PHARM.D HAND BOOK
2022-23
K L COLLEGE OF PHARMACY

KL University Vision

To be a globally renowned university.

K L University Mission:

To impart quality higher education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens with intrinsic values.

M1 - To impart quality higher education

M2 - To undertake research and extension with emphasis on application and innovation

M3- Cater to the emerging societal needs through all-round development of students of all

sections

M4 - To be globally competitive and socially responsible citizens with intrinsic values.

Vision and Mission of the Department

Vision: Lead the future of global healthcare and well-being of the communities we serve.

Mission: To produce quality Pharmacy professionals having strong theoretical foundation, innovative ideas, good design experience by bridging industry-academic gap in Pharma Sector through the use of technology and innovative teaching and exposure to research and progress with social ethics.

Mission Statements

M1. Education: Provide the most comprehensive and highest quality education for pharmaceutical sciences in a learning environment that embraces diversity, equity, integrity, ethics, moral courage and accountability.

M2. Community service: Conduct health education programs to the community to prevent disease and improve public health and well-ness by fostering an environment that promotes the safe, efficacious, and cost-effective use of medications.

M3. Research: Develop a passion for discovery and innovations with multidisciplinary collaborative research and engage in creative partnerships locally and globally to advance health education, research, and practice.

M4. Entrepreneurship: Encourage and support resourcefulness, originality, imagination, ingenuity, and vision in our students, faculty, and staff. Foster the development of entrepreneurs who have the ability to dream, inspire and innovate and courage to envisage the commercial success and socio economic productivity of innovations

Program Educational Objectives (PEOs)

PEO No	PROGRAMME EDUCATION OBJECTIVES (PEOs)
1	Pharmacy graduates will have strong background in pharmaceutical sciences with excellent knowledge in drugs and pharmaceuticals and very good skills to cater the health-care needs of the society and able to use these tools for personal and professional endeavors
2	To impart sound knowledge in the different curriculum like Pharmacognosy, Pharmaceutical Chemistry including Analytical Chemistry, Pharmaceutical Biotechnology, Pharmacology, Formulation and Development,CommunityPharmacy,Clinical Pharmacy and Pharmacotherapeutics to utilized for designing and to create novel herbal or synthetic pharmaceutical products in the view of drug discovery at an affordable price for the benefit of human being.
3	To acquire knowledge towards the current needs in the research activities carried out in various fields of pharmacy which implies the novel research approach towards the drug discovery and development to fulfill the requirement to save the patient from various unrevealed disease ailment. 4. To promote health improvement, wellness and disease prevention in cooperation with public and patient community, and other members of an inter-professional team of health care providers through periodical updating of Drug Information.
4	To provide productive, hormonius atmosphere that enables the students to acquire the excellent approach , professional behaviors, moral and ethical values to cultivate the profession dexterously.

Program Outcomes(POs)

PO No	PARTICULARS	PROGRAMME OUTCOME (PO)
1	**Pharmacy Knowledge**	Apply the knowledge of science, pharmacy fundamentals, clinical pharmacy and Pharmacotherapeutics to the solution of problem directed study.
2	**Problem analysis**	Identify, formulate, review research literature, and analyze complex clinical and therapeutic problems reaching substantiated conclusions using first principles of basic sciences, and pharmaceutical sciences.
3	**Design/development of solutions**	Design solutions for complex pharmaceutical problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	**Conduct investigations of complex problems**	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5	**Modern tool usage**	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex pharmaceutical activities with an understanding of the limitations

6	**Individual and team work**	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
7	**Environment and sustainability**	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	**Ethics**	Apply ethical principles and commit to professional ethics and responsibilities and norms of the Pharmacy practice.
9	**The Clinical Pharmacist and society**	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional Pharmacy practice.
10	**Communication**	Communicate effectively on complex pharmaceutical activities with the health care community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	**Project management and finance**	Demonstrate knowledge and understanding of the clinical management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	**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

Mapping of PEOs with Mission statement

	M1	M2	M3	M4
G1	✓		✓	
G2	✓		✓	
G3				
G4		✓		✓
G5	✓			✓
G6	✓		✓	
G7	✓			✓
G8		✓	✓	

Program Articulation Matrix (Mapping of Courses with POs)

Sl No	Course Code	Course Title	Type	L	T	P	S	PO											
								1	2	3	4	5	6	7	8	9	10	11	12
1.	22PY6101T	Human Anatomy and Physiology	PCC	3	1	0	0	3											
2.	22PY6101P	Human Anatomy and Physiology	PCC	0	0	3	0	2											
3.	22PY6102T	Pharmaceutics	PCC	2	1	0	0	2											
4.	22PY6102P	Pharmaceutics	PCC	0	0	3	0	3											
5.	22PY6103T	Medicinal Biochemistry	PCC	3	1	0	0	2											
6.	22PY6103P	Medicinal Biochemistry	PCC	0	0	3	0	3											
7.	22PY6104T	Pharmaceutical Organic Chemistry	PCC	3	1	0	0	2											
8.	22PY6104P	Pharmaceutical Organic chemistry	PCC	0	0	3	0	3											
9.	22PY6105T	Pharmaceutical Inorganic Chemistry	PCC	2	1	0	0	2											
10.	22PY6105P	Pharmaceutical Inorganic Chemistry	PCC	0	0	3	0	3											
11.	22PY610B6T/22PY610M6T	Remedial Biology/Remedial Mathematics	BS	3	1	0	0	2											
12.																			
13.	22PY610B6P	Remedial Biology	BS	0	0	3	0	3											
14.	22PY6201T	Pathophysiology	PCC	3	1	0	0	2											
15.	22PY6202T	Pharmaceutical Microbiology	PCC	3	1	0	0	2											
16.	22PY6202P	Pharmaceutical Microbiology	PCC	0	0	3	0	3											
17.	22PY6203T	Pharmacognosy& Phytopharmaceuticals	PCC	3	1	0	0	2											

18.	22PY6203P	Pharmacognosy& Phytopharmaceuticals	PCC	0	0	3	0	3											
19.	22PY6204T	Pharmacology-I	PCC	3	1	0	0	2											
20.	22PY6205T	Community Pharmacy	PCC	2	1	0	0	2								2			
21.	22PY6206T	Pharmacotherapeutics-I	PCC	3	1	0	0	2											
22.	22PY6206P	Pharmacotherapeutics-I	PCC	0	0	3	0	3											
23.	22PY6301T	Pharmacology-II	PCC	3	1	0	0	2											
24.	22PY6301P	Pharmacology-II	PCC	0	0	3	0	3											
25.	22PY6302T	Pharmaceutical Analysis	PCC	3	1	0	0	2											
26.	22PY6302P	Pharmaceutical Analysis	PCC	0	0	3	0	3											
27.	22PY6303T	Pharmacotherapeutics-II	PCC	3	1	0	0	2											
28.	22PY6303P	Pharmacotherapeutics-II	PCC	0	0	3	0	3											
29.	22PY6304T	Pharmaceutical Jurisprudence	PCC	2	0	0	0	2											
30.	22PY6305T	Medicinal Chemistry	PCC	3	1	0	0	2											
31.	22PY6305P	Medicinal Chemistry	PCC	0	0	3	0	3											
32.	22PY6306T	Pharmaceutical Formulations	PCC	2	1	0	0	2											
33.	22PY6306P	Pharmaceutical Formulations	PCC	0	0	3	0	3											
34.	22PY6401T	Pharmacotherapeutics-III	PCC	3	1	0	0	2											
35.	22PY6401P	Pharmacotherapeutics-III	PCC	0	0	3	0	3											
36.	22PY6402T	Hospital Pharmacy	PCC	2	1	0	0	2								2			

37.	22PY6402P	Hospital Pharmacy	PCC	0	0	3	0	3								3				
38.	22PY6403T	Clinical Pharmacy	PCC	3	1	0	0	2								3				
39.	22PY6403P	Clinical Pharmacy	PCC	0	0	3	0	3								3				
40.	22PY6404T	Biostatistics & Research Methodology	PCC	2	1	0	0	2												
41.	22PY6405T	Biopharmaceutics & Pharmacokinetics	PCC	3	1	0	0	2												
42.	22PY6405P	Biopharmaceutics & Pharmacokinetics	PCC	0	0	3	0	3												
43.	22PY6406T	Clinical Toxicology	PCC	2	1	0	0	2												
44.	22PY6501T	Clinical Research	PCC	3	1	0	0	2	2											
45.	22PY6502T	Pharmacoepidemiology and Pharmacoeconomics	PCC	3	1	0	0	2	2											
46.	22PY6503T	Clinical Pharmacokinetics &Pharmacotherapeutic Drug Monitoring	PCC	2	1	0	0	2	2											
47.	22PY650N4	Clerkship	PCC	0	1	0	0	2	2											
48.	22PY650E5	Project work (Six Months)	PCC	0	0	20	0	3												
49.	22PY660N1	Internship	PCC	0	0	40	0	3	3											

Academic Regulations

1. Short title and commencement. – (1) These regulations may be called the Pharm.D. Regulations 2008.

(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.

