1999. Publisher: Popular, Dubai.
3. Rang, H.P. & Dale, M.M. Pharmacology. 4<sup>th</sup> edition, 1999. Publisher: Churchill Living stone.

**Reference Books ( Theory-Latest Editions) :**

(Author, Title, Edition, Publication Place, Publisher, Publication Year)

1. Goodman Gilman, A., Rall, T.W., Nies, A.I.S. and Taylor, P. Goodman and Gilman's The pharmacological Basis of therapeutics. 9<sup>th</sup> Ed, 1996. Publisher Mc Graw Hill, Pergamon press.
2. Craig, C.R.&Stitzel, R.E. Modern Pharmacology. Latest edition. Publisher: Little Brown.Co
3. Katzung, B.G. Basic and clinical pharmacology. Latest edition. Publisher: Prentice Hall, Int.
4. Shargel and Leon. Applied Biopharmaceutics and pharmacokinetics. Latest edition. Publisher: Prentice Hall, London.



**COMMUNITY PHARMACY -THEORY****3H 3C**

Instruction hours/ week: L:2 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

**Theory: 3 Hrs.****/WeekCourse****Objectives:**

- In the changing scenario of pharmacy practice in India, Community Pharmacists are expected to offer various pharmaceutical care services.
- In order to meet this demand, students will be learning various skills such as dispensing of drugs
- To know responding to minor ailments by providing suitable safe medication
- To understand patient counseling
- To know health screening services for improved patient care in the community set up.
- To study the concept of Rational drug therapy

**Course Outcome (CO's):**

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

<b>Cos</b>	<b>Course Outcomes</b>	<b>Blooms Level</b>
CO1	Describe the rules and responsibilities of community pharmacy	Understanding
CO2	Explain community pharmacy management	Applying
CO3	Give an Outline of the concept of pharmaceutical care	Understanding
CO4	What is the importance of patient counselling and health screening services?	Remembering& Applying
CO5	Discuss health education.	Creating
CO6	Explain the management of minor ailments	Applying

**Mapping with Programme Outcomes**

<b>Cos</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>
CO1	S				S	S	S	L	S	L	
CO2	S	S	M	M			M	L	M	S	S
CO3	M				M	L		L		L	
CO4	M	M	M	S		S		L	M	M	S
CO5	M			M		S		S		M	S
CO6	M	S	M	S	M	M	M	M	M	S	S

S-Strong; M-Medium; L-Low

**Special requirements:**

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

**UNIT I****Definition, scope, of community pharmacy**

Roles and responsibilities of Community pharmacist

**UNIT II****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

**UNIT III**

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

**Inventory control in community pharmacy** Definition, various methods of Inventory Control

**ABC, VED, EOQ, Lead time, safety stock**

**UNIT IV****Pharmaceutical care**

Definition and Principles of Pharmaceutical care.

**Patient counselling**

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

**UNIT V****Patient medication adherence**

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

**Health screening services**

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

**UNIT VI****OTC Medication- Definition, OTC medication list & Counselling****Health Education**

WHO Definition of health, and health promotion, care for children, pregnant & breast feeding women, and geriatric patients.

**UNIT VII**

Introduction to Social and Preventive Pharmacy:

Commonly occurring Communicable Diseases, causative agents, Clinical presentations and prevention of Communicable diseases – Tuberculosis, Hepatitis, Typhoid, Amoebiasis, Malaria, Leprosy, Syphilis, Gonorrhoea and AIDS, HIV & AIDS control programme, National leprosy control programme.

**UNIT VIII**

Balance diet, and treatment & prevention of deficiency disorders

Family planning – role of pharmacist

**UNIT IX**

**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.

**UNIT X**

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

**Code of ethics for community pharmacists**

**Suggested Readings:**

1. Health Education and Community Pharmacy by N.S.Parmar.
2. WHO consultative group report.
3. Drug store & Business management by Mohammed Ali & Jyoti.

**Reference Books (Latest Editions):**

1. Handbook of pharmacy – health care. Edt. Robin J Harman. The Pharmaceutical press.
2. Comprehensive Pharmacy Review – Edt. Leon Shargel. Lippincott Williams & Wilkins.

**PHARMACOTHERAPEUTICS I -THEORY****4H 4C**

Instruction hours/ week: L: 3 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Theory : 4 Hrs.****/WeekCourse****Objectives:**

- 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.
- To know the importance of preparation of individualized therapeutic plans based on diagnosis;
- To understand patient-specific parameters relevant in initiating drug therapy
- To know the pathophysiology of selected disease states and explain the rationale for drug therapy

**Course Outcome (CO's):**

A successful completion of this subject it is expected that students will be able to

COs	Course Outcomes	Blooms Level
CO1	Understand the etiologic factors, signs and symptoms of selected diseases	Understand
CO2	Explain pathophysiology of selected diseases.	Knowledge
CO3	Explain drug - drug interactions for selected drugs	Knowledge
CO4	Explain drug- food interactions for selected drugs	Knowledge
CO5	Illustrate the therapeutic approach of management of selected disease.	Apply
CO6	Understand the basic concepts of different guidelines for prescribing.	Apply

**Mapping with Programme Outcomes**

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2	S											
CO3					M			M				
CO4					M			M				
CO5						S			S			
CO6									M		S	

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Strong; M-Medium; L-Low

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).

**Detailed syllabus and lecture wise schedule:**

**Etiopathogenesis and pharmacotherapy of diseases associated with following systems/  
diseases**

**UNIT I**

**Cardiovascular system:** Hypertension, Congestive cardiac failure, Angina Pectoris

**UNIT II**

Myocardial infarction, Hyperlipidaemias

**UNIT III**

Electrophysiology of heart and Arrhythmias

**UNIT IV**

**Respiratory system :** Introduction to Pulmonary function test, Asthma,

**UNIT V**

Chronic obstructive airways disease, Drug induced pulmonary diseases

**UNIT VI**

**Endocrine system :** Diabetes, Thyroid diseases, Oral contraceptives

**UNIT VII**

Hormone replacement therapy, Osteoporosis

**UNIT VIII**

**General prescribing guidelines for**

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

**UNIT IX**

**Ophthalmology:** Glaucoma, Conjunctivitis- viral & bacterial

**UNIT X**

**Introduction to rational drug use**

Definition, Role of pharmacist Essential drug concept Rational drug formulations

**Suggested Readings:**

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

**Reference Books (Latest Editions):**

1. Pathologic basis of disease - Robins SL, W.B.Saunders publication.
2. Pathology and therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice - Green and Harris, Chapman and Hall publication.
3. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication.
4. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA
5. Avery's Drug Treatment, 4th Edn, 1997, Adis International Limited.
6. Relevant review articles from recent medical and pharmaceutical literature

**PHARMACEUTICAL MICROBIOLOGY -PRACTICAL 3H 2C**

Instruction hours/ week: L: 0 T:0 P:3

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

**Practical : 3 Hrs./Week****Course Objectives:**

- To discuss about the instruments used in experimental microbiology
- To understand the sterilization methods followed in laboratory.
- To know the staining techniques used in microbiology.
- To carry out assay of different antibiotics
- To understand the mechanism of action of antibiotics.
- To perform different sterility tests and bacteriological analysis of water

**Course Outcomes (CO's):**

At the end of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Discuss about the instruments used in experimental microbiology	Understand
CO2	Understand the sterilization methods followed in laboratory.	Understand
CO3	Discover the staining techniques used in microbiology.	Understand
CO4	Carry out assay of different antibiotics	Apply
CO5	Understand the mechanism of action of antibiotics.	Understand
CO6	Execute different sterility tests and bacteriological analysis of water	Knowledge

## Mapping with Programme Outcomes

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	S										
CO2	S										
CO3	S										
CO4	S										
CO5	S										
CO6	M										

S-Strong; M-Medium; L-Low

**Title of the Experiment:**

- 1 Study of apparatus used in experimental microbiology\*.
- 2 Sterilisation 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 Turbidometric 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 methods) & 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 identifying, 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 for presentation may be 8+2 Min.

**Reference Books (Latest Editions):**

1. Vanitha Kale and Kishor Bhusari — Applied Microbiology || Himalaya Publishing house Mumbai.
2. Harsh Mohan, — Text book of Pathology|| 3<sup>rd</sup> edition, 1998, B-3 Ansari road Darya ganj N. Delhi.



**Reference books**

1. Prescott L.M. Jarley G.P., Klein.D.A. — Microbiology. 2<sup>nd</sup> edition WMC Brown Publishers, Oxford. 1993.
2. War Roitt, Jonathan Brostoff, David male, — Immunology 3<sup>rd</sup> edition 1996, Mosby-year book Europe Ltd, London.
3. Pharmacopoeia of India, Govt of India, 1996.

**PHARMACOGNOSY AND PHYTOPHARMACEUTICALS -PRACTICAL 3H 2C**

Instruction hours/ week: L: 0 T:0 P:3

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Practical : 3 Hrs./Week****Course Objectives:**

- Analyze the crude drugs by chemical tests.
- Determine the stomatal number and index and vein islet number, vein islet termination and palisade ratio.
- Determine the starch grains, calcium oxalate crystals by eye piece micrometer.
- Perform the Fiber length and width starch grains by Lycopodium spore method.
- Analyze the purity of crude drugs by ash value and extractive value.
- Determine the moisture content, swelling index and foaming index.

**Course Outcomes (CO's):** On successful completion of the course the student will

COs	Course Outcomes	Blooms Level
CO1	Explain the importance basic fundamentals of Pharmacognosy	Analyze
CO2	Analyze the macroscopy of various crude drugs	Analyze
CO3	Prepare the microscopy & powder characteristics of various crude drugs	Create
CO4	Judge the Iodine value & saponification value and unsaponifiable matter	Evaluate
CO5	Judge the ester & acid values	Evaluate
CO6	Analyze the phytoconstituents by chemical test	Analyze

Mapping with Programme Outcomes

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
COs											
CO1	M										
CO2				M							
CO3				M							
CO4				M							
CO5				M							
CO6				M							

S-Strong; M-Medium; L-Low

**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.(castor oil, sesame oil, shark liver oil, bees wax)
- 27 Chemical tests for Gelatin.

**Suggested Readings:**

1. Pharmacognosy by G.E. Trease & W.C.Evans.
2. Pharmacognosy by C.K.Kokate,Gokhale & A.C.Purohit.

**Reference Books (Latest Editions):**

1. Pharmacognosy by Brady & Tyler.E.
2. Pharmacognosy by T.E.Wallis.
3. Pharmacognosy by C.S. Shah & Qadery.
4. Pharmacognosy by M.A. Iyengar.

**PHARMACOTHERAPEUTICS I -PRACTICAL****3H 2C**

Instruction hours/ week: L: 0 T:0 P:3

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Practical : 3 Hrs./Week****Course Objectives:**

- 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.
- To know the importance of preparation of individualized therapeutic plans based on diagnosis;
- To understand patient-specific parameters relevant in initiating drug therapy
- To know the pathophysiology of selected disease states and explain the rationale for drug therapy

**Course Outcome (CO's):**

A successful completion of this subject it is expected that students will be able to

Cos	Course Outcomes	Blooms Level
CO1	Understand the etiologic factors, signs and symptoms of selected diseases	Understand
CO2	Explain pathophysiology of selected diseases.	Knowledge
CO3	Explain drug - drug interactions for selected drugs	Knowledge
CO4	Explain drug- food interactions for selected drugs	Knowledge
CO5	Illustrate the therapeutic approach of management of selected disease.	Apply
CO6	Understand the basic concepts of different guidelines for prescribing.	Apply

**Mapping with Programme Outcomes**

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2	S											
CO3					M			M				
CO4					M			M				
CO5						S			S			
CO6									M		S	

S-Strong; M-Medium; L-Low

**Practicals:**

- 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 allocated for presentation may be 8+2 Min.

**Suggested Readings:**

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

**Reference Books (Latest Editions):**

1. Pathologic basis of disease - Robins SL, W.B.Saunders publication.
2. Relevant review articles from recent medical and pharmaceutical literature

Instruction hours/ week: L: 3 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Theory : 4 Hrs. /Week****Course Objectives:**

- 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, drugs 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.
- To understand drugs acting on Blood and blood forming agents
- To study structures and functions of the components of the cell

**Course Outcomes (CO's):**

On successful completion of the course the student will

COs	Course Outcomes	Blooms Level
CO1	Understand the pharmacological aspects of drugs falling under the above mentioned chapters,	Understand
CO2	Carryout the animal experiments confidently,	Apply
CO3	Appreciate the importance of pharmacology subject as a basis of therapeutics, and	Knowledge
CO4	Correlate and apply the knowledge therapeutically.	Analyze
CO5	Drugs acting on Blood and blood forming agents	Understand
CO6	Structures and functions of the components of the cell	Understand

## Mapping with Programme Outcomes

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
COs											
CO1	S										
CO2	S	S	S	S							
CO3	S										
CO4	S		S								
CO5	S										
CO6	S										

S-Strong; M-Medium; L-Low

**UNIT I****Pharmacology of Drugs acting on Blood and blood forming agents**

- Anticoagulants
- Thrombolytics and antiplatelet agents
- Haemopoietics and plasma expanders

**UNIT II****Pharmacology of drugs acting on Renal System**

- Diuretics
- Antidiuretics

**UNIT III****Chemotherapy**

- Introduction
- Sulfonamides and co-trimoxazole
- Penicillins and Cephalosporins
- Tetracyclines and Chloramphenicol
- Macrolides, Aminoglycosides, Polyene & Polypeptide antibiotics
- Quinolines and Fluroquinolines

**UNIT IV****Chemotherapy**

- Antifungal antibiotics
- Antiviral agents
- Chemotherapy of tuberculosis and leprosy
- Chemotherapy of Malaria
- Chemotherapy of protozoal infections (amoebiasis, Giardiasis)
- Pharmacology of Anthelmintic drugs

**UNIT V**

- **Chemotherapy** : Chemotherapy of cancer (Neoplasms)

**UNIT VI**

- **Immuno pharmacology**
- Pharmacology of immune suppressants and stimulants

**UNIT VII**

- **Principles of Animal toxicology** Acute, sub acute and chronic toxicity

**UNIT VIII**

- **The dynamic cell: The structures and functions of the components of the cell**
  - a) Cell and macromolecules: Cellular classification, subcellular organelles, macromolecules, large macromolecular assemblies
  - b) Chromosome structure: Pro and eukaryotic chromosome structures, chromatin structure, genome complexity, the flow of genetic information.
  - c) DNA replication: General, bacterial and eukaryotic DNA replication.
  - d) The cell cycle: Restriction point, cell cycle regulators and modifiers.
  - e) Cell signaling: Communication between cells and their environment, ion- channels, signal transduction pathways (MAP kinase, P38 kinase, JNK, Ras and PI3- kinase pathways, biosensors.

**UNIT IX**

- **The Gene: Genome structure and function:**  
Gene structure: Organization and elucidation of genetic code.
- **Gene expression:** Expression systems (pro and eukaryotic), genetic elements that control gene expression (nucleosomes, histones, acetylation, HDACS, DNA binding protein families. **Transcription and Transcription factors:** Basic principles of transcription in pro and eukaryotes. Transcription factors that regulate transcription in pro and eukaryotes.

**UNIT X**

- **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, traslocations, 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. Processes (gene transfer technology) and applications

The following details shall be submitted for any 25 selected drugs in the form of assignment/PPT.