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 speciality 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 speciality 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 31st 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. Course of study. – The course of study for Pharm.D. shall include the subjects as given. 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.

8. Syllabus. – The syllabus for each subject of study as specified in hese regulations.

9. 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.

(2) 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.

(3) 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.

10. 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.

11. 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.

12. Mode of examinations.— (1) Theory examination shall be of three hours and practical examination shall be of four 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.

13. Award of sessional marks and maintenance of records.— (1) 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.

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

(3) 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).

14. 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.

15. 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.

16. 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.

17. Approval of examinations.— Examinations mentioned in regulations 10 to12 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.

18. 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.

19. 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.

20. 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.

21. Objectives of project work.— The main objectives of the project work is to—

(i) show the evidence of having made accurate description of published work of others and of having recorded the findings in an impartial manner; and

(ii) develop the students in data collection, analysis and reporting and interpretation skills.

22. 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 teacher;

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

(iii)project work chosen shall be related to the pharmacy practice in community, hospital and

clinical setup. It shall be patient and treatment (Medicine) oriented, like drug 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.

23. 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 teacher, 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 Roman font on A4 paper. The title shall be in bold with font size 18, sub-tiles 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 authorised 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.

24. 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: Marks

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)
Total	(30 marks)

(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)

Course Category wise Credit Distribution

S No	Course Category	Short name	No of Courses
1	Basic Sciences	BS	2
2	Professional Courses	PC	45
3	Project Work	PW	1

BS

S No	Course Code	Course Title	L	T	P	S	CH
1	22PY610B6T/ 22PY610M6T	Remedial Biology/ Remedial Mathematics	3	1	0	0	4
2	22PY610B6P	Remedial Biology	0	0	3	0	3

PC

S No	Course Code	Course Title	L	T	P	S	CH
1	22PY6101T	Human Anatomy and Physiology	3	1	0	0	4
2	22PY6101P	Human Anatomy and Physiology	0	0	3	0	3
3	22PY6102T	Pharmaceutics	2	1	0	0	3
4	22PY6102P	Pharmaceutics	0	0	3	0	3
5	22PY6103T	Medicinal Biochemistry	3	1	0	0	4
6	22PY6103P	Medicinal Biochemistry	0	0	3	0	3
7	22PY6104T	Pharmaceutical Organic Chemistry	3	1	0	0	4
8	22PY6104P	Pharmaceutical Organic chemistry	0	0	3	0	3
9	22PY6105T	Pharmaceutical Inorganic Chemistry	2	1	0	0	3
10	22PY6105P	Pharmaceutical Inorganic Chemistry	0	0	3	0	3

11	22PY6201T	Pathophysiology	3	1	0	0	4
12	22PY6202T	Pharmaceutical Microbiology	3	1	0	0	4
13	22PY6202P	Pharmaceutical Microbiology	0	0	3	0	3
14	22PY6203T	Pharmacognosy&Phytopharmaceuticals	3	1	0	0	4
15	22PY6203P	Pharmacognosy&Phytopharmaceuticals	0	0	3	0	3
16	22PY6204T	Pharmacology-I	3	1	0	0	4
17	22PY6205T	Community Pharmacy	2	1	0	0	3
18	22PY6206T	Pharmacotherapeutics-I	3	1	0	0	4
19	22PY6206P	Pharmacotherapeutics-I	0	0	3	0	3
20	22PY6301T	Pharmacology-II	3	1	0	0	4
21	22PY6301P	Pharmacology-II	0	0	3	0	3
22	22PY6302T	Pharmaceutical Analysis	3	1	0	0	4
23	22PY6302P	Pharmaceutical Analysis	0	0	3	0	3
24	22PY6303T	Pharmacotherapeutics-II	3	1	0	0	4
25	22PY6303P	Pharmacotherapeutics-II	0	0	3	0	3
26	22PY6304T	Pharmaceutical Jurisprudence	2	0	0	0	2
27	22PY6305T	Medicinal Chemistry	3	1	0	0	4
28	22PY6305P	Medicinal Chemistry	0	0	3	0	3
29	22PY6306T	Pharmaceutical Formulations	2	1	0	0	3
30	22PY6306P	Pharmaceutical Formulations	0	0	3	0	3
31	22PY6401T	Pharmacotherapeutics-III	3	1	0	0	4
32	22PY6401P	Pharmacotherapeutics-III	0	0	3	0	3
33	22PY6402T	Hospital Pharmacy	2	1	0	0	3
34	22PY6402P	Hospital Pharmacy	0	0	3	0	3
35	22PY6403T	Clinical Pharmacy	3	1	0	0	4
36	22PY6403P	Clinical Pharmacy	0	0	3	0	3
37	22PY6404T	Biostatistics & Research Methodology	2	1	0	0	3
38	22PY6405T	Biopharmaceutics & Pharmacokinetics	3	1	0	0	4
39	22PY6405P	Biopharmaceutics & Pharmacokinetics	0	0	3	0	3
40	22PY6406T	Clinical Toxicology	2	1	0	0	3

41	22PY6501T	Clinical Research	3	1	0	0	4
42	22PY6502T	Pharmacoepidemiology and Pharmacoeconomics	3	1	0	0	4
43	22PY6503T	Clinical Pharmacokinetics & Pharmacotherapeutic Drug Monitoring	2	1	0	0	3
44	22PY650N4	Clerkship	0	1	0	0	1
45	22PY660N1	Internship	0	0	40	0	40

PROJECT

S No	Course Code	Course Title	L	T	P	S	CH
1	22PH4250PW	Project Work	0	0	20	0	20

CBCS STRUCTURE

Sr.NO	Course Code	Course Title	L	T	P	S	CH
1	22PY6101T	Human Anatomy and Physiology	3	1	0	0	4
2	22PY6101P	Human Anatomy and Physiology	0	0	3	0	3
3	22PY6102T	Pharmaceutics	2	1	0	0	3
4	22PY6102P	Pharmaceutics	0	0	3	0	3
5	22PY6103T	Medicinal Biochemistry	3	1	0	0	4
6	22PY6103P	Medicinal Biochemistry	0	0	3	0	3
7	22PY6104T	Pharmaceutical Organic Chemistry	3	1	0	0	4
8	22PY6104P	Pharmaceutical Organic chemistry	0	0	3	0	3
9	22PY6105T	Pharmaceutical Inorganic Chemistry	2	1	0	0	3
10	22PY6105P	Pharmaceutical Inorganic Chemistry	0	0	3	0	3
11	22PY610B6T	Remedial Biology	3	1	0	0	4
12	22PY610B6P	Remedial Biology	0	0	3	0	3
13	22PY610M6T	Remedial Mathematics	3	1	3	0	4
14	22PY6201T	Pathophysiology	3	1	0	0	4
15	22PY6202T	Pharmaceutical Microbiology	3	1	0	0	4
16	22PY6202P	Pharmaceutical Microbiology	0	0	3	0	3
17	22PY6203T	Pharmacognosy&Phytopharmaceuticals	3	1	0	0	4
18	22PY6203P	Pharmacognosy&Phytopharmaceuticals	0	0	3	0	3
19	22PY6204T	Pharmacology-I	3	1	0	0	4
20	22PY6205T	Community Pharmacy	2	1	0	0	3

21	22PY6206T	Pharmacotherapeutics-I	3	1	0	0	4
22	22PY6206P	Pharmacotherapeutics-I	0	0	3	0	3
23	22PY6301T	Pharmacology-II	3	1	0	0	4
24	22PY6301P	Pharmacology-II	0	0	3	0	3
25	22PY6302T	Pharmaceutical Analysis	3	1	0	0	4
26	22PY6302P	Pharmaceutical Analysis	0	0	3	0	3
27	22PY6303T	Pharmacotherapeutics-II	3	1	0	0	4
28	22PY6303P	Pharmacotherapeutics-II	0	0	3	0	3
29	22PY6304T	Pharmaceutical Jurisprudence	2	0	0	0	2
30	22PY6305T	Medicinal Chemistry	3	1	0	0	4
31	22PY6305P	Medicinal Chemistry	0	0	3	0	3
32	22PY6306T	Pharmaceutical Formulations	2	1	0	0	3
33	22PY6306P	Pharmaceutical Formulations	0	0	3	0	3
34	22PY6401T	Pharmacotherapeutics-III	3	1	0	0	4
35	22PY6401P	Pharmacotherapeutics-III	0	0	3	0	3
36	22PY6402T	Hospital Pharmacy	2	1	0	0	3
37	22PY6402P	Hospital Pharmacy	0	0	3	0	3
38	22PY6403T	Clinical Pharmacy	3	1	0	0	4
39	22PY6403P	Clinical Pharmacy	0	0	3	0	3
40	22PY6404T	Biostatistics & Research Methodology	2	1	0	0	3
41	22PY6405T	Biopharmaceutics & Pharmacokinetics	3	1	0	0	4
42	22PY6405P	Biopharmaceutics & Pharmacokinetics	0	0	3	0	3
43	22PY6406T	Clinical Toxicology	2	1	0	0	3
44	22PY6501T	Clinical Research	3	1	0	0	4
45	22PY6502T	Pharmacoepidemiology and Pharmacoeconomics	3	1	0	0	4
46	22PY6503T	Clinical Pharmacokinetics & Pharmacotherapeutic Drug Monitoring	2	1	0	0	3
47	22PY650N4	Clerkship	0	1	0	0	1
48	22PY650E5	Project work (Six Months)	0	0	20	0	20
49	22PY660N1	Internship	0	0	40		40

SYLLABUS CATEGORY WISE
BS

I Year Pharm D

22PY6106RMT: Remedial Biology

L-T-P-S:3-0-0-0 **ContactHours: 90**

Mapping of Course Outcomes with PO :

CO	Course outcomes	PO	BTL
CO1	Understand the classification and salient features of plant kingdoms	PO1	2
CO2	Understand the plants morphology and salient features of the plants.	PO1	2
CO3	Understandthe taxonomy of plants, fruits and seeds	PO1	2
CO4	Understand theplant physiology and study of different microorganisms	PO1	2
CO5	Understanding the anatomy of frog	PO1	2
CO6	To gain the knowledge on general organization of mammals	PO1	2

Syllabus:

Introduction, General organization of plants and its inclusions, Plant tissues, Plant kingdom and its classification

Morphology of plants, Root, Stem, Leaf and Its modifications, Study of Animal cell, Study animal tissues

Inflorescence and Pollination of flowers, Morphology of fruits and seeds, Solanaceae, Lilliaceae, Zinziberaceae, Rubiaceae

Plant physiology; Study of Fungi, Yeast, Penicillin and Bacteria

Detailed study of frog-Digestive system**,** Nervous system, Reproductive system

Study of Pisces, Raptiles, AvesGenearal organization of mammals

Study of poisonous animals

Books:

1
.TextbookofBiologybyS.B.Gokhale2.ATextbookofBiologybyDr.ThulajappaandDr. Seetaram

Reference Books

1. A Text book of Biology by B.V.SreenivasaNaidu

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.Ekambaranathaayyer and T. N. Ananthakrishnan.

5. A manual for pharmaceutical biology practical by S.B.Gokhale and C. K. Kokate

I Year Pharm D

22PY6106RMB: Remedial Biology (Practical)

L-T-P-S:0-0-3-0 **ContactHours: 30**

Mapping of Course Outcomes with PO :

CO	Course outcomes	PO	BTL
CO1	Generalize the Organisation of plants ,plant tissues and plant kingdom	PO1	3
CO2	Application of biological principles in study of plant kingdom	PO1	3
CO3	Application of biological principles in studying morphology and plant physiology.	PO1	3
CO4	Application of biological principles in study of taxonomy	PO1	3
CO5	Application of biological principles in studying Microorganisms	PO1	3
CO6	Application of biological principles in study of animals and other poisonous animals	PO1	3

Syllabus:

Introduction to experiments in biology: a) Study of Microscope b) Section cutting techniques; c) Mounting and staining d) Permanent slide preparation

Study of cell and its inclusions

Study of mitochondria and golgi apparatus

Study of Stem modifications

Study of root modifications

Study of leaf modifications

Identification of fruits

Identification of seeds

Study of transverse section of Ephedra

Study of transverse section of acacia

Study of transverse section of ephedra

Study of transverse section of podophyllum

Different types of bones

Simple plant physiological experiments

Study of plant transpiration

Study of photosynthesis

Detailed study of frog

Study of frog's digestive system

Study of frog's nervous system

Study of frog's reproductive system

Study of frog's circulatory system

Study of computer based tutorials

Study of mitosis in onion root tip

Study of pollen germination

Study of plant population density by quadrat method

Action on salivary amylase on starch

Study of plasmolysis

Study of distribution of stomata

Study of osmosis

I Year Pharm D
22PY610M6T:REMEDIAL MATHEMATICS

L-T-P-S: 3-1-0-0 **Contact Hours: 120**

Mapping of Course Outcomes with PO :

CO#	Course Outcome	PO	BTL
CO1	Algebra : Determinants, Matrices Trigonometry : Sides and of a triangle, solution of triangles	1, 2	3
CO2	Analytical Geometry :Points, Straight line, circle, parabo	1, 2	2
CO3	Differential calculus and Partial differentiation	1, 2	3
CO4	Integral Calculus	1, 2	3
CO5	Differential equations	1, 2	3
CO6	Laplace transform	1, 2	3

Syllabus:

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

Books

1. Differential Calculus by Shanthinarayan
2. Pharmaceutical Mathematics with application to Pharmacy by Panchaksharappa Gowda D.H.

Reference Books

1. Integral Calculus by Shanthinarayan
2. Higher Engineering Mathematics by Dr.B.S.Grewal

PC

I Year Pharm D
22PY6101T: HUMAN ANATOMY AND PHYSIOLOGY I

L-T-P-S:3-1-0-0 **ContactHours:120**

Mapping of Course Outcomes with PO :

CO#	CourseOutcome	PO	BTL
CO1	Understanding the cellular level and tissue level of organization in the human body, Process of blood cell, Lymph formation and their importance in body physiology	PO1	2
CO2	Understand the anatomy and functions of organs involved in circulatory and respiration	PO1	2
CO3	Understanding the process of digestion, and Anatomical location, physiological functions of human nervous system	PO1	2
CO4	Understanding the secretion and functions of endocrinal hormones and Physiology of excretory organs.	PO1	2
CO5	Understanding the Anatomy and functions of special sense organs, and the process of reproduction	PO1	2
CO6	Understanding the skeletal system of humans and sports physiology	PO1	2

Syllabus:

Haemopoietic System

a) Composition and functions of blood
b) Hemopoiesis and disorders of blood components (definition of disorder)
c) Blood groups
d) Clotting factors and mechanism
- Platelets and disorders of coagulation

Lymph

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

Cardiovascular system

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

Respiratory system

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

Digestive system

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

Nervous system

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

Urinary system

a) Anatomy and physiology of urinary system
b) Formation of urine
c) Renin Angiotensin system – Juxtaglomerular apparatus - acid base Balance

Clearance tests and micturition

Endocrine system

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

Reproductive system

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

Sense organs

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

Osseous system - structure, composition and functions of the Skeleton.