\*\*Name of the Drug, Brand name, Category, Therapeutic uses, Dose, Pharmacological action, Route of administration, Side effects, Contraindications, Drug Interactions with drug/food, Pharmacokinetics



**Suggested Readings ( Theory):**

1. Tripathi, K. D. Essentials of medical pharmacology. 4<sup>th</sup> edition, 1999. Publisher: Jaypee, Delhi.
2. Satoskar, R.S. and Bhadarkar, S.D. Pharmacology and pharmacotherapeutics. 16<sup>th</sup> edition (single volume), 1999. Publisher: Popular, Dubai.
3. Rang, H.P. and Dale, M.M. Pharmacology. 4<sup>th</sup> edition, 1999. Publisher: Churchill Living stone.

**Reference Books (Latest Editions):**

1. Goodman Gilman, A., Rall, T.W., Nies, A.I.S. and Taylor, P. Goodman and Gilman's The pharmacological Basis of therapeutics. 9<sup>th</sup> edition, 1996. Publisher: Mc Graw Hill, Pergamon press.
2. Craig, C.R. and Stitzel, R.E. Modern Pharmacology. Latest edition. Publisher: Little Brown and company.
3. Katzung, B.G. Basic and clinical pharmacology. Latest edition. Publisher: Prentice Hall, International.
4. 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.

**PHARMACEUTICAL ANALYSIS -THEORY****4H 4C**

Instruction hours/ week: L: 3 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

**Theory : 4 Hrs. /Week****Course Objectives:**

- This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs.
- This subject is designed to impart a fundamental knowledge on the principles and instrumentation of spectroscopic and chromatographic technique.
- This also emphasizes on theoretical and Practical knowledge on modern analytical instruments that are used for drug testing.
- To discuss the applications of analytical techniques.
- To perform quantitative analysis of drugs using various analytical instruments.
- To perform qualitative analysis of drugs using various analytical instruments

**Course Outcomes (CO's):**

At the end of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis.	Understand
CO2	Describe the instrumentation of spectroscopy techniques.	Apply
CO3	Understand the chromatographic separation and analysis of drugs.	Understand
CO4	Discuss the applications of analytical techniques.	Apply
CO5	Perform quantitative analysis of drugs using various analytical instruments.	Apply
CO6	Perform qualitative analysis of drugs using various analytical instruments.	Apply

**Mapping with Programme Outcomes**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M		L							
CO2			S		S							
CO3			M		M							
CO4			S		S							
CO5			S		S							
CO6			S		M							

**S-Strong; M-Medium; L-Low**

**Course Content:****UNIT I****Quality Assurance:**

- a. Introduction, sources 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.

**UNIT II****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.

- h. **Column Chromatography:** Adsorption column chromatography, Operational technique, frontal analysis and elution analysis. Factors affecting column efficiency, applications and partition chromatography.
- i. **TLC:** Introduction, principle, techniques,  $R_f$  value and applications.
- j. **PC:** Introduction, principle, types of paper chromatography, preparation techniques, development techniques, applications.
- k. **Ion-exchange chromatography:** Introduction, principles, types of ion exchange synthetic resins, physical properties, factors affecting ion exchange, methodology and applications.
- l. **HPLC:** Introduction, Theory, instrumentation, and applications.
- m. **HPTLC:** Introduction, Theory, instrumentation, and applications.
- n. **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, derivatisation techniques, programmed temperature gas chromatography, applications.
- h. **Electrophoresis:** Principles of separation, equipment for paper and gelelectrophoresis, and application.
- i. **Gel filtration and affinity chromatography:** Introduction, technique, applications.

**UNIT III****Electrometric Methods:**

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

- **Potentiometry:** Electrical potential, electrochemical cell, reference electrodes, indicator electrodes, measurement of potential and pH, construction and working of electrodes, Potentiometric titrations, methods of detecting end point, Karl Fischer titration.
- **Conductometry:** Introduction, conductivity cell, conductometric titrations and applications.
- **Polarography:** Instrumentation, DME, residual current, diffusion current and limiting current, polarographic wave, Ilkovic's equation, Effect of oxygen on polarographic wave, Polarographic maxima and suppressors and applications.
- **Amperometric Titrations:** Introduction, types of electrodes used, reference and indicator electrode, instrumentation, titration procedure, advantages and disadvantages of Amperometry over potentiometry. Pharma applications.

**UNIT IV****Spectroscopy:**

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

**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 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.

**UNIT V**

**Instrumentation** – Photometer, UV Visible spectrometer – sources of UV – Visible radiations, collimating systems, monochromators, sample cells and following detectors – photocell Barrier layer cell, Phototube, Diode array, applications of U.V.-Visible spectroscopy in pharmacy and spectrophotometric titrations.

**UNIT VI**

**Infrared Spectroscopy:** Vibrational transitions, frequency – structure correlations, Infrared absorption bands, Instrumentation–IR spectro-meter – sources of IR, Collimating systems, monochromators, sample cells, sample handling in IR spectroscopy and detectors– Thermocouple, Golay Cells, Thermistor, Bolometer, Pyroelectric detector, Applications of IR in pharmacy.

**UNIT VII**

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

**Flame Photometry: Theory,** nebulisation, flame and flame temperature, interferences, flame spectrometric techniques and instrumentation and pharmaceutical applications.

**Atomic Absorption Spectrometry:** Introduction, Theory, types of electrodes, instrumentation and applications.

**UNIT VIII**

**Atomic Emission Spectroscopy:** Spectroscopic sources, atomic emission spectrometers, photographic and photoelectric detection.

**NMR & ESR (introduction only):** Introduction, theoretical aspects and applications.

**UNIT IX**

**Mass Spectroscopy: (Introduction only)** – Fragmentation, types of ions produced mass spectrum and applications.

**Polarimetry: (Introduction only)** – Introduction to optical rotatory dispersion, circular dichroism, polarimeter.

**UNIT X**

**X-RAY Diffraction: (Introduction only)** – Theory, reciprocal lattice concept, diffraction patterns and applications.

**Thermal Analysis:** Introduction, instrumentation, applications, and DSC and DTA.

**Suggested Readings:**

1. A.H.Beckett& J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I&II,  
StahlonePress of University of London.
2. A.I.Vogel, TextBook of Quantitative Inorganic analysis.
3. P.Gundu Rao, Inorganic Pharmaceutical Chemistry.
4. Bentley and Driver's Textbook of Pharmaceutical Chemistry.

**Reference Books**

1. John H. Kennedy, Analytical chemistry principles.
2. Indian Pharmacopoeia.

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THIRD YEAR

**PHARMACOTHERAPEUTICS II -THEORY****4H 4C**

Instruction hours/ week: L: 3 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

**Theory : 4 Hrs. /Week****Course Objectives:**

- 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.
- To know the importance of preparation of individualized therapeutic plans based on diagnosis
- To 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).
- To develop patient case based assessment skills

**Course Outcomes (CO's):**

At the end of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Know the pathophysiology of selected disease states and the rationale for drug therapy	Knowledge
CO2	Know the therapeutic approach to management of these diseases;	Analyse
CO3	Know the controversies in drug therapy;	Evaluate
CO4	Know the importance of preparation of individualised therapeutic plans based on diagnosis; and	Apply
CO5	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).	Evaluate
CO6	Students will be developing patient case based assessment skills	Create

Mapping with Programme Outcome:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	S	S	S		M	S	S		M		S
CO2		S			S	M					L
CO3	S	S	M		L						S
CO4					S		S			M	L
CO5	M				S	S		L		L	M
CO6					S			S		L	M

S-Strong; M-Medium; L-Low

**Course Outcomes (CO's):**

1. Know the pathophysiology of selected disease states and the rationale for drug therapy
2. Know the therapeutic approach to management of these diseases;
3. Know the controversies in drug therapy;
4. Know the importance of preparation of individualised therapeutic plans based on diagnosis; and
5. 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).
6. Students will be developing patient case based assessment skills

**Detailed syllabus and lecture wise schedule : Etiopathogenesis and pharmacotherapy of diseases associated with following systems / diseases –**

**UNIT I**

**Infectious disease:** Guidelines for the rational use of antibiotics and surgical Prophylaxis, Tuberculosis, Meningitis, Respiratory tract infections

**UNIT II**

**Infectious disease:** Gastroenteritis, Endocarditis, Septicemia

**UNIT III**

**Infectious disease:** Urinary tract infections, Protozoal infection- Malaria, HIV & Opportunistic infections

**UNIT IV**

**Infectious disease:** Fungal infections, Viral infections, Gonorrhoea and Syphilis

**UNIT V**

**Musculoskeletal disorders**

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



**UNIT VI****Renal system**

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

**UNIT VII**

**Oncology:** Basic principles of Cancer therapy, General introduction to cancer chemotherapeutic agents

**UNIT VIII**

Chemotherapy of breast cancer, leukemia.

**UNIT IX**

**Infectious disease:** Management of chemotherapy nausea and emesis

**UNIT X**

**Dermatology:** Psoriasis, Scabies, Eczema, Impetigo

**Suggested Readings:**

1. Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone publication

**Reference Books (Latest Editions):**

1. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange
2. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication
3. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA]

**PHARMACEUTICAL JURISPRUDENCE -THEORY****2H****2C**

Instruction hours/ week: L: 2 T:0 P:0

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

**Theory : 2 Hrs.****/WeekCourse****Objectives:**

- 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 is 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.
- To acquire clear idea on drug price control order and its implication in India.
- To acquire information regarding the licenses to be achieved for a new drug discovery process.

**Course Outcomes (CO's):**

At the end of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Practice the Professional ethics;	Apply
CO2	Understand the various concepts of the pharmaceutical legislation in India;	Understand
CO3	Know the various parameters in the Drug and Cosmetic Act and rules;	Knowledge
CO4	Know the Drug policy, DPCO, Patent and design act;	Knowledge
CO5	Understand the labeling requirements and packaging guidelines for drugs and cosmetics;	Understand
CO6	Be able to understand the concepts of Dangerous Drugs Act, Pharmacy Act and Exciseduties Act.	Understand

**Mapping with Programme Outcomes**

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1							S		
CO2									M
CO3									M
CO4									M
CO5									M
CO6									M

S-Strong; M-Medium; L-Low

**Detailed syllabus and lecture wise schedule:**

**UNIT I**

- **Pharmaceutical Legislations** – A brief review.
- Principle and Significance of professional ethics. Critical study of the code of pharmaceutical ethics drafted by PCI.

**UNIT II**

**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, V, 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.

**UNIT III**

**Pharmacy Act –1948.**

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

**UNIT IV**

**Medicinal and Toilet Preparation Act –1955.**

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

**UNIT V**

**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.

**UNIT VI**

**Study of Salient Features of Drugs and magic remedies Act and its rules.**

**UNIT VII**

**Study of essential Commodities Act Relevant to drugs price control Order.**

**UNIT VIII**

**Drug Price control Order & National Drug Policy (Current).**

**UNIT IX****Prevention of Cruelty to animals Act-1960.****Patents & design Act-1970.****UNIT X****Brief study of prescription and Non-prescription Products.****Assignments:****Format of the assignment**

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

**Case studies relating to**

- 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.
- Various prescription and non-prescription products.
- Medical and surgical accessories.
- Diagnostic aids and appliances available in the market.

**Suggested Readings:**

1. Mithal , B M. Textbook of Forensic Pharmacy. Calcutta :National; 1988.

**Reference Books (Latest Editions):**

1. Singh, KK, editor. Beotra's the Laws of Drugs, Medicines & cosmetics. Allahabad: Law Book House; 1984.
2. Jain, NK. A Textbook of forensic pharmacy. Delhi: Vallabh prakashan ; 1995.
3. Reports of the Pharmaceutical enquiry Committee
4. I.D.M.A., Mumbai. DPCO 1995
5. Various reports of Amendments.
6. Deshapande, S.W. The drugs and magic remedies act 1954 and rules 1955. Mumbai: Susmit Publications; 1998.
7. Eastern Book Company .The narcotic and psychotropic substances act 1985, Lucknow: Eastern; 1987.

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THIRD YEAR

**MEDICINAL CHEMISTRY -THEORY****4H 4C**

Instruction hours/ week: L: 3 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

**Theory : 4 Hrs. /Week****Course Objectives:**

- This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs.
- The subject emphasis on modern techniques of rational drug design like quantitative structure activity relationship (QSAR)
- To understand the prodrug concept, combinatorial chemistry and Computer aided drug design (CADD).
- The subject also emphasizes on the chemistry, mechanism of action, metabolism,
- To know adverse effects, Structure Activity Relationships (SAR) and therapeutic uses
- To synthesis of important drugs.

**Course Outcomes (CO's):**

At the end of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Illustrate the classification of drugs.	Understand
CO2	Explain the mechanism of action of drugs.	Apply
CO3	Understand the chemistry of drugs with respect to their biological activity.	Understand
CO4	Know the metabolism, adverse effects and therapeutic value of drugs.	Understand
CO5	Discuss the importance of SAR of drugs.	Understand
CO6	Understand the importance of drug design and different techniques of drug design.	Understand

## Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M										M	
CO2	M										M	
CO3	M										M	
CO4	M										M	
CO5	M										M	
CO6	M										M	

S-Strong; M-Medium; L-Low

**UNIT I**

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

**UNIT II**

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.

**UNIT III****Anti-infective agents**

- Local anti-infective agents
- Preservatives
- Antifungal agents
- Urinary tract anti-infectives

**UNIT IV****Anti-infective agents**

- Antitubercular agents
- Antiviral agents and Anti AIDS agents
- Antiprotozoal agents
- Anthelmintics
- Antiscabies and Antipedicular agents

**UNIT V**

- Sulphonamides and sulphones
- Antimalarials

**UNIT VI**

- Antibiotics
- Antineoplastic agents

**UNIT VII****Cardiovascular agents**

- Antihypertensive agents
- Antianginal agents and vasodilators

**UNIT VIII****Cardiovascular agents**

- Antiarrhythmic agents
- Antihyperlipidemic agents
- Coagulants and Anticoagulants
- Endocrine

**UNIT IX**

- Hypoglycemic agents
- Thyroid and Antithyroid agents

**UNIT X**

- Diuretics
- Diagnostic agents
- Steroidal Hormones and Adrenocorticoids

**Suggested Readings:**

1. Wilson and Gisvold's Text book of Organic, Medicinal and Pharmaceutical Chemistry, Lippincott-Raven Publishers-New York, Philadelphia.
2. William.O.Foye, Principles of Medicinal Chemistry, B.I. Waverly Pvt. Ltd., New Delhi.
3. Burgers, Medicinal Chemistry, M.E., Welly Med.Chemistry M.E. Walffed Johnwilley and Sons, Wiley-interscience Publication, New York, Toronto.
4. A Text Book of Medicinal Chemistry Vol. I and II by Surendra N. Pandeya, S.G. Publisher, 6, Dildayal Nagar, Varanasi -10.
5. Indian Pharmacopoeia 1985 and 1996. The Controller of Publications, Civil Lines, Delhi - 54.

**Reference Books (Latest Editions):**

1. Current Index of Medical Specialities (CIMS) and MIMS India, MIMS, A.E. Morgan Publications (I) Pvt. Ltd, New Delhi-19.
2. Organic Drug Synthesis-Ledniser Mitzsher Vol. I and II.
3. Pharmaceutical Chemistry drug Synthesis Vol. I and II by H. J. Roth and A. Kleemann.
4. The Science and Practice of Pharmacy Vol. 1 and 2, Remington, MACK Publishing Company, Easton, Pennsylvania.