- Classification of joints, Types of movements of joints and disorders of joints (Definitions only)
- Skeletal muscles

a) Histology
b) Physiology of Muscle contraction

- Physiological properties of skeletal muscle and their disorders (definitions)

Sports physiology

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

Books:

1. K Sembulingam, PremaSembulingam. Essentials of Medical Physiology. 7th Edition. New Delhi: Jaypee Brothers Medical Publishers (P) Ltd.; 2016
2. Gerard J. Tortora, Bryan Derrickson. Principles of Anatomy and Physiology. 11th Edition. USA: John Wiley & Sons, Inc; 2007.
3. Anne Waugh, Allison Grand. Anatomy and Physiology in Health and Illness. 12th Edition. China: Churchill Livingstone Elsevier; 2014.

Reference Books

1. Text book of Medical Physiology- Arthur C, Guyton and John E. Hall. Miamisburg, OH, U.S.A.
2. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview,MI USA
3. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A. 32
4. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
5. Textbook of Human Histology by Inderbir Singh, Jaypee brother's medical publishers, New Delhi.
6. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi.
7. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
8. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
9. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje, Academic Publishers Kolkata

I Year Pharm D

22PY6101P : HUMAN ANATOMY AND PHYSIOLOGY I

L-T-P-S:0-0-3-0 **ContactHours:3hr/week**

Mapping of Course Outcomes with PO :

CO#	CourseOutcome	PO	BTL
CO1	Acquire the knowledge in identification of tissues, estimation of blood cells count.	PO1	3
CO2	Applying the knowledge to determine the ESR, bleeding time, clotting time of blood.	PO1	3
CO3	Examine the skeletal system and blood pressure.	PO1	3
CO4	Acquire the knowledge on cardiovascular, digestive system.	PO1	3
CO5	Summarise the Anatomy and functions of special sense organs, and understand the process of reproduction	PO1	3
CO6	Construct of muscle curve in different conditions.	PO1	3

Syllabus:

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

Study of tissues of human body (a) Connective tissue. (b) Nervous tissue.

Determination of W.B.C. count of blood.

Determination of R.B.C. count of blood.

Determination of differential count of blood.

Determination of Erythrocyte Sedimentation Rate.

Determination of Hemoglobin content of Blood.

Determination of Bleeding time & Clotting time.

Determination of Blood Pressure.

Determination of Blood group.

Skeleton system part I-axial skeleton with the help of charts, models & specimens.

Skeleton system part II- appendicular skeleton with the help of charts, models & specimens.

Cardiovascular system with the help of charts, models & specimens.

Respiratory system with the help of charts, models & specimens.

Digestive system with the help of charts, models & specimens.

Urinary system with the help of charts, models & specimens.

Nervous system with the help of charts, models & specimens.

Special senses with the help of charts, models & specimens.

Reproductive system with the help of charts, models & specimens.

Study of different family planning appliances.

To perform pregnancy diagnosis test.

Study of appliances used in experimental physiology.

To record simple muscle curve using gastroenemius sciatic nerve preparation.

To record simple summation curve using gastroenemius sciatic nerve preparation.

To record simple effect of temperature using gastroenemius sciatic nervepreparation.

To record simple effect of load & after load using gastroenemius sciatic nervepreparation.

To record simple fatigue curve using gastroenemius sciatic nerve preparation.

I Year Pharm D
22PY6102T: Pharmaceutics

L-T-P-S: 2-1-0-0 **Contact Hours: 90**

Mapping of Course Outcomes with PO:

CO No	Course Outcome(CO)	PO	BTL
CO1	To understand the different dosage forms, History of Pharmacy and pharmacopoeias	1	2
CO2	To Understand the Pharmaceutical Calculations involved in formulation and preparation of powder dosage forms	1	2
CO3	To understand the preparation of Monophasic liquid dosage forms	1	2
CO4	To understand the biphasic liquid dosage forms	1	2
CO5	To understand the concepts of suppositories and Gelanicals	1	2
CO6	To gain the knowledge on Surgical aids and incompatibilities	1	2

Syllabus:

Introduction to dosage forms - classification and definitions.
Prescription: definition, parts and handling
Posology: Definition, Factors affecting dose selection. Calculation of children and infant doses.

History of Pharmacy: Historical back ground and development of profession of pharmacy and pharmaceutical industry in brief. Development of Indian Pharmacopoeia and introduction to other Pharmacopoeias such asBP, USP, European Pharmacopoeia, Extra pharmacopoeia and Indian national formulary.

Pharmaceutical calculations: Weights and measures – Imperial & Metric system, Calculations involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing point and molecular weight.
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.

Monophasic liquids: Theoretical aspects of formulation including adjuvant like stabilizers, colorants, flavours with examples. Study of Monophasic liquids like gargles, mouth washes, Throat paint, Ear drops, Nasal drops, Liniments and lotions, Enemas and collodions.
Biphasic dosage forms: Suspensions and emulsions, Definition, advantages and disadvantages, classification, test for the type of emulsion, formulation, stability and evaluation.
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 andextracts.
Surgical aids: Surgical dressings, absorbable gelatin sponge, sutures, ligatures and medicated bandages.
Incompatibilities: Introduction, classification and methods to overcome the incompatibilities.

Books:

1. R. M. Mehta, Dispensing Pahrmacy, edition 2016, Vallabha Publications.
2. R.M. Mehta, Pharmaceutics – I, edition 2016, Vallabha Publications.

Reference Books

1. H.C. Ansel et al., Pharmaceutical Dosage Form and Drug Delivery System, Lippincott Williams and Walkins, New Delhi.
2. Carter S.J., Cooper and Gunn's-Dispensing for Pharmaceutical Students, CBS publishers, New Delhi.
3. M.E. Aulton, Pharmaceutics, The Science& Dosage Form Design, Churchill Livingstone, Edinburgh.
4. Indian pharmacopoeia.

5. British pharmacopoeia.
6. Lachmann. Theory and Practice of Industrial Pharmacy,Lea&Febiger Publisher, The University of Michigan.
7. Alfonso R. Gennaro Remington. The Science and Practice of Pharmacy, Lippincott Williams, New Delhi.
8. E.A. Rawlins, Bentley's Text Book of Pharmaceutics, English Language Book Society, Elsevier Health Sciences, USA.
9. Isaac GhebreSellassie: Pharmaceutical Pelletization Technology, Marcel Dekker, INC, New York.

I Year Pharm D

22PY6103P:Pharmaceutics (Practical)

L-T-P-S: 0-0-3-0 **Contact Hours: 90**

Mapping of Course Outcomes with PO:

CO No.	Course Outcome (CO)	PO	BTL
CO1	Understand the preparation of Syrups and elixirs	1	2
CO2	Understand the preparation of Linctus and Solutions	1	2
CO3	Understand the preparation of Liniments and Suspensions	1	2
CO4	Understand the preparation of Emulsions	1	2
CO5	Understand the preparation of powders and suppositories	1	2
CO6	Understand the preparation of Incompatibilities, pastes and ear drops	1	2

List of Experiments:

1. Syrups

a. Simple Syrup I.P

b. Syrup of ferrous SulphateIP

e. Orange Syrup

2. Elixir

a. Piperizine citrate elixir BP

b. c. Paracetamol elixir BPC

CO-II

3. Linctus

a. Simple Linctus BPC

b. Pediatric simple Linctus BPC

4. Solutions

a. Solution of cresol with soap IP

b. Strong solution of ferric chloride BPC

c. Aqueous Iodine Solution IP

d. Strong solution of Iodine IP

e. Strong solution of ammonium acetate IP

5. Liniments

a. Liniment of turpentine IP*

b. Liniment of camphor IP

6. Suspensions

a. Calamine lotion

b. Magnesium Hydroxide mixture BP

7. Emulsions

a. Cod liver oil emulsion

b. Liquid paraffin emulsion

8. Powders

a. Eutectic powdes

b. Explosive powder

c. Dusting powder

d. Insufflations

9. Suppositories

a. Boric acid suppositories

b. Chloral suppositories

10. Incompatibilities

a. Mixtures with Physical

b. Chemical & Therapeutic incompatibilities

12. Paste

Zinc oxide paste

13. Ear Drops

Phenol – glycerine ear drops

I Year Pharm D
22PY6103T: Medicinal Biochemistry

L-T-P-S:3-1-0-0 **Contact Hours: 120**

Mapping of Course Outcomes with PO:

CO	Course Outcome	PO	BTL
CO1	Understanding the catalytic activity of enzymes and importance of isoenzymes indiagnosis of disease	1	2
CO2	Understanding the metabolic process biomolecules in health and illness (metabolicdisorders)	1	2
CO3	Understanding the concepts of t h e genetic organization of mammalian genome; protein synthesis, replication, mutation and repair mechanism	1	2
CO4	Understanding t h e biochemical principles of organ function tests of kidney, liver andendocrine gland	1	2
CO5	Understanding the principles, significance and methods of different biochemical tests	1	2
CO6	Understanding the Immunochemical techniques for determination of hormone levels and protein levels in serum	1	2

Syllabus:

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.