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THIRD YEAR

**PHARMACEUTICAL FORMULATIONS -THEORY 3H 3C**

Instruction hours/ week: L: 2 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

**Theory : 3 Hrs. /Week****Course Objectives:**

- Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.
- To discover various formulation considerations in development of pharmaceutical dosage forms like tablets, capsules, etc.
- To Understand the quality control tests for the dosage forms.
- To know parenterals and novel drug delivery system.
- To understand clearly about packaging and cosmetic preparations.
- To interpret the various pharmaceutical additives to be included in all dosage forms.

**Course Outcomes (CO's):**

At the end of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Acquire knowledge about the various pharmaceutical dosage forms and their manufacturing techniques.	Knowledge
CO2	Discover various formulation considerations in development of pharmaceutical dosage forms like tablets, capsules, etc.	Create
CO3	Understand the quality control tests for the dosage forms.	Understand
CO4	Detail on parenterals and Novel Drug Delivery System.	Apply
CO5	Understand clearly about packaging and cosmetic preparations.	Apply
CO6	Interpret the various pharmaceutical additives to be included in all dosage forms	Analyze

**Mapping with Programme Outcomes**

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	L								
CO2	L								
CO3	L								
CO4	L								
CO5	L								
CO6	L								

S-Strong; M-Medium; L-Low



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**Detailed syllabus and lecture wise schedule:****UNIT I**

Pharmaceutical dosage form- concept and classification

**UNIT II**

**Tablets:** Formulation of different types of tablets, tablet excipients, granulation techniques quality control and evaluation of tablets.

**UNIT III**

Tablet coating, Type of coating, quality control tests for coated tablet.

**UNIT IV**

**Capsules;** Production and filling of hard gelatin capsules, Raw material for shell, finishing, quality control tests for capsules.

**UNIT V**

Production and filling of soft gelatin capsules, quality control tests for soft gelatin capsules.

**UNIT VI**

**Liquid orals:** Formulation and evaluation of suspensions, emulsions and solutions. Stability of these preparations

**UNIT VII**

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

**UNIT VIII**

**Ophthalmic preparations (Semi – Solids):** Introduction and classification Factors affecting absorption and anatomy of eye Packaging storage and labeling

**UNIT IX**

Ointments Types of Ointment Base Preparation of ointment, Jellies Types of jellies Formulation of jellies Suppositories, Method of preparation, Types Packaging

**UNIT X**

Definition and concept of Controlled and novel Drug delivery systems with available examples, viz. parenteral, trans dermal, buccal, rectal, nasal, implants, ocular

**Suggested Readings:**

1. Pharmaceutical dosage forms, Vol, I,II and III by lachman
2. Rowlings Text book of Pharmaceutics
3. Tutorial Pharmacy – Cooper & Gunn

**Reference Books (Latest Editions):**

1. Remington's Pharmaceutical Sciences
2. USP/BP/IP

**PHARMACOLOGY II -PRACTICAL 3H 2C**

Instruction hours/ week: L: 0 T:0 P:3

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

**Practical : 3 Hrs./Week****Course Objectives:**

- To Calculate the dose in pharmacological experiments.
- To Perform various pharmacological screening studies.
- To Demonstrate the toxicity studies in animal models.
- To know the student's t test, ANOVA, Chi square test, Wilcoxon Signed Rank test.
- To determine the pharmacokinetic parameters by using the data.
- To evaluate the acute skin irritation, acute eye irritation and corrosion of a test substance.

**Course Outcomes (CO's):**

On successful completion of the course the student will

COs	Course Outcomes	Blooms Level
CO1	Understand the pharmacological aspects of drugs falling under the above mentioned chapters,	Understand
CO2	Carryout the animal experiments confidently,	Apply
CO3	Appreciate the importance of pharmacology subject as a basis of therapeutics, and	Knowledge
CO4	Correlate and apply the knowledge therapeutically.	Analyze
CO5	Drugs acting on Blood and blood forming agents	Understand
CO6	Structures and functions of the components of the cell	Understand

**Mapping with Programme Outcomes**

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
COs											
CO1			S								
CO2			S	S							
CO3	S										
CO4	S			S							
CO5	S		S								
CO6			S								

**S-Strong; M-Medium; L-Low**

**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 method.
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, Rabbits).
13. Study of Theory, principle, procedure involved and interpretation of given results 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 rotarod.
  - f) Cardiotonic activity of drugs using isolated frog heart and mammalian heart preparations.

**Suggested Readings**

1. Tripathi, K. D. Essentials of medical pharmacology. 4<sup>th</sup> edition, 1999. Publisher: Jaypee, Delhi.
2. Satoskar, R.S. and Bhadarkar, S.D. Pharmacology and pharmacotherapeutics. 16<sup>th</sup> edition (single volume), 1999. Publisher: Popular, Dubai.
3. Rang, H.P. and Dale, M.M. Pharmacology. 4<sup>th</sup> edition, 1999. Publisher: Churchill Living stone.

**Reference Books (Latest Editions):**

1. 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.

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THIRD YEAR

**PHARMACEUTICAL ANALYSIS -PRACTICAL 3H 2C**

Instruction hours/ week: L: 0 T:0 P:3

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Practical : 3 Hrs./Week****Course Objectives:**

- To estimate the samples using analytical instruments.
- To perform assay of drug samples using analytical instruments
- To determine the effect of solvents on absorption maxima.
- To separate the mixtures of sample using chromatographic techniques.
- To demonstrate HPLC.
- To demonstrate gas chromatography.

**Course Outcomes**

At the end of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Estimate the samples using analytical instruments	Apply
CO2	Perform assay of drug samples using analytical instruments	Apply
CO3	Determine the effect of solvents on absorption maxima.	Apply
CO4	Separate the mixtures of sample using chromatographic techniques.	Apply
CO5	Demonstrate HPLC.	Apply
CO6	Demonstrate gas chromatography.	Apply

## Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			S	S								
CO2			S	S								
CO3			S	S								
CO4			S	M								
CO5			S	M								
CO6			S	M								

S-Strong; M-Medium; L-Low

**Course Content:****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 Supra 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.

**Suggested Readings:**

1. A.H.Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I&II, Stahlone Press of University of London.
2. A.I.Vogel, TextBook of Quantitative Inorganic analysis.
3. P.Gundu Rao, Inorganic Pharmaceutical Chemistry.
4. Bentley and Driver's Textbook of Pharmaceutical Chemistry.

**Reference Books (Latest Editions):**

1. John H. Kennedy, Analytical chemistry principles.
2. Indian Pharmacopoeia.

**PHARMACOTHERAPEUTICS II -PRACTICAL 3H 2C**

Instruction hours/ week: L: 0 T:0 P:3

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

**Practical : 3 Hrs./Week****Course Objectives:**

- 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.
- To know the importance of preparation of individualised therapeutic plans based on diagnosis
- To 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).
- To develop patient case based assessment skills

**Course Outcomes (CO's):**

At the end of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Know the pathophysiology of selected disease states and the rationale for drug therapy	Knowledge
CO2	Know the therapeutic approach to management of these diseases;	Analyse
CO3	Know the controversies in drug therapy	Evaluate
CO4	Know the importance of preparation of individualised therapeutic plans based on diagnosis; and	Apply
CO5	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).	Evaluate
CO6	Students will be developing patient case based assessment skills	Create

Mapping with Programme Outcome:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	S	S	S		M	S	S		M		S
CO2		S		M	S	M			M		S
CO3	S	S	M		L						
CO4					S	S			M	M	
CO5	M			S	S		S	L			L
CO6				S	S			S		M	L

S-Strong; M-Medium; L-Low

### Practicals :

- 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.
- 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 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.

### Suggested Readings:

1. Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone publication

### Reference Books (Latest Editions):

1. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange



**MEDICINAL CHEMISTRY -PRACTICAL 3H 2C**

Instruction hours/ week: L: 0 T:0 P:3

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

**Practical : 3 Hrs./Week****Course Objectives:**

- To prepare drugs and medicinally important compounds by traditional and microwave method.
- To prepare drug intermediates by traditional and microwave method.
- To perform assay of drug substances.
- To draw structures of chemicals using soft ware's.
- To determine physicochemical properties for drugs using software.
- To screen drug likeliness.

**Course Outcomes**

At the end of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Prepare drugs and medicinally important compounds by traditional and microwave method.	Apply
CO2	Prepare drug intermediates by traditional and micro wave method.	Apply
CO3	Perform assay of drug substances.	Apply
CO4	Draw structures of chemicals using softwares.	Apply
CO5	Determine physicochemical properties for drugs using software.	Understand
CO6	Screen drug like liness.	Understand

## Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M										
CO2	S	M										
CO3	S	M										
CO4	L	L										
CO5	M	L										
CO6	L	L										

S-Strong; M-Medium; L-Low

**CONTENT**

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.

**Suggested Readings:**

1. Wilson and Gisvold's Text book of Organic, Medicinal and Pharmaceutical Chemistry, Lippincott-Raven Publishers-New York, Philadelphia.
2. Indian Pharmacopoeia 1985 and 1996. The Controller of Publications, Civil Lines, Delhi - 54.

**Reference Books (Latest Editions):**

1. Current Index of Medical Specialities (CIMS) and MIMS India, MIMS, A.E. Morgan Publications (I) Pvt. Ltd, New Delhi-19.
2. Organic Drug Synthesis-Ledniser Mitzsher Vol. I and II.
3. Pharmaceutical Chemistry drug Synthesis Vol. I and II by H. J. Roth and A. Kleemann.
4. The Science and Practice of Pharmacy Vol. 1 and 2, Remington, MACK Publishing Company, Easton, Pennsylvania.

**PHARMACEUTICAL FORMULATIONS -PRACTICAL 3H 2C**

Instruction hours/ week: L: 0 T:0 P:3

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

**Practical : 3 Hrs./Week****Course Objectives:**

- To manufacture tablets.
- To understand the strict formulation considerations in parenteral and ophthalmic manufacturing.
- To demonstrate the evaluations of different packaging materials in pharmaceutical industry.
- To achieve skills in making a pharmaceutical product.
- To demonstrate the manufacturing of capsules.
- To exploit the formulation of various cosmetics.

**Course Outcomes (CO's):**

At the end of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Manufacture tablets.	Apply
CO2	Understand the strict formulation considerations in parenteral and ophthalmic manufacturing.	Understand
CO3	Demonstrate the evaluations of different packaging materials in pharmaceutical industry.	Evaluation
CO4	Achieve skills in making a pharmaceutical product.	Apply
CO5	Demonstrate the manufacturing of capsules.	Apply
CO6	Exploit the formulation of various cosmetics.	Analyze

## Mapping with Programme Outcomes

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	L								
CO2	L								
CO3	L								
CO4	L								
CO5	L								
CO6	L								

S-Strong; M-Medium; L-Low

**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)**

**Suggested Readings:**

1. Pharmaceutical dosage forms, Vol, I,II and III by lachman
2. Rowlings Text book of Pharmaceutics
3. Tutorial Pharmacy – Cooper & Gunn

**Reference Books (Latest Editions):**

1. Remington's Pharmaceutical Sciences
2. USP/BP/IP

**PHARMACOTHERAPEUTICS III -THEORY****4H****4C**

Instruction hours/ week: L: 3 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Theory : 4 Hrs. /Week****Course Objectives:**

- 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.
- To summarize the therapeutic approach to management of these diseases including reference to the latest available evidence;
- To diagnose a disease using biochemical & pathological Parameters.
- To discuss the preparation of individualized therapeutic plans based on diagnosis

**Course Outcome (CO's):**

On successful completion of the course the student will

COs	Course Outcomes	Blooms Level
CO1	Explain Pathophysiology of selected disease states and the rationale for drug therapy;	Evaluating
CO2	Understand the therapeutic approach to manage of these diseases;	Understanding
CO3	Diagnose a dynamic based on biochemical & Pathological Parameters;	Analyzing
CO4	Evaluate the importance of individualized therapeutic plans based on diagnosis;	Evaluating
CO5	Identify the patient-specific parameters relevant in initiating drug therapy, and monitoring drug therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects);	Applying
CO6	Demonstrate patient counselling points for various diseases;	Understanding

## Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	M										
CO2			S								
CO3			S								
CO4						M					
CO5			M								
CO6								M			

S-Strong; M-Medium; L-Low

**Etiopathogenesis and pharmacotherapy of diseases associated with following systems/ diseases:**

**UNIT I**

- **Gastrointestinal system:** Peptic ulcer disease, Gastro Esophageal Reflux Disease

**UNIT II**

- Inflammatory bowel disease

**UNIT III**

- Liver disorders - Alcoholic liver disease, Viral hepatitis including jaundice

**UNIT IV**

- Drug induced liver disorders.

**UNIT V**

- **Haematological system:** Anaemias, Venous thromboembolism

**UNIT VI**

- Drugs induced blood disorders.

**UNIT VII**

- **Nervous system:** Epilepsy, Parkinsonism, Stroke, Alzheimer's disease,

**UNIT VIII**

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

**UNIT IX**

- Pain management including Pain pathways, neuralgias, headaches.

**UNIT X**

- Evidence Based Medicine

The following details shall be submitted for any 25 selected drugs in the form of assignment/PPT.

\*\*Name of the Drug, Brand name, Category, Therapeutic uses, Dose, Pharmacological action, Route of administration, Side effects, Contraindications, Drug Interactions with drug/food, Pharmacokinetics

**Suggested Readings:**

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

**Reference Books (Latest Editions):**

1. Pathologic basis of disease - Robins SL, W.B.Saunders publication
2. Pathology and therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice - Green and Harris, Chapman and Hall publication
3. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication
4. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda -Kimble MA
5. Avery's Drug Treatment, 4th Edn, 1997, Adis International Limited.

**HOSPITAL PHARMACY -THEORY****3H 3C**

Instruction hours/ week: L: 2 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Theory : 3 Hrs. /Week****Course Objectives:**

- 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,
- to know drug dispensing, manufacturing of parenteral preparations,
- to understand drug information, patient counselling,
- to learn therapeutic drug monitoring for improved patient care.
- To know The Stores Management and Inventory Control.

**Course Outcome (CO's):**

Upon completion of the course, the student will –

COs	Course Outcomes	Blooms Level
CO1	Outline on hospital pharmacy Organize & understand the management of materials & finance;	Knowledge
CO2	Understand budget prepare and implementation in Hospital Pharmacy;	Knowledge
CO3	Illustrate the Stores Management and Inventory Control.	Knowledge
CO4	Discuss various drug distribution methods in hospital & for scheduled drugs;	Evaluate
CO5	Describe the manufacturing practices of various formulations in hospital set up & radio Pharmaceuticals;	Knowledge
CO6	Understand the professional practice management skills in hospital pharmacies;	Analyse

**Mapping with Programme Outcome**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	S	S					S		M		S
CO2		S	S	S		M	S		M		
CO3						S	S		S		S
CO4		S		S			S	M			
CO5	M	M					S	L			
CO6	M	M			S		S	L			

S-Strong; M-Medium; L-Low



**UNIT I****Hospital - its Organization and functions****UNIT II****Hospital pharmacy-Organization and management**

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

**UNIT III****The Budget – Preparation and implementation****Hospital drug policy**

- a) Pharmacy and Therapeutic committee (PTC)
- b) Hospital formulary

**UNIT IV****Hospital committees**

- Infection committee
- Research and ethical committee
- c) developing therapeutic guidelines
- d) Hospital pharmacy communication - Newsletter

**UNIT V****Hospital pharmacy services**

- Procurement & warehousing of drugs and Pharmaceuticals
- Inventory control
- Definition, various methods of Inventory Control  
ABC, VED, EOQ, Lead time, safety stock

**UNIT VI****Drug distribution in the hospital**

- Individual prescription method
- Floor stock method
- Unit dose drug distribution method

**UNIT VII****Distribution of Narcotic and other controlled substances****Central sterile supply services – Role of pharmacist**

**UNIT VIII****Manufacture of Pharmaceutical preparations**

Sterile formulations – large and small volume parenterals manufacture

Of Ointments, Liquids, and cream, **Pharmaceutical compounding**

**Sterile preparations:** Sterile compounding, Good Compounding Practices, Responsibility of Compounding personnel.

**UNIT IX**

Manufacturing of Tablets, granules, capsules, and powders

Total parenteral nutrition

**Continuing professional development programs**

Education and training

**Radio Pharmaceuticals – Handling and packaging****UNIT X****Professional Relations and practices of hospital pharmacist****Suggested Readings:**

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

**Reference Books (Latest Editions):**

1. WHO consultative group report.
2. R.P.S. Vol.2. Part –B; Pharmacy Practice section.
3. Handbook of pharmacy – health care. Edt. Robin J Harman. The Pharmaceutical press.

**CLINICAL PHARMACY -THEORY****4H 4C**

Instruction hours/ week: L: 3 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Theory : 4 Hrs.****/WeekCourse****objective:**

- To Monitor drug therapy of patient through medication chart review and clinical review;
- To Obtain medication history interview and counsel the patients;
- To Identify and resolve drug related problems;
- To detect, assess and monitor adverse drug reaction;
- To Interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states; and
- To Retrieve, analyse, interpret and formulate drug or medicine information.

**Course Outcomes (CO's):**

On successful completion of the course the student will

<b>Cos</b>	<b>Course Outcomes</b>	<b>Blooms Level</b>
CO1	Describe the daily activities of clinical Pharmacist in improving the patient case.	Understand
CO2	Understand the basis for evaluating the biomedical literatures;	Evaluate
CO3	Identify and resolve drug related problems;	Apply
CO4	Detect, assess and monitor adverse drug reaction;	Apply
CO5	Interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states;	Evaluate
CO6	Retrieve, analyse, interpret and formulate drug or medicine information.	Create

## Mapping with Programme Outcomes

<b>POs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>
<b>Cos</b>											
CO1	S									S	S
CO2	S										
CO3	S			S			S				
CO4	S		S							S	M
CO5	S		S				S			M	
CO6	S	S	S		S	M	S			M	

S-Strong; M-Medium; L-Low

**Detailed syllabus and lecture wise schedule:****UNIT I****Definitions, development and scope of clinical pharmacy****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

**UNIT II**

- Medication history
- Patient counseling

**UNIT III**

- Drug utilisation evaluation (DUE) and review (DUR)

**UNIT IV**

- Quality assurance of clinical pharmacy services

**UNIT V**

- **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.

- **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

**UNIT VI**

- **Drug & Poison information**
  - Introduction to drug information resources available
  - Systematic approach in answering DI queries

- Critical evaluation of drug information and literature
- Preparation of written and verbal reports
- Establishing a Drug Information Centre
- Poisons information- organization & information resources

## UNIT VII

### Pharmacovigilance

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

## UNIT VIII

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

## UNIT IX

- Pharmaceutical care concepts
- Critical evaluation of biomedical literature

## UNIT X

- Medication errors

### Suggested Readings:

1. Practice Standards and Definitions - The Society of Hospital Pharmacists of Australia.
2. Basic skills in interpreting laboratory data - Scott LT, American Society of Health System Pharmacists Inc.
3. Biopharmaceutics and Applied Pharmacokinetics - Leon Shargel, Prentice Hall publication.
4. A text book of Clinical Pharmacy Practice; Essential concepts and skills, Dr.G.Parthasarathi et al, Orient Orient Langram Pvt. Ltd. ISSN8125026

### Reference Books (Latest Editions):

- 1 Australian drug information -Procedure manual. The Society of Hospital Pharmacists of Australia.
- 2 Clinical Pharmacokinetics - Rowland and Tozer, Williams and Wilkins Publication.
- 3 Pharmaceutical statistics. Practical and clinical applications. Sanford Bolton, MarcelDekker, Inc.

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FOURTH YEAR

**BIostatistics AND RESEARCH METHODOLOGY -THEORY 3H 3C**

Instruction hours/ week: L: 2 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Theory : 3 Hrs.****/Week Course****Objectives:**

- To understand some basic concepts of research and its methodologies
- To identify appropriate research topics
- To select and define appropriate research problem and parameters
- To prepare a project proposal
- To organize and conduct research in a more appropriate manner
- To write a research report and thesis

**Course Outcomes (CO's):**

A successful completion of this subject it is expected that students will be able to

COs	Course Outcomes	Blooms Level
CO1	Understand some basic concepts of research and its methodologies.	Understand
CO2	Execute computer applications in Hospital Pharmacy.	Knowledge
CO3	Select and define appropriate research problem and parameters.	Knowledge
CO4	Construct various data graphics in research.	Knowledge
CO5	Organize and conduct research in a more appropriate manner.	Apply
CO6	Implement statistical parameter in research.	Apply

**Mapping with Programme Outcomes:**

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2			S									
CO3					M							
CO4								M				
CO5											S	
CO6			S									

S-Strong; M-Medium; L-Low

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**Course Content:****UNIT I****Research Methodology**

- Types of clinical study designs:
- Case studies, observational studies, interventional studies,
- Designing the methodology
- 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
- Report writing and presentation of data

**UNIT II****Biostatistics**

- Introduction
- Types of data distribution
- Measures describing the central tendency distributions- average, median, mode
- Measurement of the spread of data-range, variation of mean, standard deviation, variance, coefficient of variation, standard error of mean.

**UNIT III****Data graphics**

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

**UNIT IV**

- **Basics of testing hypothesis**
  - Null hypothesis, level of significance, power of test, P value, statistical estimation of confidence intervals.
  - Level of significance (Parametric data)- students t test (paired and unpaired), chi Square test, Analysis of Variance (one-way and two-way)
  - 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)
  - Linear regression and correlation- Introduction, Pearson's and Spearman's correlation and correlation coefficient.
  - Introduction to statistical software: SPSS, Epi Info, SAS.

**UNIT V**

- **Statistical methods in epidemiology**

Incidence and prevalence, relative risk, attributable risk

**UNIT VI**

- **Computer applications in pharmacy**

**UNIT VII**

- **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.

**UNIT VIII**

- **Computer In Community Pharmacy**

Computerizing the Prescription Dispensing process

Use of Computers for Pharmaceutical Care in community pharmacy

**UNIT IX**

- Accounting and General ledger system

**UNIT X**

- **Drug Information Retrieval & Storage :**

Introduction – Advantages of Computerized Literature Retrieval

Use of Computerized Retrieval

**Suggested Readings:**

1. Pharmaceutical statistics- Practical and clinical applications, Sanford

Bolton 3<sup>rd</sup> edition, publisher Marcel Dekker Inc. New York.

**Reference Books (Latest Editions):**

1. Drug Information- A Guide for Pharmacists, Patrick M Malone, Karen L Kier, John E

Stanovich , 3<sup>rd</sup> edition, McGraw Hill Publications 2006



**BIOPHARMACEUTICS AND PHARMACOKINETICS -THEORY 4H 4C**

Instruction hours/ week: L: 3 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Theory: 4 Hrs. /Week****Course Objectives:**

- This subject is designed to impart knowledge and skills of Biopharmaceutics and pharmacokinetics and their applications in pharmaceutical development, design of dose and dosage regimen and in solving the problems raised therein.
- To explain the use of plasma drug concentration-time data to calculate the pharmacokinetic parameters.
- To understand the concepts of bioavailability and bioequivalence of drug products and their significance.
- To understand various pharmacokinetic parameters, their significance & applications.
- To demonstrate a clear information on compartmental models and methods to assess the models.
- To describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.

**Course Outcomes (CO's):** At the end of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance.	Understand
CO2	Explain the use of plasma drug concentration-time data to calculate the pharmacokinetic parameters.	Understand
CO3	Understand the concepts of bioavailability and bioequivalence of drug products and their significance.	Understand
CO4	Understand various pharmacokinetic parameters, their significance & applications.	Analyze
CO5	Demonstrate a clear information on compartmental models and methods to assess the models.	Apply
CO6	Describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.	Understand

## Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1		S					M				
CO2		S					M		M	L	M
CO3	S		S	S	M	M	M	S	M		M
CO4		M	M	M	M	M	M		M	M	S
CO5			M	S			S		M		M
CO6			M	M	M						

S-Strong; M-Medium; L-Low

**UNIT I****Biopharmaceutics**

## Introduction to Biopharmaceutics

- Absorption of drugs from gastrointestinal tract.
- Drug Distribution.
- Drug Elimination.

**UNIT II****Introduction to Pharmacokinetics.**

- Mathematical model
- Drug levels in blood.
- Pharmacokinetic model
- Compartment models
- Pharmacokinetic study.

**UNIT III****One compartment open model.**

- Intravenous Injection (Bolus)
- Intravenous infusion.

**UNIT IV****Multicompartment models.**

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

**UNIT V****Multiple – Dosage Regimens.**

- Repetitive Intravenous injections – One Compartment Open Model
- Repetitive Extravascular dosing – One Compartment Open model
- Multiple Dose Regimen – Two Compartment Open Model

**UNIT VI****Nonlinear Pharmacokinetics.**

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

**UNIT VII****Non-compartmental Pharmacokinetics.**

- Statistical Moment Theory.
- MRT for various compartment models.

**UNIT VIII**

- Physiological Pharmacokinetic model.

**UNIT IX****Bioavailability and Bioequivalence.**

- Introduction.
- Bioavailability study protocol.

**UNIT X**

- Methods of Assessment of Bioavailability

**Suggested Readings:**

- 1 Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi
- 2 Remington's Pharmaceutical Sciences, By Mack Publishing Company, Pennsylvania.
- 3 Pharmacokinetics: By Milo Gibaldi Donald, R. Merceel Dekker Inc.
- 4 Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.
- 5 Biopharmaceutics and Pharmacokinetics; By Robert F Notari

**Reference Books (Latest Editions):**

1. Biopharmaceutics; By Swarbrick
2. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B.Jaiswal, Vallabh Prakashan Pitampura, Delhi
3. Cilincal Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and Thomas, N. Tozen, Lea and Febrger, Philadelphia, 1995.

**CLINICAL TOXICOLOGY -THEORY****3H 3C**

Instruction hours/ week: L: 2 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Theory : 3 Hrs. /Week****Course Objectives:**

- To understand the general working knowledge of the principles and practice of clinical toxicology
- To know the health implications of toxic exposures and commonly involved chemicals for toxicity
- To understand principles of general toxicology and clinical management practice.
- To demonstrate and apply history, assessment and therapy considerations associated with the management of a toxic exposure.
- To understand treatment guidelines for specific toxic substances.
- To get knowledge about preventive approaches to reduce unintentional poisoning.

**Course Outcomes (CO's):**

On successful completion of the course the student will

COs	Course Outcomes	Blooms Level
CO1	Understand the general working principles and practice of clinical toxicology	Understand
CO2	The health implications of toxic exposures and commonly involved chemicals for toxicity	Apply
CO3	Understand principles of general toxicology and clinical management practice.	Understand
CO4	Demonstrate the assessment and therapy considerations associated with the management of a toxic exposure.	Apply
CO5	Understand treatment guidelines for specific toxic substances.	Understand
CO6	Knowledge about preventive approaches to reduce unintentional poisoning	Knowledge

## Mapping with Programme Outcomes

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
COs											
CO1	S										
CO2	S										
CO3	S										
CO4	S										
CO5	S										
CO6	S										

S-Strong; M-Medium; L-Low

**UNIT I**

- General principles involved in the management poisoning
- Antidotes and the clinical applications.
- Supportive care in clinical Toxicology.

**UNIT II**

- Gut Decontamination.
- Elimination Enhancement.
- Toxicokinetics.

**UNIT III**

Clinical symptoms and management of acute poisoning with the following agents –

- Pesticide poisoning: organophosphorous compounds, carbamates, organochlorines, pyrethroids.
- Opiates overdose.
- Antidepressants
- Barbiturates and benzodiazepines.

**UNIT IV**

Clinical symptoms and management of acute poisoning with the following agents –

Alcohol: ethanol, methanol.

- Paracetamol and salicylates.
- Non-steroidal anti-inflammatory drugs.

**UNIT V**

- Clinical symptoms and management of acute poisoning with the following agents –Hydrocarbons: Petroleum products and PEG.
- Caustics: inorganic acids and alkali.
- Radiation poisoning

**UNIT VI**

- Clinical symptoms and management of chronic poisoning with the following agents – Heavy metals: Arsenic, lead, mercury, iron, copper

**UNIT VII**

- Clinical symptoms and management of acute poisoning with the following agents – Venomous snake bites: Families of venomous snakes, clinical effects of venoms, general management as first aid, early manifestations, complications and snake bite injuries.

**UNIT VIII**

- Plants poisoning. Mushrooms, Mycotoxins. Food poisonings
- Envenomations – Arthropod bites and stings.

**UNIT IX****Substance abuse:**

Signs and symptoms of substance abuse and treatment of dependence

- CNS stimulants :amphetamine
- Opioids
- CNS depressants

**UNIT X**

Hallucinogens: LSD

- Cannabis group
- Tobacco

The following details shall be submitted for any 25 selected drugs in the form of assignment/PPT.

\*\*Name of the Drug, Brand name, Category, Therapeutic uses, Dose, Pharmacological action, Route of administration, Side effects, Contraindications, Drug Interactions with drug/food, Pharmacokinetics.

**Suggested Readings:**

1. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi
2. Matthew J Ellenhorn. Ellenhorns Medical Toxicology – Diagnosis and Treatment of Poisoning. Second edition. Williams and Willkins publication, London

**Reference Books (Latest Editions):**

1. V V Pillay. Handbook of Forensic Medicine and Toxicology. Thirteenth edition 2003  
Paras Publication, Hyderabad

**PHARMACOTHERAPEUTICS III -PRACTICAL 3H 2C**

Instruction hours/ week: L: 0 T:0 P:3

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Practical : 3 Hrs./Week****Course Objectives:**

- 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.
- To summarize the therapeutic approach to management of these diseases including reference to the latest available evidence;
- To discuss the controversies in drug therapy;
- To discuss the preparation of individualized therapeutic plans based on diagnosis

**Course Outcome (CO's):** On successful completion of the course the student will

COs	Course Outcomes	Blooms Level
CO1	Analyze individual cases for various diseases;	Analyzing
CO2	Present case reports for various diseases;	Analyzing
CO3	Demo Patient counselling points;	Understanding
CO4	Identify advance drug reactions;	Applying
CO5	Analyze various drug interactions;	Analyzing
CO6	Manage selection of drug therapy during ward rounds participations;	Evaluating

**Mapping with Programme Outcomes**

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1			S								
CO2			M					M			
CO3								M			
CO4			M								
CO5			M								
CO6			M								

S Strong; M-Medium; L-Low

**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.

**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.

**Suggested Readings:**

1. Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone publication

**Reference Books (Latest Editions):**

1. Pathologic basis of disease - Robins SL, W.B.Saunders publication
2. Pathology and therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice - Green and Harris, Chapman and Hall publication



**HOSPITAL PHARMACY -PRACTICAL****3H 2C**

Instruction hours/ week: L: 0 T:0 P:3

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

**Practical : 3 Hrs./Week****Course Objectives:**

- 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,
- to know drug dispensing, manufacturing of parenteral preparations,
- to understand drug information, patient counselling,
- to learn therapeutic drug monitoring for improved patient care.
- To know The Stores Management And Inventory Control.