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 (□-oxidation); Ketogenesis and ketolysis; biosynthesis of fatty acids, lipids; metabolism of cholesterol; Hormonalregulation of lipid metabolism. Defective metabolism of lipids (Atheroslerosis, fatty liver, hypercholesterolmiea).

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

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

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

Introduction to clinical chemistry: Cell; composition; malfunction; Roll of the clinical chemistry laboratory. The kidney function tests: Role of kidney; Laboratory tests for normal function includes-

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

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

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

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

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

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

Electrolytes: Body water, compartments, water balance, and electrolyte distribution.

Determination of sodium, calcium, potassium, chlorides, bicarbonates in the body fluids.

Books:

a. Harpers review of biochemistry - Martin
b. Text book of biochemistry – D.Satyanarayana

c. Text book of clinical chemistry- Alex kaplan &Laverve L.Szabo

Reference Books

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

I Year Pharm D

22PY6103P: Medicinal Biochemistry practical

L-T-P-S:0-0-3-0 **Contact Hours: 3hrs/week**

Mapping of Course Outcomes with PO:

CO#	Course Outcome	PO	BTL
CO1	Applying the knowledge and to perform qualitative analysis of urine	4	3
CO2	Applying the knowledge and to perform quantitative analysis of both urine and blood	4	3
CO3	Acquiring knowledge to estimate the liver parameters	4	3
CO4	Acquiring knowledge to estimate the Kidney parameters	4	3
CO5	Applying the knowledge to estimate lipid profile parameters	4	3
CO6	Acquiring knowledge to estimate enzyme activities and electrolytes	4	3

Syllabus:

Qualitative analysis of normal constituents of urine.
Qualitative analysis of abnormal constituents of urine.
Quantitative estimation of urine sugar by Benedict's reagent method.
Quantitative estimation of urine chlorides by Volhard's method.
Quantitative estimation of urine calcium by precipitation method.
Preparation of Folin Wu filtrate from blood.
Quantitative estimation of blood creatinine.
Quantitative estimation of blood sugar Folin-Wu tube method.
Estimation of SGOT in serum.
Estimation of SGPT in serum.
Determination of serum bilirubin
Quantitative estimation of urine creatinine by Jaffe's method.
Experiment on lipid profile tests
Determination of Glucose by means of Glucoseoxidase.
Enzymatic hydrolysis of Glycogen/Starch by Amylases.
Study of factors affecting Enzyme activity. (pH & Temp.)
Determination of sodium, calcium and potassium in serum

I Year Pharm D

22PY6104T :Pharmaceutical Organic Chemistry (Theory)

L-T-P-S: 3-1-0-0 **Contact Hours:** 120 hrs

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO	BTL
CO1	Understand the IUPAC/Common system of nomenclature of simple organic compounds	1	2
CO2	To understand the organic reactions, reactivity, stability, mechanisms involved in aliphatic and alicyclic compounds	1	2
CO3	To understand the free radical addition and the theory of resonance	1	2
CO4	To understand the nucleophilc & electrophilic aromatic substitution reactions, reactivity and orientation	1	2
CO5	To understand the named organic reactions with mechanisms and Interpret oxidation and reduction reactions	1	2
CO6	To understand the preparation, test for purity, assay and medicinal uses of official compounds	1	2

Syllabus:

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, ASem-ines, Amines, Phenols, Alkyl Halides, Carboxylic Acid, Esters, Acid Chlorides And Cycloalkanes.

Nuclophilic aliphatic substitution mechanism: Nucleophiles and leaving groups, kinetics of second and first order reaction, mechanism and kinetics of SN_2 reactions. Stereochemistry and steric hindrance, role of solvents, phase transfer catalysis, mechanism and kinetics of SN1 reactions, stereochemistry, carbocation and their stability, rearrangement of carbocation, role of solvents in SN1 reaction, Ion dipole bonds, SN2 versus SN1 solvolyses, nucleophilic assistance by the solvents.
Dehydro halogenation of alkyl halides: 1,2 elimination, kinetics, E2 and E1 mechanism, elimination via carbocation, evidence for E2 mechanism, absence of rearrangement isotope effect, absence hydrogen exchange, the element effect, orientation and reactivity, E2 versus E1, elimination versus substitution, dehydration of alcohol, ease of dehydration, acid catalysis, reversibility, orientation.
Free radicals chain reactions of alkane: Mechanism, relative reactivity and stability.
Alicyclic compounds: Preparations of cyclo alkanes, Bayer strain theory and orbital picture of angle strain.

Electrophillic 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 broSem-ines, peroxide effect, electrophillic addition, mechanism, rearrangement, absence of hydrogen exchange, orientation and reactivity, addition of halogen, mechanism, halohydin formation, mechanism of free radicals additon, mechanism of peroxide initiated addition of hydrogen broSem-ine, orientation of free addition, additions of carbene to alkene, cyclo addition reactions.
Carbon-carbon double bond as substituents: Free radical halogenations of alkenes, comparision of free radical substitution with free radical addition, free radical substitution in alkenes, 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, nucleophyllic substitution in allylic substrate, SN1 reactivity, allylic rearrangement, resonance stabilisation of allyl cation, hyper conjugation, nucleophilic substitution in allylic substrate, SN2 nucleophilic substituion 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.
Elecrophilic aromatic substitution: Effect of substituent groups, determination of orientation, determination of relative reactivity, classification of substituent group, mechanism of nitration, sulphonation, halogenation, friedel craft alkylation, friedel craft acylation, reactivity and orientation, activating and deactivating O,P,M directing groups, electron release via resonance, effect of halogen on electrophilic aromatic substitution in alkyl benzene, side chain halogination of alkyl benzene, resonance stabilization of benzyl radical.

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 caboxyl group, comparison of alkyl nucleophilic substitution with acyl nucleophilic substitution. Nucleophilic aromatic substitution: Bimolecular displacement mechanisms, orientation, comparison of aliphatic nucleophilic substitution with that of aromatic.
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. 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. Oxidation reduction reaction.

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

Books:

1. T.R.Morrison and R. Boyd - Organic chemistry,

2. I.L.Finer- Organic chemistry, the fundamentals of chemistry
3. Bentley and Driver-Text book of Pharmaceutical chemistry

Reference Books

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.

I Year Pharm D
22PY6104P : Pharmaceutical Organic Chemistry (Practical)

L-T-P-S: 0-0-4-0 **Contact Hours:** 90 hrs

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO	BTL
CO1	Applying the knowledge to Synthesize organic compounds by acetylation, benzoylation and bromination methods.	1	3
CO2	Applying the knowledge to Synthesize organic compounds by condensation, diazotisation and coupling and hydrolysis methods.	1	3
CO3	Applying the knowledge to Synthesize organic compounds by nitration reactions, oxidation, reduction and miscellaneous reactions methods.	1	3
CO4	Acquiring knowledge to Identify Phenols, amides, carbohydrates, amines in various compounds.	1	3
CO5	Acquiring knowledge to Identify Carboxylic acids, aldehyde, ketones and alcohols in various compounds.	1	3
CO6	Acquiring knowledge to Identify Carboxylic acids, aldehyde, ketones and alcohols Esters, hydrocarbons, anilides and nitro compounds	1	3

Syllabus:

Introduction to the various laboratory techniques through demonstration involving synthesis of the actylation, benzoylation and bromination reactions

1. Acetanilde / aspirin (Acetylation)
2. Benzanilide / Phenyl benzoate (Benzoylation)
3. P-bromo acetanilide / 2,4,6 – tribromo aniline (Bromination)

Introduction to the various laboratory techniques through demonstration involving synthesis of the condensation, diazotization and coupling and hydrolysis reactions

1. Dibenzylidene acetone (Condensation)
2. 1-Phenylazo-2-napthol (Diazotisation and coupling)
3. Benzoic acid / salicylic acid (Hydrolysis of ester)

Introduction to the various laboratory techniques through demonstration involving synthesis of the oxidation, reduction, nitration and miscellaneous types of reactions

1. Preparation of benzoic acid from toluene or benzaldehyde
2. M-phenylene diamine (Reduction of M-dinitrobenzene)/ Aniline from nitrobenzene
3. M-dinitro benzene (Nitration)

4. Benzophenone oxime
5. Nitration of salicylic acid
6. Preparation of picric acid
7. Preparation of O-chlorobenzoic acid from O-chlorotolune

Identification of organic compounds belonging to the following classes by: Systematic qualitative organic analysis including preparation of derivatives Phenols, amides, carbohydrates, amines

Identification of organic compounds belonging to the following classes by : Systematic qualitative organic analysis including preparation of derivatives Carboxylic acids, aldehyde, ketones and alcohols

Identification of organic compounds belonging to the following classes by : Systematic qualitative organic analysis including preparation of derivatives Esters, hydrocarbons, anilides and nitro compounds.

I Year Pharm D
22PY61105T: Pharmaceutical Inorganic Chemistry

L-T-P-S: 2-1-0-0 **Contact Hours: 90**

Mapping of Course Outcomes with PO/PSO:

CO	Course outcomes	PO	BTL
1	Understanding the methods to identify errors and the concepts of different titrations and the indicators used in the titrations.	1	2
2	To understand the of principles of titrations	1	2
3	To understand the of principles of titrations and limit tests	1	2
4	Understand the monograph study of various inorganic compounds belonging to the class of gastrointestinal agents	1	2
5	Understand the monograph study of various inorganic compounds belonging to the class of Electrolytes, trace materials, anti-microbials and pharmaceutical aids	1	2
6	Understand the monograph study of various inorganic compounds belonging to the class of dental products, miscellaneous products and radio pharmaceuticals	1	2

SYLLABUS:

Errors: Sources of errors, types of errors, methods of minimizing errors, accuracy, precision, and significant figures

Volumetric analysis: Classification of volumetric analytical techniques based on principle, Primary and secondary standards. Preparation and standardization of various molar and normal solutions

Acid-base titrations: Classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves

Theory of indicators: Theories of indicators used in acid-base, redox and complexometric titrations

Redox titrations: Concepts of oxidation and reduction, Types of redox titrations (Principles and applications) Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassium iodate

Non aqueous titrations: Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl

Precipitation titrations: Mohr's method, Volhard's, Modified Volhard's, Fajans method, estimation of sodium chloride.

Complexometric titrations: Classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium gluconate.

Gravimetry: Principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, Estimation of barium sulphate

Limit tests: Principles involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate.

Medicinal gases: Oxygen, carbon dioxide, Nitrogen, Helium, Nitrous oxide,

Acidifiers: Ammonium chloride and Dil. HCl

Antacids: Ideal properties of antacids, combinations of antacids, Sodium Bicarbonate, Aluminum hydroxide gel, Magnesium hydroxide mixture

Cathartics: Magnesium sulphate, Sodium orthophosphate, Kaolin and Bentonite

Electrolyte replenishers: Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride, Potassium chloride, Calcium glconate and Oral Rehydration Salt (ORS), Physiological acid base balance.

Essential Trace elements: Importance of trace elements in human body physiology and homeostasis including zinc (Zn), copper (Cu), selenium (Se), chromium (Cr), cobalt (Co), iodine (I), manganese (Mn), and molybdenum (Mo).

Antimicrobials: Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide, Chlorinated lime, Iodine and its preparations

Pharmaceutical aids: Inorganic diluents, disintegrants, colorants, glidants used in pharmaceutical formulation

Dental Products: Dentifrices, role of fluoride in the treatment of dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, and Zinc eugenol cement

Miscellaneous compounds: *Expectorants*: Potassium iodide, Ammonium chloride*; *Emetics*: Copper sulphate*, Sodium potassium tartarate; *Haematinics*: Ferrous sulphate*, Ferrous gluconate; *Poison and Antidote*: Sodium thiosulphate*, Activated charcoal, Sodium nitrite; *Astringents*: Zinc Sulphate, Potash Alum

Radio Pharmaceuticals: Radio activity, Measurement of radioactivity, Properties of α, β, γ radiations, Half-life, radio isotopes and study of radio isotopes - Sodium iodide I131, Storage conditions, precautions & pharmaceutical application of radioactive substances.

Approved Textbooks:

1. A textbook 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

Approved References:

1. Inorganic Pharmaceutical Chemistry by Anand & Chatwal
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

I Year Pharm D

22PY6105P: Pharmaceutical Inorganic Chemistry

L-T-P-S: 0-0-3-0 **Contact Hours: 3Hrs/W**

Mapping of Course Outcomes with PO/PSO:

CO	Course outcomes	PO	BTL
1	Test for identification of impurities	1,4	4
2	Analyze the assays of selected inorganic compounds	1,4	4
3	Estimation of mixtures	1,4	5
4	Test for identity of selected inorganic compounds	1,4	4
5	Test for Purity of selected inorganic compounds	1,4	4
6	Analyze the Preparation of selected organic compounds	1,4	4

SYLLABUS:

Limit test (6 exercises)

a. Limit test for chlorides
b. Limit test for sulphates
c. Limit test for iron
d. Limit test for heavy metals
e. Limit test for arsenic
f. Modified limit tests for chlorides and sulphates

Assays (10 exercises)

a. Ammonium chloride- Acid-base titration
b. Ferrous sulphate- Cerimetry
c. Copper sulphate- Iodometry
d. Calcium gluconate- Complexometry
e. Hydrogen peroxide – Permanganometry
f. Sodium benzoate – Nonaqueous titration
g. Sodium chloride – Modified Volhard's method
h. Assay of KI – KIO_3 titration
i. Gravimetric estimation of barium as barium sulphate
j. Sodium antimony gluconate or antimony potassium tartrate

Estimation of mixture (Any two exercises)

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

Test for identity (Any three exercises)

a. Sodium bicarbonate
b. Barium sulphate
c. Ferrous sulphate
d. 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)

a. Boric acids
b. Potash alum
c. Calcium lactate
d. Magnesium sulphate

Recommended Books (Latest Editions):

1. Vogel's Textbook of Quantitative Chemical Analysis by A.I. Vogel
2. Practical Pharmaceutical Chemistry by A.H. Beckett and J. B. Stenlake
3. Bentley and Driver's Textbook of Pharmaceutical Chemistry
4. Indian Pharmacopoeia

II Year Pharm D
22PY6201T: Pathophysiology (Theory)

L-T-P-S: 3-1-0-0 **Contact Hours: 120**

Mapping of Course Outcomes with PO:

CO#	Course Outcome	PO	BTL
CO1	Understand the pathogenesis and morphology of reversible and irreversible cell injury and inflammation	1	2
CO2	To understand mechanisms involved in autoimmune diseases and allograft rejection	1	2
CO3	To understand the general biology of cancer, mechanism of shock and effects of radiation exposure	1	2
CO4	To Understand the Biological effects of radiation, Environmental and nutritional diseases	1	2
CO5	To understand the etiopathogenesis of selected diseases	1	2
CO6	To understand the etiopathogenesis of infectious diseases	1	2

Syllabus:

Basic principles of cell injury and Adaptation

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

Inflammation

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

Diseases of Immunity

a. Introduction to Tand B cells
b. MHC proteins or transplantation antigens
c. Immune tolerance
-Hypersensitivity
Hypersensitivity type I, II, III, IV, Biological significance, Allergy due to food, chemicals and drugs
- Autoimmunity
Criteria for autoimmunity, Classifications of autoimmune diseases in man, mechanism of autoimmunity, Transplantation and immunologic tolerance, allograft rejections, transplantation antigens, mechanism of rejection of allograft.
- Acquired immune deficiency syndrome (AIDS)
- Amylodosis

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, Environmental and nutritional diseases

i) Air pollution and smoking- SO2,NO, NO2, and CO

ii) Protein calorie malnutrition, vitamins, obesity, pathogenesis of starvation.