**Course Outcome (CO's):**

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

COs	Course Outcomes	Blooms Level
CO1	Evaluate drug interactions in outpatient prescriptions;	Analyse
CO2	Evaluate drug interactions in ward prescription;	Analyse
CO3	Defending drug information queries;	Evaluate
CO4	Identify adverse drug reaction	Understand
CO5	Assessing drug inventory control in Hospital Pharmacy	Create
CO6	Assessing drug inventory control in Nursing Station.	Create

**Mapping with Programme Outcome**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	S		M	S	S	L			L	
CO2	M	M	S		M	S	S	L			L	
CO3	M	S			S	S	S	S			M	
CO4		S		S	S			S				
CO5	S	S	M		M	S		M	L			
CO6	S	S	M		M	S		M	L			

S-Strong; M-Medium; L-Low

**COURSE CONTENT**

1. Assessment of drug interactions in the given prescriptions
2. Drug information queries.
3. 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. Sterile compounding

**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.

**Suggested Readings:**

1. Hospital pharmacy by William E. Hassan

**Reference Books (Latest Editions):**

1. WHO consultative group report.
2. R.P.S. Vol.2. Part –B; Pharmacy Practice section.

**CLINICAL PHARMACY -PRACTICAL****3H 2C**

Instruction hours/ week: L: 0 T:0 P:3

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

**Practical : 3 Hrs./Week****Course objective:**

- To Monitor drug therapy of patient through medication chart review and clinical review
- To Obtain medication history interview and counsel the patients;
- To Identify and resolve drug related problems;
- To detect, assess and monitor adverse drug reaction;
- To Interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states; and
- To Retrieve, analyse, interpret and formulate drug or medicine information.

**Course Outcomes (CO's):**

On successful completion of the course the student will

COs	Course Outcomes	Blooms Level
CO1	Demonstrate patient medication history	Understand
CO2	Illustrate patient counseling interview;	Apply
CO3	Defending drug information queries;	Evaluate
CO4	Detect, assess and monitor adverse drug reaction;	Evaluate
CO5	Interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states;	Apply
CO6	Analyze and interpret drug or medicine information.	Evaluate

## Mapping with Programme Outcomes

Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
<b>COs</b>											
CO1	S	S	S	L		M	M			M	M
CO2	S	S	S		S	M		S	M	L	
CO3	S		S	M				M			M
CO4	S		S		L	L	L			S	M
CO5		S								M	
CO6	S	S	S		S	M	S			M	

S-Strong; M-Medium; L-Low

Students are expected to perform 15 Practicals in the following areas covering the topics dealt in Theory class.

- 1 Answering drug information questions (4 Nos)
- 2 Patient medication counseling (4 Nos)
- 3 Case studies related to laboratory investigations (4 Nos)
- 4 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. 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.

**Suggested Readings:**

1. Practice Standards and Definitions - The Society of Hospital Pharmacists of Australia.
2. A text book of Clinical Pharmacy Practice; Essential concepts and skills, Dr.G.Parthasarathi etal, Orient Orient Langram Pvt. Ltd. ISSN8125026

**Reference Books (Latest Editions):**

- 1 Australian drug information -Procedure manual. The Society of Hospital Pharmacists of Australia.
- 2 Clinical Pharmacokinetics - Rowland and Tozer, Williams and Wilkins Publication.

**BIOPHARMACEUTICS AND PHARMACOKINETICS -PRACTICAL****3H****2C**

Instruction hours/ week: L: 0 T:0 P:3

Marks: Internal: 30 External: 70 Total: 100

**Practical: 3 Hrs./Week**

External Semester Exam: 3 Hours

**Course Objectives:**

- This subject is designed to impart knowledge and skills of Biopharmaceutics and pharmacokinetics and their applications in pharmaceutical development, design of dose and dosage regimen and in solving the problems raised therein.
- To explain the use of plasma drug concentration-time data to calculate the pharmacokinetic parameters.
- To understand the concepts of bioavailability and bioequivalence of drug products and their significance.
- To understand various pharmacokinetic parameters, their significance & applications.
- To demonstrate a clear information on compartmental models and methods to assess the models.
- To describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.

**Course Outcomes (CO's):** At the end of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance.	Analyze
CO2	Explain the use of plasma drug concentration-time data to calculate the pharmacokinetic parameters.	Analyze
CO3	Understand the concepts of bioavailability and bioequivalence of drug products and their significance.	Analyze
CO4	Understand various pharmacokinetic parameters, their significance & applications.	Analyze
CO5	Demonstrate a clear information on compartmental models and methods to assess the models.	Understand
CO6	Describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.	Understand

## Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	S	M	M								
CO2	S	M	M	M					L		
CO3			S								
CO4	S	M		M					M		
CO5	S	M	S	M							
CO6	S	M	S	M							

S-Strong; M-Medium; L-Low

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, Sulphamethoxzole, 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.

**Suggested Readings:**

1. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi
2. Biopharmaceutics and Pharmacokinetics; By Robert F Notari

**Reference Books (Latest Editions):**

1. Biopharmaceutics; By Swarbrick
2. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and SunilB.Jaiswal, Vallabh Prakashan Pitampura, Delhi.

**CLINICAL RESEARCH -THEORY****4H 4C**

Instruction hours/ week: L: 3 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Theory : 4 Hrs. /Week****Course Objectives:**

- Understand various approaches to drug discovery
- Understand the regulatory and ethical process
- Describe the new drug development process
- Estimate and Discuss the clinical trials activities
- Estimate safety monitoring and reporting in clinical trials
- Identify preventive approaches to reduce unintentional poisoning.
- Related the roles & responsibilities of Clinical trial Personnels.

**Course Outcomes (CO's):**

On successful completion of the course the student will

COs	Course Outcomes	Blooms Level
CO1	Summarize the various approaches to drug discovery	Understanding
CO2	Explain the regulatory and ethical process	Understanding & Applying
CO3	Describe the new drug development process	Applying
CO4	Estimate and Discuss the clinical trials activities	Remembering& Applying
CO5	Estimate safety monitoring and reporting in clinical trials	Analyzing and Evaluating
CO6	Identify preventive approaches to reduce unintentional poisoning	Creating
CO7	Describe the roles & responsibilities of Clinical trial Personnel.	Understanding

## Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	S	S		S	S				S	L	S
CO2	S		S		S	S	S		S		
CO3	S	S	S	S	M				S	M	S
CO4	S		M	S	M	S		S	M		L
CO5	S	M	S	M	M	M	S		S	S	
CO6	M	S	S			S		S	M		L
CO7	S		M			M	M	S	M	M	

S-Strong; M-Medium; L-Low

**UNIT I**

- **Drug development process:** Introduction Various Approaches to drug discovery
- Pharmacological
- Toxicological

**UNIT II**

- IND Application
- Drug characterization
- Dosage form

**UNIT III****Clinical development of drug:**

- Introduction to Clinical trials
- Various phases of clinical trial.
- Methods of post marketing surveillance

**UNIT IV**

Abbreviated New Drug Application submission.

- Good Clinical Practice – ICH, GCP, Central drug standard control organisation (CDSCO) guidelines
- Challenges in the implementation of guidelines
- Ethical guidelines in Clinical Research

**UNIT V**

- Composition, responsibilities, procedures of IRB / IEC
- Overview of regulatory environment in USA, Europe and India.

**UNIT VI**

Role and responsibilities of clinical trial personnel as per ICH GCP

- Sponsor
- Investigators
- Clinical research associate
- Auditors
- Contract research coordinators
- Regulatory authority

**UNIT VII**

- Designing of clinical study documents (protocol, CRF, ICF, PIC with assignment)

**UNIT VIII**

- Informed consent Process



**UNIT IX**

- Data management and its components

**UNIT X**

- Safety monitoring in clinical trials.

**Suggested Readings:**

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

**Reference Books (Latest Editions):**

1. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.
2. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.

## PHARMACOEPIDEMOLOGY AND PHARMACOECONOMICS -THEORY

**4H 4C**

Instruction hours/ week: L: 3 T: 1 P: 0

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours

**Theory: 4 Hrs. /Week**

**Course Objectives:**

- Identify the application pharmacoepidemiology and pharmacoeconomics in clinical settings
- Discuss the various pharmacoepidemiology outcome measures.
- Understand the concept of risk in pharmacoepidemiology and different methods of measuring risk
- Examine various pharmacoepidemiological methods
- Interpret various types case studies
- Asses about current pharmacoenomic evaluation methods

**Course Outcomes (CO's):**

On successful completion of the course the student will

COs	Course Outcomes	Blooms Level
CO1	Identify the application pharmacoepidemiology and pharmacoeconomics in clinical setting	Analyse
CO2	Discuss the various pharmacoepidemiology outcome measures.	Evaluate
CO3	Understand the concept of risk in pharmacoepidemiology and different methods of measuring risk	Knowledge
CO4	Examine various pharmacoepidemiological methods	Analyse
CO5	Interpret various types case studies	Evaluate
CO6	Asses about current pharmacoenomic evaluation methods	Create

**Mapping with Programme Outcome**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1					M	S		S		S	M
CO2	S	S		S						S	S
CO3	S	M			M						S
CO4	S	M				L	M				S
CO5	M	S	S			S	S	S	S	M	M
CO6	M			S	S	S	S	M	S	M	M

S-Strong; M-Medium; L-Low

**UNIT I****Pharmacoepidemiology:**

- **Definition and scope:**
- Origin and evaluation of pharmacoepidemiology need for pharmacoepidemiology, aims and applications.

**UNIT II**

- **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 doses, medication adherence measurement

**UNIT III**

- **Concept of risk in pharmacoepidemiology**
- Measurement of risk, attributable risk and relative risk, time-risk relationship and odds ratio

**UNIT IV****Pharmacoepidemiological methods**

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

**UNIT V**

- 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.

**UNIT VI**

- **Sources of data for pharmacoepidemiological studies** Ad Hoc data sources and automated data systems

**UNIT VII**

- **Selected special applications of pharmacoepidemiology**

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

**UNIT VIII****Pharmacoeconomics:**

- **Definition, history, needs of pharmacoeconomic evaluations**
- Role in formulary management decisions

**UNIT IX****Pharmacoeconomic 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

**UNIT X**

- **Applications of Pharmacoeconomics** Software and case studies

**Suggested Readings:**

1. Rascati K L. Essentials of Pharmacoeconomics, 2nd ed. Philadelphia: Woulters Kluwer Lippincott Williams & Wilkins, 2013
2. Thomas E Getzen. Health economics. Fundamentals and Flow of Funds. 1997, 2003. John Wiley & Sons, second edition
3. Andrew Briggs, Karl Claxton, Mark Sculpher. Decision Modelling for Health Economic Evaluation, Published by the Oxford University Press 2006

**Reference Books**

1. Michael Drummond, Mark Sculpher, George Torrence, Bernie O'Brien and Greg Stoddart. Methods for the Economic Evaluation of Health Care Programmes Oxford University Press (Third Edition) – 2005.
2. George E Mackinnon III. Understanding health outcomes and pharmacoeconomics, 2013.

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FIFTH YEAR

**CLINICAL PHARMACOKINETICS AND PHARMACOTHERAPEUTIC  
DRUG MONITORING -THEORY**

3H 3C

Instruction hours/ week: L: 2 T:1 P:0

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Theory: 3 Hrs. /Week****Course Objectives:**

- This subject is designed to impart knowledge and skills of Biopharmaceutics and pharmacokinetics and their applications in pharmaceutical development, design of dose and dosage regimen and in solving the problems arised therein.
- To explain the use of plasma drug concentration-time data to calculate the pharmacokinetic parameters.
- To understand the concepts of bioavailability and bioequivalence of drug products and their significance.
- To understand various pharmacokinetic parameters, their significance & applications.
- To demonstrate a clear information on compartmental models and methods to assess the models.
- To describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.

**Course Outcomes (CO's):**

On successful completion of the course the student will

COs	Course Outcomes	Blooms Level
CO1	Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance.	Understand
CO2	Demonstrate compartmental models its methods.	Understand
CO3	Describe Therapeutic drug monitoring of drugs in various disease conditions	Apply
CO4	Discuss various pharmacokinetic parameters, their significance & applications.	Apply
CO5	Evaluate dosage adjustment in renal and hepatic impairment	Apply
CO6	Discuss genetic polymorphisim in drug metabolism	Knowledge

## Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2	S			M								
CO3			M									
CO4								M			M	
CO5	S					M			M			
CO6									S			

S-Strong; M-Medium; L-Low

**UNIT I**

- **Introduction to Clinical pharmacokinetics.**

**UNIT II**

- **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.

**UNIT III****Pharmacokinetics of Drug Interaction:**

- Pharmacokinetic drug interactions
- Inhibition and Induction of Drug metabolism
- Inhibition of Biliary Excretion.

**UNIT IV****Therapeutic Drug monitoring:**

- Introduction
- Individualization of drug dosage regimen (Variability – Genetic, Age and Weight, disease, Interacting drugs).
- Indications for TDM. Protocol for TDM.

**UNIT IV****Pharmacokinetic/Pharmacodynamic Correlation in drug therapy.**

- TDM of drugs used in the following disease conditions: cardiovascular disease, Seizure disorders, Psychiatric conditions, and Organ transplantations.

**UNIT V****Dosage adjustment in Renal and hepatic Disease.**

- Renal impairment, Pharmacokinetic considerations

**UNIT VI**

General approach for dosage adjustment in Renal disease.

- Measurement of Glomerular Filtration rate and creatinine clearance.
- Dosage adjustment for uremic patients.

**UNIT VII**

- Extracorporeal removal of drugs.
- Effect of Hepatic disease on pharmacokinetics.

**UNIT VIII****Population Pharmacokinetics.**

- Introduction to Bayesian Theory.
- Adaptive method or Dosing with feed back.
- Analysis of Population pharmacokinetic Data.

**UNIT IX****Pharmacogenetics**

- Genetic polymorphism in Drug metabolism: Cytochrome P-450 Isoenzymes.
- Genetic Polymorphism in Drug Transport and Drug Targets.

**UNIT X**

- Pharmacogenetics and Pharmacokinetics / Pharmacodynamic considerations

The following details shall be submitted for any 25 selected drugs in the form of assignment/PPT.

\*\*Name of the Drug, Brand name, Category, Therapeutic uses, Dose, Pharmacological action, Route of administration, Side effects, Contraindications, Drug Interactions with drug/food, Pharmacokinetics

**Suggested Readings:**

1. Leon Shargel, Susanna Wu-Pong, Andrew Yu. Applied Biopharmaceutics & Pharmacokinetics. 6th edition. New York: Mc Graw Hill; 2012.
2. Peter L. Bonate. Pharmacokinetic - Pharmacodynamic Modeling and Simulation. 2nd edition. USA: Springer; 2011.
3. Michael E. Burton, Leslie M. Shaw, Jerome J. Schentag, William E. Evans. Applied Pharmacokinetics & Pharmacodynamics: Principles of Therapeutic Drug Monitoring. 4th edition. US: Lippincott Williams & Wilkins; 2005.

**Reference Books (Latest Editions):**

1. Steven How-Yan Wong, Irving Sunshine. Handbook of Analytical Therapeutic Drug Monitoring and Toxicology. 1st edition. USA: CRC Press; 1996.
2. Soraya Dhillon, Andrzej Kostrzewski. Clinical pharmacokinetics. 1st edition. London: Pharmaceutical Press;2006.