Pathophysiology of common diseases

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

Infectious diseases:

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

II Year Pharm D

22PY6202T: Pharmaceutical Microbiology (Theory)

L-T-P-S: 3-1-0-0 **Contact Hours: 90**

Mapping of Course Outcomes with PO:

CO#	Course Outcome	PO	BTL
CO1	To understand the basic concepts of microbiology	1	2
CO2	To understand the key growth parameters required by micro-organisms	1	2
CO3	To understand the principles of sterilization used in the pharmaceutical industry	1	2
CO4	To understand the concepts of immunology and interpolate the same in disease diagnosis	1	2
CO5	To understand the techniques for microbiological assays	1	2
CO6	Understand the diagnostic tests and Infectious diseases	1	2

Syllabus:

Introduction to the science of microbiology. Major divisions of microbial world and Relationship among them. Different methods of classification of microbes and study of Bacteria, Fungi, virus, Rickettsiae, Spirochetes.

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.

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

Immunology- Immunity, Definition, Classification, General principles of natural immunity, Phagocytosis, acquired immunity (active and passive). Antigens, chemical nature of antigens structure and formation of Antibodies, Antigen-Antibody reactions. Bacterial exotoxins and endotoxins. Significance of toxoids in active immunity, Immunization programme, and importance of booster dose.

Microbial culture sensitivity Testing: Interpretation of results Principles and methods of different microbiological assays, microbiological assay Of Penicillin, Streptomycin and vitamin B2 and B12. Standardisation of vaccines and sera.

Diagnostic tests: Schick's Test, Elisa test, Western Blot test, Southern Blot, PCR Widal, QBC, Mantaux Peripheral smear. Study of malarial parasite.Study of infectious diseases: Typhoid, Tuberculosis, Malaria, Cholera, Hepatitis, Meningitis, Syphilis & Gonorrhea and HIV.

Reference books

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

Text books

a. Vanitha Kale and Kishor Bhusari — Applied Microbiology ‖ Himalaya Publishing house Mumbai.
b. Mary Louis Turgeon — Immunology and Serology in Laboratory Medicines‖ 2nd

edition, 1996 Mosby- Year book inc St. Louis Missouri 63146.

c. Harsh Mohan, — Text book of Pathology‖ 3rd edition, 1998, B-3 Ansari road Darya ganj N. Delhi.

II Year Pharm D
22PY6202P: Pharmaceutical Microbiology (Practical)

L-T-P-S: 0-0-3-0 **Contact Hours: 30**

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO	BTL
CO1	Prepare various culture media for the growth of microorganisms	1	3
CO2	Identify and isolate bacteria	1	3
CO3	Demonstrate aseptic procedures	1	3
CO4	Carry out sterilization and sterility testing of pharmaceuticals	1	3
CO5	Evaluate antimicrobials and determine the MIC of antimicrobial agents	1	4
CO6	Conduct planned experiments and prepare laboratory report in a standard format	1	4

Syllabus:

a. Study of apparatus used in experimental microbiology*.
b. Sterilisation of glass wares. Preparation of media and sterilisation. *
c. Staining techniques – Simple staining; Gram's staining; Negative staining**
d. Study of motility characters*
e. Enumeration of micro-organisms (Total and Viable) *
f. Study of the methods of isolation of pure culture. *
g. Bio chemical testing for the identification of micro*-organisms.
h. Cultural sensitivity testing for some micro-organisms. *
i. Sterility testing for powders and liquids. *
j. Determination of minimum inhibitory concentration. *
k. Microbiological assay of antibiotics by cup plate method. *
l. Microbiological assay of vitamins by Turbidometric method*
m. Determination of RWC. **
n. Diagnostic tests for some common diseases, Widal, malarial parasite. **

* Indicate minor experiment & ** indicate major experiment Syllabus is not divided properly

II Year Pharm D

22PY6202T: Pharmacognosy and Phytopharmaceuticals (Theory)

L-T-P-S: 3-1-0-0 **Contact Hours: 90**

Mapping of Course Outcomes with PO:

CO#	Course Outcome	PO	BTL
CO1	To know the history of Pharmacognosy and its evolution	1	1
CO2	To understand the classification of crude drugs and discuss their primary and secondary metabolites	1	2
CO3	To understand the morphological and microscopical characters of crude drugs crude drugs	1	2
CO4	To understand the various parameters related to cultivation, collection, processing and storage of carbohydrates and related products	1	2
CO5	To understand the production, evaluation, uses of oils and proteins	1	2
CO6	To understand the plant fibres used in surgical dressings and adulteration of crude drugs	1	2

Syllabus:

1. Introduction.
2. Definition, history and scope of Pharmacognosy.
3. Classification of crude drugs.
4. Cultivation, collection, processing and storage of crude drugs.
5. Detailed method of cultivation of crude drugs.
6. Study of cell wall constituents and cell inclusions.
7. Microscopical and powder Microscopical study of crude drugs.
8. Study of natural pesticides.
9. Detailed study of various cell constituents.
10. Carbohydrates and related products.
11. Detailed study carbohydrates containing drugs. (11 drugs)
12. Definition sources, method extraction, chemistry and method of analysis of lipids.
13. Detailed study of oils.
14. Definition, classification, chemistry and method of analysis of protein.
15. Study of plants fibers used in surgical dressings and related products.
16. Different methods of adulteration of crude drugs.

Reference books

a. Pharmacognosy by Brady &Tyler.E.
b. Pharmacognosy by T.E.Wallis.
c. Pharmacognosy by C.S. Shah & Qadery.
d. Pharmacognosy by M.A. Iyengar.

Text books

a. Pharmacognosy by G.E. Trease & W.C.Evans.

b. Pharmacognosy by C.K.Kokate,Gokhale & A.C.Purohit.

II Year Pharm D
22PY6203T: Pharmacognosy and Phytopharmaceuticals (Practical)

L-T-P-S: 0-0-3-0 **Contact Hours: 90**

Mapping of Course Outcomes with PO:

CO#	Course Outcome	PO	BTL
CO1	Understand the pharmacognosy experiments	1	2
CO2	Identify cell wall constituents and cell inclusions	1	2
CO3	Identify the crude drugs by its morphological characteristics and study the anatomical characters by preparing slides	1	2
CO4	Identify the crude drugs by its morphological characteristics and study the anatomical characters by preparing slides	1	2
CO5	Conducting chemical tests for selected oils.	1	2
CO6	Conduct Chemical tests for natural compounds	1	2

Syllabus:

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,
6. Macro, powder and microscopic study of Cinnamon.
7. Macro, powder and microscopic study of Cinchona.
8. Macro, powder and microscopic study of Ephedra.
9. Macro, powder and microscopic study of Quassia.
10. Macro, powder and microscopic study of Clove
11. Macro, powder and microscopic study of Fennel.
12. Macro, powder and microscopic study of Coriander.
13. Macro, powder and microscopic study of Isapgol.
14. Macro, powder and microscopic study of Nux vomica.
15. Macro, powder and microscopic study of Rauwolfia.
16. Macro, powder and microscopic study of Liquorice.
17. Macro, powder and microscopic study of Ginger.
18. Macro, powder and microscopic study of Podophyllum.
19. Determination of Iodine value.
20. Determination of Saponification value and unsaponifiable matter.
21. Determination of ester value.
22. Determination of Acid value.
23. Chemical tests for Acacia.
24. Chemical tests for Tragacanth.
25. Chemical tests for Agar.

26. Chemical tests for Starch.
27. Chemical tests for Lipids. (Castor oil, sesame oil, shark liver oil, bees wax)
28. Chemical tests for Gelatin.