## CLERKSHIP

1H

1C

Instruction hours/ week: L:0 T:0 P:1

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

Seminar: 1 Hrs. /Week

## SEMINAR &amp; CASE PRESENTATION ASSESSMENT RUBRIC

Ward:		Date:				
Title of presentation:						
Name:		ID No:		Group		
Scope of Evaluation						
Objectives		Poor		↔	Excellent	
		1	2	3	4	5
1.	Provide clear objectives and able to answer them at the end of the presentation.	1	2	3	4	5
<b>Case Summary</b>						
2.	Case presented with adequate information on bio-data, chief complaints and histories.	1	2	3	4	5
3.	Case presented with adequate information on review of systems, lab investigations and review of hospital course.	1	2	3	4	5
<b>Evaluation of drug therapy</b>						
4.	Able to identify, describe and explain the significance of patient-specific PCIs.	1	2	3	4	5
5.	Able to assess through the hospital course, any important occurrences, therapeutic intervention, appropriate subjective and objective data to demonstrate the therapeutic efficacy or toxicity.	1	2	3	4	5
6.	Able to correlate pharmacokinetics (ADME) of the drugs which may affect the patient's therapy.	1	2	3	4	5
7.	Able to recommend how the management may be improved. (Drug choice, monitoring parameters, therapeutic outcome, patient education)	1	2	3	4	5
<b>Application of literature or references to case discussion</b>						
8.	Able to select updated and relevant literature and correlate the finding to the discussion.	1	2	3	4	5
<b>Delivery of presentation</b>						
9.	Able to present in a professional manner with appropriate flow in the allocated time.	1	2	3	4	5
10.	Able to handle Q&A session and rationalize the answer.	1	2	3	4	5
Total		=	/50	=	/	100%

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Sign and stamp of examiner

Instruction hours/ week: L:0 T:0 P:20

Marks: External: 100 Total: 100

External Semester Exam: 3 Hours

**Practicals : 20 Hrs. /Week**

	<b>Excellent (4)</b>	<b>Good (3)</b>	<b>Average (2)</b>	<b>Poor (1)</b>
<b>Organization</b>	Writing shows high degree of attention to logic and reasoning of points. • Unity clearly leads the reader to the conclusion and stirs thought regarding the topic	• Writing is coherent and logically organized with transitions used between ideas and paragraphs to create coherence. • Overall unity of ideas is present	• Writing is coherent and logically organized. Some points remain misplaced and stray from the topic. • Transitions evident but not used throughout essay.	• Writing lacks logical organization. • It shows some coherence but ideas lack unity. • Serious errors.
<b>Level of Content</b>	• Content indicates synthesis of ideas, in- depth analysis and evidences original thought and support for the topic.	• Content indicates original thinking • Develops ideas with sufficient and firm evidence	• Content indicates thinking and reasoning applied with original thought on a few ideas.	• Shows some thinking and reasoning but most ideas are underdeveloped and unoriginal.
<b>Conclusion</b>	• Conclusion is a concise, well-written summary of the argument	• Conclusion is somewhat related to the thesis and argument.	• There is a conclusion but it is not obviously related to the thesis or argument	• No conclusion
<b>References and citation</b>	• Uniform style of referencing and updated information provided	• Few different style of referencing and quite updated references	• Noticeable different style of referencing and only few updated references	• Wrong or different style of referencing. • Outdated references
<b>Format</b>	• Meets all formal and assignment requirements and evidences attention to detail; all margins, spacing and indentations are correct; essay is neat and correctly assembled with professional look.	• Meets format and assignment requirements; margins, spacing and indentations are correct • Essay is neat and correctly assembled.	• Meets format and assignment requirements; generally correct margins, spacing and indentations • Essay is neat but may have some assembly errors	• Fails to follow format and assignment requirements. • incorrect margins, spacing and indentation. • neatness of essay

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Sign and stamp of examiner

**VALUE ADDED ELECTIVE COURSES FOR PHARM.D PROGRAMME**

S No	Category	Course code	Course title	No of hrs	Credit points	Year in which course can be taken
1.	Skills	24PD113ET	Communication Skills Theory	4	2	I
2.	Human Value	24PD114ET	Yoga for Youth Empowerment Theory	4	2	I
3.	Human Value	24PD210ET	Health and Lifestyle Theory	4	2	II
4.	MOOC	24PD211ET	NPTEL-1	4	2	II
5.	Indian Knowledge system	24PD312ET	Indian Indigenous Medicine	4	2	III
6.	MOOC	24PD312ET	NPTEL-2	4	2	III
7.	Skills	24PD411EP	Statistical Software Practical	4	2	IV
8.	Social Responsibility	24PD412ET	Ethical leadership Theory	4	2	IV
9.	Skills	24PD506ET	Medical Coding Theory	4	2	V
10.	Skills	24PD507EP	Pharmaceutical calculation-Theory	4	2	V

Value added elective courses are those designed to enhance the capability of students beyond the general academic curriculum, which may help to improve the employability and equip the students with essential skills to succeed in life of the student. The program offers five categories of Elective courses – Human value, Social Responsibility, Indian Knowledge system, Skill based and NPTEL courses. All Elective courses carry 2 credits each.

A student can select any 1 elective course from the 2 Human value courses offered and 1 other social responsibility courses out of the 2 courses in the respective category. Under the Indian Knowledge system Courses category 1 course, and a student can select any 1 of them. Skill-based courses are Practical-oriented ones to provide the necessary skills to increase the employability quotient of the student. The program offers 4 skill-based courses and 2 MOOC courses are offered. The student must complete 2 MOOC courses and in the year 4 offered skill-based course is compulsory remaining 3 skill-based courses can select any 1 of them. Above all selected electives courses are considered for the CGPA calculation and the grades of all electives completed will be included in the respective year grade sheet.

**COMMUNICATION SKILLS****2H****1C**

Instruction hours/ week: L: 2 T:0 P:0

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

**Theory: 3 Hrs / Week****Course Objectives:**

- Understand the communication models and their application in real-life communication scenarios.
- Analyze different communication styles and strategies, and apply appropriate strategies for effective communication in diverse contexts.
- Explore verbal and nonverbal communication, including body language, tone of voice, facial expressions, and gestures, and understand how they impact the message conveyed
- Develop active listening skills to enhance understanding, rapport-building, and conflict resolution in interpersonal communication
- Examine the culture, gender, ethnicity, and other factors on interpersonal communication, and develop strategies for effective cross-cultural communication and relationship-building
- Apply communication theories to improve communication dynamics in various personal and professional contexts.

**Course Outcomes (CO's):**

On successful completion of the course the student will

COs	Course Outcomes	Blooms Level
CO1	Understand the communication theories and models, including their application and mediated communication contexts.	Understand
CO2	Apply communication strategies and techniques to achieve desired outcomes in personal and professional interactions.	Apply
CO3	Analyse communication dynamics, evaluate messages and sources, and make decisions in communication situations	Analyze
CO4	Enhance interpersonal competence by improving ability to build rapport, establish trust, manage relationships, and navigate cultural differences in diverse personal and professional context.	Analyze
CO5	Develop presentation skills, including speech organization, audience analysis, visual design, and delivery techniques, to deliver engaging and persuasive presentations in various settings.	Apply
CO6	Understand the ethical communication practices, and promote constructive and collaboration in personal, professional and contexts.	Understand

## Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1								S			
CO2					M			S			
CO3					S				M		
CO4								M	S		M
CO5	S					M				M	
CO6								S			

S-Strong; M-Medium; L-Low

### Course Content:

#### Unit 1 Introduction to Communication Theory

- Overview of communication as a field of study, introduction to foundational theories and models, including the Shannon-Weaver model, and basic concepts such as sender, receiver, message, channel, noise, and feedback.

#### Unit 2 Interpersonal Communication:

- Exploration of communication dynamics in one-on-one interactions, including verbal and nonverbal cues, listening skills, self-disclosure, empathy, and conflict resolution strategies

#### Unit 3 Group Communication:

- Examination of communication processes within small groups and teams, including roles, norms, cohesion, decision-making, leadership, and managing group dynamics.

#### Unit 4 Public Speaking and Presentation Skills:

- Development of effective public speaking and presentation skills, including speech organization, audience analysis, delivery techniques, visual aids, and overcoming public speaking anxiety.

#### Unit 5 Intercultural Communication:

- Understanding the impact of culture on communication patterns and norms, exploring cultural differences in verbal and nonverbal communication, and developing strategies for successful intercultural communication.

#### Unit 6 Mass Communication and Media Effects:

- Analysis of mass communication theories and media effects on society, including agenda-setting, cultivation Theory, media literacy, and the role of media in shaping perceptions and attitudes

**Unit 7 Communication in Organizations:**

- Examination of communication structures and processes within organizations, including formal and informal communication channels, organizational culture, leadership communication, and conflict management strategies.

**Unit 8 Communication Ethics and Law:**

- Exploration of ethical issues in communication, including privacy, accuracy, fairness, and responsible use of media, as well as an overview of legal frameworks governing communication, such as defamation, copyright, and freedom of speech.

**Unit 9 Technology and Communication:**

- Discussion of the impact of technology on communication practices, including social media, online communication tools, digital etiquette, and the challenges and opportunities of mediated communication.

**Unit 10 Applied Communication Theories:**

- Application of communication theories and concepts to real- world scenarios, case studies, and Practical exercises aimed at improving communication skills in personal, professional contexts.

**Suggested Readings:**

1. Basic communication skills for Technology, Andreja.J.RutherFord, 2ndEdition, Pearson Education, 2111
2. Communication skills, SanjayKumar, Pushpalata, 1st Edition, Oxford Press, 2011
3. Organizational Behaviour, Stephen.P.Robbins, 1st Edition, Pearson, 2013
4. Brilliant-Communication skills, GillHasson, 1st Edition, Pearson Life, 2011
5. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5thEdition, Pearson,2013.
6. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD,2010
7. Communication skills for professionals,Konarnira,2nd Edition,Newarrivals–PHI,2011
8. Personality development and soft skills,Barun KMitra,1st Edition, Oxford Press,2011
9. Soft skill for everyone, Butter Field,1st Edition,Cengage Learning india pvt.ltd,2011
10. Soft skills and professional communication, rancis Peters SJ, 1st Edition, McGraw Hill Education, 2011
11. Effective communication, John Adair, 4th Edition, Pan Mac Millan,2009.

**YOGA FOR YOUTH EMPOWERMENT -THEORY****2H 1C**

Instruction hours/ week: L: 2 T:0 P:0

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

**Theory: 3 Hrs / Week****Course Objectives:****To make the students**

- To create awareness about Yoga and Physical Health
- To providing Value Education to improve the students character understanding Greatness of Life force and Mind
- To know about five aspects of life and to develop good Qualities and eliminating bad ones
- Learning introspection practices like Analysis of Thoughts, Moralization of Desires, Neutralization of Anger and Eradication of Worries Diversity in Men (Why Men Differ).
- To understand about the yoga, life and practice Yogasanas
- Develop teaching skills, embody Yoga philosophy, and apply learnings through practicum and reflection.

**Course Outcomes (CO's):**

On successful completion of the course the student will

<b>Cos</b>	<b>Course Outcomes</b>	<b>Blooms Level</b>
CO1	Understand the concepts of about Yoga and Physical Health	Understand
CO2	Study the concepts a Greatness of Life force and Mind	Understand
CO3	Learn the aspects of Personality Development - Sublimation	Understand
CO4	Practices Human Resource Development	Apply
CO5	Understand about the yoga, life and Law of Nature	Apply
CO6	Develop effective teaching skills, embody Yoga philosophy in daily life, and demonstrate competence through practicum and reflective practice sessions	Apply

## Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1										S	M
CO2											S
CO3										S	
CO4										S	S
CO5											S
CO6								S			

S-Strong; M-Medium; L-Low

## Course Content:

### Unit 1: Introduction to Yoga

- History and Philosophy of Yoga
- Benefits of Yoga
- Ethical Principles in Yoga Practice
- Introduction to Breath Awareness

### Unit 2: Foundation of Asana Practice

- Basic Yoga Poses (Asanas)
- Alignment Principles and Modifications
- Sun Salutations (Surya Namaskar)
- Introduction to Mindful Movement

### Unit 3: Deepening the Asana Practice

- Standing Poses and Balance
- Forward Bends and Hip Openers
- Backbends and Heart Openers
- Twists and Core Strength

### Unit 4: Exploring Pranayama and Breathwork

- Principles of Pranayama
- Ujjayi Breath and Breath Awareness
- Introduction to Kapalabhati and Nadi Shodhana
- Integrating Breath with Movement

### Unit 5: Cultivating Meditation and Mindfulness

- Introduction to Meditation
- Mindfulness Practices
- Mantra Meditation



- Loving-Kindness Meditation

**Unit 6: Understanding Anatomy and Physiology**

- Functional Anatomy for Yogis
- Biomechanics of Yoga Poses
- Effects of Yoga on the Nervous System
- Physiology of Stress and Relaxation

**Unit 7: Teaching Methodology**

- Effective Verbal Communication and Cueing
- Demonstration and Hands-on Adjustments
- Creating Sequences and Class Plans
- Cultivating a Supportive Teaching Environment

**Unit 8: Yoga Philosophy and Lifestyle**

- The Eight Limbs of Yoga
- Yogic Diet and Nutrition
- Practicing Yoga Off the Mat: Ethics and Values
- Integrating Yoga Philosophy into Daily Life

**Unit 9: Practicum and Teaching Experience**

- Teaching Practicum Sessions
- Peer Feedback and Reflection
- Finalizing Sequences and Lesson Plans
- Teaching Demonstration and Evaluation

**Unit 10: Integration and Reflection**

- Integration of Course Learnings
- Reflective Practice and Self-Inquiry
- Goal Setting for Continued Practice and Growth
- Celebration and Closing Ceremony

**Textbooks and Readings:**

1. "The Heart of Yoga: Developing a Personal Practice" by T.K.V. Desikachar
2. "The Yoga Sutras of Patanjali" by Swami Satchidananda
3. "Light on Yoga" by B.K.S. Iyengar
4. "The Secret Power of Yoga" by Nischala Joy Devi
5. "The Bhagavad Gita" translated by Eknath Easwaran

**Anatomy and Physiology:**

1. "The Key Muscles of Yoga" by Ray Long
2. "The Key Poses of Yoga" by Ray Long
3. "Yoga Anatomy" by Leslie Kaminoff and Amy Matthews
4. "The Anatomy of Yoga: An Instructor's Inside Guide to Improving Your Poses" by Abby Ellsworth
5. "Functional Anatomy of Yoga: A Guide for Practitioners and Teachers" by David Keil

**Teaching Methodology:**

1. "Teaching Yoga: Essential Foundations and Techniques" by Mark Stephens
2. "Yoga Sequencing: Designing Transformative Yoga Classes" by Mark Stephens
3. "The Art of Teaching Yoga: Teacher Training Manual and Workbook" by Amy Ippoliti and Taro Smith
4. "The Breathing Book: Good Health and Vitality Through Essential Breath Work" by Donna Farhi
5. "Yoga Adjustments: Philosophy, Principles, and Techniques" by Mark Stephens

**Meditation and Mindfulness:**

1. "The Miracle of Mindfulness: An Introduction to the Practice of Meditation" by Thich Nhat Hanh
2. "Wherever You Go, There You Are: Mindfulness Meditation in Everyday Life" by Jon Kabat-Zinn
3. "The Mind Illuminated: A Complete Meditation Guide Integrating Buddhist Wisdom and Brain Science" by Culadasa (John Yates, Ph.D.), Matthew Immergut, and Jeremy Graves
4. "Meditation for Beginners" by Jack Kornfield
5. "Real Happiness: The Power of Meditation: A 28-Day Program" by Sharon Salzberg

**HEALTH AND LIFESTYLE -THEORY****2H****2C**

Instruction hours/ week: L: 2 T:0 P:0

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Theory: 3 Hrs / Week****Course Objectives:**

- Understand the relationship between lifestyle factors and health outcomes.
- Identify modifiable risk factors for chronic diseases and medication-related complications.
- Explore evidence-based strategies for promoting healthy behaviors and lifestyle modifications.
- Develop communication skills to engage patients in discussions about health and lifestyle choices.
- Evaluate the role of pharmacists in interdisciplinary healthcare teams for lifestyle management and preventive care.
- To Foster critical thinking and decision-making skills regarding health-related information and trends

**Course Outcomes (CO's):**

On successful completion of the course the student will

<b>Cos</b>	<b>Course Outcomes</b>	<b>Blooms Level</b>
CO1	To articulate and evaluate different philosophical perspectives on the nature of health and well-being.	Evaluate
CO2	To demonstrate an understanding of ethical considerations in health-related decisions and lifestyle choices	Understand
CO3	To analyze the philosophical implications of the mind-body relationship and its significance for overall well-being.	Analyze
CO4	To assess the ethical dimensions of dietary choices and their impact on personal health and environmental sustainability.	Analyze
CO5	Students will evaluate the philosophical significance of physical activity and exercise for promoting health and well-being.	Evaluate
CO6	To apply mindfulness practices and meditation techniques to enhance self-awareness and mental health.	Apply

## Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1									S		M
CO2										S	
CO3										S	
CO4		M							M		S
CO5											S
CO6		S									

S-Strong; M-Medium; L-Low

**Course Content:****Unit 1: Introduction to Health and Lifestyle Medicine**

- Definition of lifestyle medicine
- Overview of lifestyle factors influencing health
- The role of pharmacists in promoting healthy lifestyles

**Unit 2: Nutrition and Dietary Habits**

- Principles of healthy eating
- Dietary guidelines and recommendations
- Nutrition-related diseases and interventions

**Unit 3: Physical Activity and Exercise Prescription**

- Benefits of physical activity for health and well-being
- Exercise recommendations for different age groups and populations
- Exercise prescription and counseling skills for pharmacists

**Unit 4: Stress Management and Mental Health**

- Understanding the impact of stress on health
- Stress management techniques and coping strategies
- Mental health resources and referral pathways

**Unit 5: Sleep Hygiene and Circadian Rhythms**

- Importance of quality sleep for overall health
- Strategies for improving sleep hygiene
- Circadian rhythms and their implications for health

**Unit 6: Tobacco Cessation and Substance Use Disorders**

- Health consequences of tobacco and substance use
- Evidence-based interventions for tobacco cessation
- Pharmacist's role in addressing substance use disorders

**Unit 7: Weight Management and Obesity Prevention**

- Obesity as a chronic disease
- Strategies for weight management and prevention
- Behavioral approaches to promoting healthy weight

**Unit 8: Chronic Disease Prevention and Management**

- Lifestyle interventions for preventing and managing chronic diseases
- Patient-centered approaches to chronic disease management
- Medication adherence and lifestyle modifications

**Unit 9: Health Promotion and Community Outreach**

- Designing health promotion initiatives for diverse populations
- Community resources and partnerships for promoting healthy lifestyles
- Evaluating the effectiveness of health promotion programs

**Unit 10: Integrative Approaches to Lifestyle Medicine**

- Integrating lifestyle medicine into pharmacy practice
- Interdisciplinary collaboration for holistic patient care
- Ethical considerations in promoting lifestyle modifications

**Textbooks and Readings:**

- "Prescribing Lifestyle Medicine" by Mark H. Houston
- "Lifestyle Medicine: A Manual for Clinical Practice" edited by James M. Rippe
- "Principles and Practice of Sleep Medicine" by Meir H. Kryger

24PD211ET

SECOND YEAR

**NPTEL COURSE**

**2H**

**2C**

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**INDIAN INDIGENOUS MEDICINE -THEORY****2H****2C**

Instruction hours/ week: L: 2 T:0 P:0

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Course Objectives:** Students can able to

- Understand the philosophical foundations, historical development, and cultural significance of Indian indigenous medicine systems.
- Familiarize students with the diagnostic methods, principles of treatment, and pharmacological practices of Ayurveda, Siddha, and Unani
- Explore the integration of Indian indigenous medicine with modern healthcare systems and its cultural significance in Indian society.
- Analyze global perspectives on traditional medicine and identify emerging trends and career pathways in Indian indigenous medicine.
- Develop critical thinking skills and the ability to apply indigenous medical principles to contemporary health challenges.
- Apply the ethical engagement with indigenous healing practices and foster a respectful understanding of cultural diversity in healthcare.

**Course Outcomes (CO's):**

On successful completion of the course the student will

<b>Cos</b>	<b>Course Outcomes</b>	<b>Blooms Level</b>
CO1	Explain the philosophical underpinnings of Ayurveda, Siddha, Unani, and folk medicine traditions.	Understand
CO2	Identify and describe various diagnostic techniques used in Ayurveda, Siddha, and Unani medicine.	Knowledge
CO3	Analyze the principles of treatment and pharmacological practices employed in Ayurveda, Siddha, and Unani systems.	Analyze
CO4	Explore emerging trends, research opportunities, and career pathways in the field of Indian indigenous medicine.	Apply
CO5	Analyze and synthesize information from various sources to critically evaluate indigenous medical practices and their applications.	Analyze
CO6	Apply indigenous medical principles to propose solutions for contemporary health challenges, such as non-communicable diseases and mental health	Apply

## Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	S									S	M
CO2	S								M		M
CO3		S								S	
CO4									S		M
CO5				M							S
CO6							S	M			

S-Strong; M-Medium; L-Low

### Course Content:

#### Unit 1: Introduction to Indian Indigenous Medicine

- Overview of Indian indigenous medicine systems: Ayurveda, Siddha, Unani, and folk medicine traditions
- Historical development and cultural context of indigenous medicine in India
- Philosophical underpinnings and basic principles shared across Indian indigenous medicine systems

#### Unit 2: Philosophical Foundations and Diagnostic Methods

- Principles of Ayurveda: Doshas, dhatus, and malas
- Siddha philosophy: Body-mind-spirit integration and vitalism
- Unani humoral Theory and temperament types
- Diagnostic methods in Ayurveda, Siddha, and Unani: Pulse diagnosis, tongue examination, and clinical examination

#### Unit 3: Principles of Treatment and Pharmacological Practices

- Ayurvedic treatment modalities: Herbal medicine, panchakarma, and dietary recommendations
- Siddha therapeutic interventions: Marma therapy, yoga, and siddha external therapies
- Unani therapeutic modalities: Regimental therapy, pharmacotherapy, and dietotherapy
- Pharmacology in Ayurveda, Siddha, and Unani: Herbal formulations, mineral preparations, and traditional alchemical processes



**Unit 4: Integrative Medicine and Modern Healthcare Systems**

- Challenges and opportunities in integrating indigenous medicine with modern healthcare systems
- Case studies and examples of successful integration models in India and abroad
- Regulatory frameworks and quality standards for traditional medicine products and practitioners
- Cultural significance of indigenous medicine in Indian society: Rituals, festivals, and healing traditions

**Unit 5: Global Perspectives and Recognition of Traditional Medicine**

- International recognition and acceptance of traditional medicine: WHO Traditional Medicine Strategy 2014-2023
- Role of traditional medicine in addressing global health challenges: Access to healthcare, non-communicable diseases, and mental health
- Emerging trends, research opportunities, and career pathways in Indian indigenous medicine

**Unit 6: Ethics and Cultural Competency**

- Ethical considerations in engaging with indigenous healing practices
- Respectful understanding of cultural diversity in healthcare
- Communication skills and cultural competency in engaging with diverse communities and healthcare traditions

**Unit 7: Ayurvedic Pharmacology and Herbal Medicine**

- Principles of Ayurvedic pharmacology: Rasa, guna, veerya, vipaka, and prabhava
- Classification of medicinal plants and herbal preparations
- Ayurvedic pharmacopoeia and quality standards for herbal products

**Unit 8: Siddha Medicine: Alchemy and Vitalism**

- Siddha alchemical processes: Preparation of mercury and minerals
- Siddha herbal formulations and external therapies

- Siddha pharmacopoeia and quality standards for medicinal substances

**Unit 9: Unani Medicine: Greco-Arabic Influences**

- Historical development and origins of Unani medicine
- Principles of Unani humoral Theory and treatment modalities
- Unani pharmacopoeia and quality standards for herbal medicines

**Unit 10: Case Studies and Research Opportunities**

- Analysis of case studies and clinical trials in Indian indigenous medicine
- Research opportunities and future directions in Ayurveda, Siddha, and Unani
- Career pathways and professional development in the field of Indian indigenous medicine

**Reference Books:**

1. "Encyclopedia of Indian Medicine" edited by C.R. Rao
2. "History of Indian Medicine: Containing Notices, Biographical Sketches, and Bibliographic Lists of Medical Works in Sanskrit, Arabic, Persian, Pali, Prakrit, and Other Eastern Languages" by G. S. Mehta
3. "The Roots of Ayurveda" by Dominik Wujastyk
4. "Indian Medicinal Plants: An Illustrated Dictionary" by C.P. Khare
5. "Indian Alchemy: Soma in the Veda" by David Gordon White
6. "Indian Medicinal Plants: A Compendium of 500 Species" by Ashok K. Jain

**Textbooks:**

1. "Ayurveda: The Science of Self-Healing" by Dr. Vasant Lad
2. "The Yoga of Herbs: An Ayurvedic Guide to Herbal Medicine" by Dr. David Frawley and Dr. Vasant Lad
3. "Essentials of Siddha Medicine" by M.A. Venkatakrisna Rao
4. "Introduction to Unani Medicine" by Hakim Syed Zillur Rahman
5. "Principles and Practice of Unani Medicine" by S.M. Bokhari
6. "Textbook of Pharmacognosy and Phytochemistry" by Biren Shah and A.K. Seth
7. "Ayurveda and the Mind: The Healing of Consciousness" by Dr. David Frawley
8. "Siddha Medicine: The Secrets of Ancient Siddha Vaidyas" by Dr. David Frawley and Dr. Subhash Ranade
9. "Unani Medicine: Introduction and Clinical Application" by Mohammad Zaki Ansari
10. "The Legacy of Charaka" by Veerabhadran Ramanathan
11. "Traditional Medicine: A Global Perspective" edited by Steven B. Kayne

24PD312ET

THIRD YEAR

**NPTEL COURSE**

**2H**

**2C**

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**STATISTICAL SOFTWARE -PRACTICAL****3H****2C**

Instruction hours/ week: L: 0 T:0 P:3

Marks: Internal: 30 External: 70 Total: 100  
External Semester Exam: 3 Hours**Course Objectives:**

- Understand the importance of statistical software in pharmacy research and practice.
- Familiarize with the interface and functionalities of statistical software packages.
- Perform basic statistical analyses, including descriptive statistics and hypothesis testing.
- Explore advanced statistical techniques relevant to pharmacy research, such as regression analysis and survival analysis.
- Develop skills in data visualization and presentation using statistical software tools.

**Course Outcomes (CO's):**

On successful completion of the course the student will

<b>Cos</b>	<b>Course Outcomes</b>	<b>Blooms Level</b>
CO1	Understand the significance of statistical software in pharmacy research, including its role in data analysis, decision-making and evidence-based practice.	Understand
CO2	Demonstrate proficiency in navigating the interface and utilizing the key functionalities of statistical software packages commonly used in pharmacy research and practice settings.	Apply
CO3	Apply fundamental statistical techniques, including descriptive statistics and hypothesis testing, to analyze pharmacy-related data sets effectively, interpret findings and draw appropriate conclusions.	Analyse
CO4	Applying advanced statistical methods relevant to pharmacy research to investigate complex relationships and outcomes in pharmaceutical studies.	Understand
CO5	Develop in data visualization and presentation techniques using statistical software tools, enabling the creation of clear and informative visual representations of pharmacy-related data for communication.	Understand

## Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1				S							
CO2	S		M								
CO3	S			M							
CO4	M		M	S							
CO5	M			S							
CO6	S			M							

S-Strong; M-Medium; L-Low

**Course Outline:****Unit 1: Introduction to Statistical Software**

- Overview of statistical software packages (e.g., SPSS, R, SAS)
- Installing and setting up statistical software
- Introduction to the user interface and basic functionalities

**Unit 2: Data Management and Importing**

- Data types and formats
- Importing data from different sources (e.g., Excel, CSV files)
- Data cleaning and preparation techniques

**Unit 3: Descriptive Statistics**

- Measures of central tendency and variability
- Frequency distributions and graphical representations
- Interpreting descriptive statistics output

**Unit 4: Inferential Statistics: Parametric Tests**

- Introduction to hypothesis testing
- One-sample and independent samples t-tests
- Paired samples t-test and analysis of variance (ANOVA)

**Unit 5: Inferential Statistics: Non-parametric Tests**

- Wilcoxon signed-rank test and Mann-Whitney U test
- Kruskal-Wallis test and Friedman test
- Choosing between parametric and non-parametric tests

**Unit 6: Regression Analysis**

- Simple linear regression
- Multiple linear regression

- Interpreting regression output and assessing model fit

**Unit 7: Survival Analysis**

- Kaplan-Meier survival curves
- Log-rank test and Cox proportional hazards model
- Applications of survival analysis in pharmacy and healthcare research

**Unit 8: Data Visualization**

- Creating basic and advanced plots (e.g., histograms, scatterplots, box plots)
- Customizing plot aesthetics and labels
- Exporting plots for publication and presentations

**Unit 9: Advanced Topics in Statistical Software**

- Factor analysis and principal component analysis (PCA)
- Cluster analysis and discriminant analysis
- Time series analysis and forecasting techniques

**Unit 10: Applied Research Projects**

- Designing and executing a research project using statistical software
- Analyzing and interpreting research findings
- Presenting research results using appropriate statistical visualizations and techniques

**Textbooks and Readings:**

- "Discovering Statistics Using SPSS" by Andy Field
- "R for Data Science" by Hadley Wickham and Garrett Grolemund
- "Applied Survival Analysis: Regression Modeling of Time-to-Event Data" by David W. Hosmer Jr., Stanley Lemeshow, and Susanne May.

**Suggested reading books**

1. "An Introduction to Statistical Learning: with Applications in R" by Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani. 2nd Edition (2021)
  2. "Discovering Statistics Using IBM SPSS Statistics" by Andy Field 5th Edition (2021)
  3. "R for Data Science" by Hadley Wickham and Garrett Grolemund. 1st Edition (2017)
  4. "Stata Survival Manual" by David Pevalin and Karen Robson. 5th Edition (2020)
  5. "SPSS Survival Manual" by Julie Pallant. 7th Edition (2020)
  6. "SAS Essentials: Mastering SAS for Data Analytics" by Alan Elliott and Wayne A. Woodward. 2nd Edition (2020)
  7. "R Graphics Cookbook" by Winston Chang. 2nd Edition (2018)
  8. "Data Analysis Using Regression and Multilevel/Hierarchical Models" by Andrew Gelman and Jennifer Hill. 2nd Edition (2020)
  9. "Modern Applied Statistics with S" by William N. Venables and Brian D. Ripley 4th Edition (2002)
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**ETHICAL LEADERSHIP -THEORY****1H 2C**

Instruction hours/ week: L: 1 T:0 P:0

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

**Course Objective**

1. Understand a comprehensive ethical leadership principles, theories, and models, including the importance of integrity, honesty, fairness, and accountability.
2. Identify, analyze, and evaluate ethical dilemmas in leadership contexts, applying ethical decision-making frameworks.
3. Apply ethical principles in ethical decision-making, recognize cognitive biases, and to resolve complex dilemmas.
4. Enhance the communication skills, learning to communicate ethically and effectively and ethical challenges with integrity and transparency.
5. Understand the importance of diversity, equity, and inclusion in ethical leadership, learning to promote a culture of respect, dignity, and fairness that values diverse perspectives and experiences.
6. Fostering a culture of ethical leadership within organizations, including promoting ethical behavior, values alignment, and ethical decision-making processes.

**Course Outcome (CO's):**

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

<b>Cos</b>	<b>Course Outcomes</b>	<b>Blooms Level</b>
CO1	Understand of Ethical Leadership Concepts, key principles and theories of ethical leadership, and accountability in leadership roles.	Understand
CO2	Apply ethical decision-making models and frameworks to analyze complex dilemmas, evaluate alternative courses of action, and make ethical decisions in leadership contexts.	Apply
CO3	Communicate ethically and transparently with stakeholders, address conflicts with integrity, and foster open dialogue in organizational settings.	Analyse
CO4	Understand the ethical imperative of promoting diversity, equity and develop strategies for creating inclusive environments that value diverse perspectives	Understand
CO5	Cultivate a culture of ethical leadership within organizations, including ethical behavior, values and ethical decision-making processes among team members.	Apply
CO6	Engage in self-reflection and introspection, assessing their own values, beliefs, and ethical principles, and develop a personal ethical leadership philosophy and action plan.	Apply



## Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1					S		S				
CO2					M		S				
CO3					S		M				
CO4		M					S			S	
CO5		S					M				
CO6		S			S						

S-Strong; M-Medium; L-Low

**Course contents****Unit 1: Introduction to Ethical Leadership**

- Definition and importance of ethical leadership
- Historical perspectives on ethical leadership
- Theoretical frameworks for understanding ethical leadership
- Ethical dilemmas in leadership roles

**Unit 2: Moral Reasoning and Decision Making**

- Ethical theories and principles (e.g., utilitarianism, deontology, virtue ethics)
- Moral development and ethical decision-making models
- Cognitive biases and ethical decision-making
- Case studies on ethical decision-making in leadership contexts

**Unit 3: Values-Based Leadership**

- Identifying personal and organizational values
- Aligning values with leadership actions and decisions
- Building a values-driven organizational culture
- Ethical leadership and corporate social responsibility

**Unit 4: Ethical Communication**

- Importance of transparency and honesty in communication
- Ethical considerations in persuasive communication
- Active listening and empathetic communication skills
- Addressing conflicts and resolving ethical communication challenges

## ■ **Unit 5: Ethical Decision-Making Processes**

- Ethical decision-making frameworks (e.g., Rest's Four Component Model, Kidder's Ethical checkpoints)
- Stakeholder analysis and ethical impact assessment
- Implementing ethical decision-making processes in organizational contexts
- Ethical leadership in crisis management and decision-making under pressure

## **Unit 6: Ethical Leadership in Diversity and Inclusion**

- Promoting diversity and inclusion in leadership roles
- Ethical considerations in managing diverse teams
- Addressing bias and discrimination in leadership practices
- Creating inclusive organizational cultures through ethical leadership

## **Unit 7: Ethical Leadership and Organizational Justice**

- Principles of organizational justice (distributive, procedural, interactional)
- Ethical implications of power dynamics in organizations
- Fairness in resource allocation and decision-making processes
- Ethical leadership and fostering a culture of trust and fairness

## **Unit 8: Ethical Leadership Development**

- Assessing and developing ethical leadership competencies
- Ethical leadership training and development programs
- Coaching and mentoring for ethical leadership
- Personal reflection and growth as an ethical leader

## **Unit 9: Ethical Leadership in Global Contexts**

- Cross-cultural perspectives on ethical leadership
- Ethical challenges in international business and diplomacy
- Cultural differences in ethical values and practices
- Strategies for promoting ethical leadership in global organizations

## **Unit 10: Ethical Leadership in Action: Case Studies and Applications**

- Analyzing real-world ethical leadership challenges and dilemmas
- Ethical leadership in specific industries or sectors (e.g., healthcare, finance, technology)
- Developing action plans for ethical leadership initiatives
- Reflection on personal values and commitments as ethical leaders

**References**

1. "Ethical Leadership and Decision Making in Education: Applying Theoretical Perspectives to Complex Dilemmas" by Joan Poliner Shapiro and Steven Jay Gross
2. "Ethical Leadership in Schools: Creating Community in an Environment of Accountability" by Kenneth A. Strike and Camille A. Farrington
3. "Ethical Leadership and Decision Making in Education: Applying Theoretical Perspectives to Complex Dilemmas" by Joan Poliner Shapiro and Steven Jay Gross
4. "Ethical Leadership: A Primer" by Gerald C. Kane and Bret Simmons: A concise introduction to ethical leadership, covering key concepts, theories, and Practical strategies for fostering ethical behavior in organizations.
5. **"The Ethics of Leadership" by Joanne B. Ciulla** - This book provides an in-depth exploration of the ethical dimensions of leadership, examining historical perspectives, contemporary issues, and case studies from various fields.
6. **"Leading with Integrity: Character-Based Leadership" by John J. Sosik and William A. Gentry** - Focusing on character-based leadership, this text explores the role of integrity, honesty, and authenticity in ethical leadership practices.
7. **"Ethical Leadership: Global Challenges and Perspectives" edited by Aycan Kara and Ayşegül Özbebek Tunç** - Offering global perspectives on ethical leadership, this book addresses cross-cultural challenges, ethical dilemmas, and best practices in leadership ethics.
8. **"The Ethics of Authenticity" by Charles Taylor** - This philosophical work explores the concept of authenticity in leadership, examining how leaders can align their actions with their values and maintain integrity in a complex world.
9. **"The Responsible Leader: Developing a Culture of Responsibility in an Uncertain World" by Tim Richardson** - Focusing on responsibility and accountability in leadership, this book offers Practical insights and tools for ethical decision-making and organizational governance.
10. **"Ethical Leadership: Progress with a Moral Compass" by Joanne B. Ciulla, Terry L. Price, and Susan E. Murphy** - This book provides a comprehensive overview of ethical leadership research, theories, and practices, offering guidance for leaders to navigate ethical challenges and build trust within organizations.

**MEDICAL CODING -THEORY****1H****2C**

Instruction hours/ week: L: 1 T:0 P:0

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

Theory: 3 Hrs / Week

**Course Objectives**

- Understand the concept of the structure, functioning and regulations of the healthcare system.
- Identify the influence of fundamental terminology used in healthcare documentation and coding.
- Acquire proficiency in assigning accurate medical codes using various classification systems such as ICD-10-CM, CPT, and HCPCS Level II.
- Explore strategies of coding guidelines, conventions, and rules to ensure code assignment and compliance with regulatory.
- Develop critical thinking skills by analyzing complex medical scenarios and determining the appropriate codes based on documentation, clinical indicators, and coding guidelines.
- Critically evaluate ethical coding practices, patient confidentiality and coding regulations:

**Course Outcomes (CO's):**

On successful completion of the course the student will

<b>COs</b>	<b>Course Outcomes</b>	<b>Blooms Level</b>
CO1	Understand the diagnosis and procedure codes using the appropriate code set, including ICD-10-CM, CPT, and HCPCS Level II.	Understand
CO2	Applying the coding guidelines, conventions, and principles by assign correct codes in various medical scenarios	Apply
CO3	Analyze medical documentation, including physician notes, operative reports, and diagnostic test results, to extract relevant information for coding purposes	Analyze
CO4	Evaluate the accuracy and compliance of coded medical records with coding guidelines, regulatory requirements.	Understand
CO5	Understand the ability to use coding reference materials, such as codebooks, encoding software, and online databases, to research and resolve coding queries.	Understand
CO6	Communicate effectively with healthcare professionals, including physicians, nurses, and administrators, to clarify documentation and ensure accurate code assignment	Apply

## Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	S	M									
CO2		S									M
CO3	M	S									
CO4		S		M							
CO5	M						S				
CO6	S	M									

S-Strong; M-Medium; L-Low

### Course Content

#### Unit 1: Introduction to Medical Coding

- Overview of medical coding and its importance in healthcare
- Historical perspective and evolution of coding systems
- Role of medical coders in the healthcare industry

#### Unit 2: Medical Terminology and Anatomy

- Fundamentals of medical terminology, including prefixes, suffixes, and root words
- Anatomy and physiology basics relevant to medical coding
- Common diseases, conditions, and procedures encountered in medical coding practice

#### Unit 3: ICD-10-CM Coding

- Introduction to the International Classification of Diseases, 10th Revision, Clinical Modification (ICD-10-CM)
- Structure and organization of the ICD-10-CM code set
- Guidelines for accurate diagnosis code assignment and documentation requirements

#### Unit 4: CPT Coding

- Introduction to the International Classification of Diseases, 10th Revision, Clinical Modification (ICD-10-CM)
- Structure and organization of the ICD-10-CM code set
- Guidelines for accurate diagnosis code assignment and documentation requirements

#### Unit 5: HCPCS Level II Coding

- Introduction to the Healthcare Common Procedure Coding System (HCPCS) Level II
- Coverage of supplies, durable medical equipment (DME), and other healthcare services not included in CPT
- Application of HCPCS Level II codes in coding and billing processes

**Unit 6: Coding Guidelines and Conventions**

- Detailed exploration of coding guidelines, conventions, and official coding rules
- Importance of accuracy, specificity, and consistency in code assignment
- Coding scenarios and exercises to reinforce guideline application

**Unit 7: Modifiers and Edits**

- Understanding modifiers and their role in modifying or clarifying procedure codes
- Commonly used modifiers and their appropriate application
- Identifying and resolving coding edits, including National Correct Coding Initiative (NCCI) edits

**Unit 8: Evaluation and Management (E/M) Coding**

- Overview of E/M coding for outpatient and inpatient encounters
- Components of E/M services and key documentation requirements
- Guidelines for selecting the appropriate E/M code based on level of service provided

**Unit 9: Regulatory Compliance and Ethics**

- Importance of ethical coding practices and compliance with regulatory requirements
- Overview of healthcare regulations, including HIPAA, Stark Law, and False Claims Act
- Consequences of fraudulent coding practices and strategies for maintaining compliance

**Unit 10: Coding Practice and Case Studies**

- Application of coding knowledge and skills through Practical coding exercises
- Analysis of real-world coding scenarios and case studies
- Feedback and discussion to reinforce learning and address coding challenges.

**Reference Books:**

1. ICD-10-CM Official Guidelines for Coding and Reporting: Published by the American Hospital Association, this book provides official coding guidelines for diagnosis coding using the International Classification of Diseases, 10th Revision, Clinical Modification (ICD-10-CM).
2. CPT Professional Edition: Published by the American Medical Association (AMA), this book provides the most current procedural coding guidelines and codes using the Current Procedural Terminology (CPT) system.
3. HCPCS Level II Professional: Also published by the AMA, this book contains the Healthcare Common Procedure Coding System (HCPCS) Level II codes, which are used for procedures, services, and supplies not covered by CPT codes.
4. Principles of Healthcare Reimbursement: This book covers the basics of healthcare reimbursement, including insurance policies, billing processes, and regulatory requirements related to medical coding and billing

5. Step-by-Step Medical Coding: This textbook provides a comprehensive overview of medical

coding principles and practices, including step-by-step instructions for assigning diagnostic and procedural codes.

6. **Understanding ICD-10-CM and ICD-10-PCS: A Worktext:** This book focuses specifically on understanding and applying ICD-10-CM and ICD-10-PCS coding systems, with Practical exercises and case studies.
7. **Medical Coding Certification Exam Preparation:** This book is designed to help students prepare for medical coding certification exams, such as the Certified Professional Coder (CPC) exam offered by the American Academy of Professional Coders (AAPC).
8. **Coding Basics: Understanding Medical Collections:** This book covers the basics of medical coding and collections, including coding principles, reimbursement methodologies, and strategies for maximizing revenue

**PHARMACEUTICAL CALCULATION -PRACTICAL****3H 2C**

Instruction hours/ week: L:0 T:0 P:3

Marks: Internal: 30 External: 70 Total: 100

External Semester Exam: 3 Hours

**Course Objective:**

- Develop accurate pharmaceutical calculation skills.
- Understand dosage determination principles.
- Apply pharmacokinetic concepts for dosage optimization.
- Practice pharmaceutical compounding techniques.
- Perform quality control tests for product potency and uniformity.
- Promote awareness of medication safety through precise calculations.

**Course Outcomes (CO's):**

On successful completion of the course the student will

Cos	Course Outcomes	Blooms Level
CO1	Achieve accuracy in pharmaceutical calculations	Apply
CO2	Optimize dosage regimens using pharmacokinetic concepts	Apply
CO3	Master pharmaceutical compounding techniques	Apply
CO4	Ensure product potency and uniformity through quality control	Apply
CO5	Grasp dosage determination principles for precise prescriptions.	Apply
CO6	Enhance medication safety awareness through meticulous calculations.	Apply

## Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	S	M	M								
CO2	S										
CO3	S	M									
CO4	S										
CO5	S		S								
CO6	S			M							

S-Strong; M-Medium; L-Low

**Course Content**

1. Drug Dosage Calculation
2. Pharmaceutical Solution Preparation
3. Percent Composition Calculation



4. Drug Stability Testing
5. Pharmaceutical Compounding
6. Pharmacokinetic Parameter Calculation
7. Pharmaceutical Dosing Regimen Optimization
8. Pharmaceutical Excipient Compatibility Study
9. Pharmaceutical Quality Control
10. Pharmaceutical Formulation Cost Analysis
11. Pharmaceutical Dilution Calculation
12. Pediatric Dosage Calculation
13. Intravenous Infusion Rate Calculation
14. Drug Concentration Adjustment Calculation
15. Pharmaceutical Manufacturing Yield Calculation
16. Bioavailability and Bioequivalence Calculation
17. Pharmacokinetic Modeling and Simulation
18. Pharmaceutical Expiry Date Calculation
19. Drug Solubility Calculation
20. Pharmaceutical Process Validation Calculation

**References**

1. Remington: The Science and Practice of Pharmacy" edited by David B. Troy and Joseph Price Remington
2. "Pharmaceutical Calculations" by Howard C. Ansel and Mitchell J. Stoklosa
3. "Goodman & Gilman's: The Pharmacological Basis of Therapeutics" edited by Laurence Brunton, Bruce Chabner, and Björn Knollmann
4. "Pharmaceutical Dosage Forms and Drug Delivery Systems" by Howard C. Ansel and Loyd V. Allen Jr.
5. "Principles of Physical Biochemistry" by Kensal E. van Holde, W. Curtis Johnson, and P. Shing Ho
6. "Pharmacokinetics: Processes, Mathematics, and Applications" by Peter Welling, Thomas E. Saltzman, and William E. Hassan
7. "Pharmaceutical Compounding and Dispensing" by John F. Marriott and Keith A. Wilson
8. "Pharmaceutical Calculations" by Payal Agarwal and Sarvesh Paliwal
9. "Pharmaceutical Analysis: A Textbook for Pharmacy Students and Pharmaceutical Chemists" by David G. Watson
10. "Pharmaceutical Manufacturing Handbook: Production and Processes" edited by Shayne Cox Gad