II Year Pharm D
22PY6204T: Pharmacology –I (Theory)

L-T-P-S: 3-1-0-0 **Contact Hours: 120**

Mapping of Course Outcomes with PO:

CO#	Course Outcome	PO	BTL
CO1	To understand the pharmacokinetics and pharmacodynamics of a drug	1	2
CO2	To understand the drugs acting on ANS	1	2
CO3	To understand the drugs acting on cardiovascular system	1	2
CO4	To understand the drugs acting on CNS	1	2
CO5	To understand the drugs acting on Respiratory tract	1	2
CO6	To understand the pharmacology of hormones and hormone antagonists	1	2

Syllabus:

General Pharmacology

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

Pharmacology of drugs acting on ANS

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

Pharmacology of drugs acting on cardiovascular system

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

Pharmacology of drugs acting on Central Nervous System

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

Pharmacology of Drugs acting on Respiratory tract

a. Bronchodilators
b. Mucolytics
c. Expectorants
d. Antitussives
e. Nasal Decongestants

Pharmacology of Hormones and Hormone antagonists

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

Pharmacology of autocoids and their antagonists

a. Histamines and Anti-histaminics
b. 5-Hydroxytryptamine and its antagonists
c. Lipid derived autocoids and platelet activating factor

Reference books

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

Text books

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

II Year Pharm D
22PY6205T: Community Pharmacy –I (Theory)

L-T-P-S: 2-1-0-0 **Contact Hours: 90**

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO	BTL
CO1	To gain the knowledge on community pharmacy	1,9	1
CO2	To understand the prescriptions and inventory management	1,9	2
CO3	To understand the pharmaceutical care and patient counseling	1,9	2
CO4	To gain the knowledge on medication adherence and health screening services	1,9	2
CO5	To understand the health education	1,9	2
CO6	To understand the health screening services in community pharmacy	1,9	2

Syllabus:

Definition, scope, of community pharmacy

a. Roles and responsibilities of Community pharmacist

Community Pharmacy Management

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

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

Inventory control in community pharmacy: Definition, various methods of Inventory Control ABC, VED, EOQ, Lead time, safety stock.

Pharmaceutical care: Definition and Principles of Pharmaceutical care.

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

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

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

OTC Medication- Definition, OTC medication list & Counselling

Health Education

a. WHO Definition of health, and health promotion, care for children, pregnant & breast-feeding women, and geriatric patients.
b. Commonly occurring Communicable Diseases, causative agents,

c. Clinical presentations and prevention of communicable diseases – Tuberculosis, Hepatitis, Typhoid, Amoebiasis, Malaria, Leprosy,
d. Syphilis, Gonorrhea and AIDS
e. Balance diet, and treatment & prevention of deficiency disorders Family planning – role of pharmacist

Responding to symptoms of minor ailments

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

Essential Drugs concept and Rational Drug Therapy Role of community pharmacist

Code of ethics for community pharmacists

Reference books

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

Text books

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

II Year Pharm D
22PY6204P: Pharmacotherapeutics - I (Theory)

L-T-P-S: 3-1-0-0 **Contact Hours: 120**

Mapping of Course Outcomes with PO:

CO#	Course Outcome	PO	BTL
CO1	To understand the etiopathogenesis of CVS	1	2
CO2	To understand the etiopathogenesis of Respiratory system	1	2
CO3	To understand the etiopathogenesis of Endocrine system	1	2
CO4	Understand the individualized therapeutic plans based on diagnosis	1	2
CO5	To understand the drugs used in ophthalmology	1	2
CO6	To understand the rationale for drug use	1	2

Syllabus:

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

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

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

General prescribing guidelines for (A) Pediatric patients **(B)** Geriatric patients **(c)** Pregnancy and breast feeding

CO V: Ophthalmology: Glaucoma, Conjunctivitis- viral & bacterial

CO VI: Introduction to rational drug use: Definition, Role of pharmacist Essential drug concept Rational drug formulations

Reference books

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

Text books

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

II Year Pharm D

22PY6204P: Pharmacotherapeutics - I (Practical)

L-T-P-S: 0-0-3-0 **Contact Hours: 30**

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO	BTL
CO1	To analyze and present the recorded cases in General medicine department	1	3
CO2	To analyze and present the recorded cases in General medicine department	1	3
CO3	To analyze and present the recorded cases in Pulmonology department	1	3
CO4	To analyze and present the recorded cases in Cardiology department	1	3
CO5	To analyze and present the recorded cases in Gastroenterology department	1	3
CO6	To analyze and present the recorded cases in Ophthalmology department	1	3

Syllabus:

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.

5 cases should be presented and recorded covering most common diseases
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5 cases should be presented and recorded covering most common diseases

III Year Pharm D

22PY6301T: Pharmacology - II (Theory)

L-T-P-S: 3-1-0-0 **Contact Hours: 120**

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO	BTL
CO1	To understand the pharmacology of drugs acting on blood and blood forming agents and Renal system	1	2
CO2	To understand the pharmacology of chemotherapy	1	2
CO3	To understand the immuno pharmacology and principles of animal toxicology	1	2
CO4	To acquire the knowledge on cell, macromolecules, cell signalling, DNA replication and cell cycle.	1	2
CO5	To understand the iimportance of gene and its structure, genome, gene expression, recombinant DNA technology and other associated aspects	1	2
CO6	To understand the iimportance of RNA and other associated aspects	1	2

Syllabus:

Pharmacology of Drugs acting on Blood and blood forming agents

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

Pharmacology of drugs acting on Renal System

a) Diuretics
b) Antidiuretics

Chemotherapy

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

m) Chemotherapy of cancer (Neoplasms)

Immunopharmacology

Pharmacology of immunosuppressants and stimulants

Principles of Animal toxicology

Acute, sub-acute and chronic toxicity

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 signalling:** Communication between cells and their environment, ion-channels, signal transduction pathways (MAP kinase, P38 kinase, JNK, Ras and PI3-kinase pathways, biosensors.

The Gene: Genome structure and function:

a) **Gene structure:** Organization and elucidation of genetic code.

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

c) **Transcription and Transcription factors:** Basic principles of transcription in pro and eukaryotes. Transcription factors that regulate transcription in pro and eukaryotes.

RNA processing: rRNA, tRNA and mRNA processing.

Protein synthesis: Mechanisms of protein synthesis, initiation in eukaryotes, translation control and post-translation events

Altered gene functions: Mutations, deletions, amplifications, LOH, 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

Reference books

a. Goodman Gilman, A., Rall, T.W., Nies, A.I.S. and Taylor, P. Goodman and Gilman's The pharmacological Basis of therapeutics. 9th edition, 1996. Publisher: Mc Graw Hill, Pergamon press.
b. Craig, C.R. and Stitzel, R.E. Modern Pharmacology. Latest edition. Publisher: Little Brown and company.
c. Katzung, B.G. Basic and clinical pharmacology. Latest edition. Publisher: Prentice Hall, International.
d. Gupta, P.K. and Salunkhe, D.K. Modern Toxicology. Volume I, II and III. Latest edition. Publisher: B.V. Gupta, Metropolitan Book Co. (p) Ltd, New Delhi.

Text books

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

III Year Pharm D
22PY6204P: Pharmacology - II (Practical)

L-T-P-S: 0-0-3-0 **Contact Hours: 90**

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO	BTL
CO1	To understand the laboratory animals and their handling	1	2
CO2	To know the importance of solutions and laboratory appliances used in experimental pharmacology	1	2
CO3	Understand the anesthetics used in laboratory animals	1	2
CO4	Application of bioassays Ach	1	3
CO5	Applications of bioassays of histamine	1	3
CO6	To understand the demonstrate intraperitoneal and intramuscular routes of administration of drugs in animals and describe different anaesthetics used in laboratory animals	1	2

Syllabus:

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 anaesthetics 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. Anti-inflammatory 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.

d. Locomotor activity evaluation of drugs using actophotometer and rotorod.
e. Cardiotonic activity of drugs using isolated frog heart and mammalian heart preparations.

Reference books

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

Text books

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

III Year Pharm D

22PY6302T: Pharmaceutical Analysis (Theory)

L-T-P-S: 3-1-0-0 **Contact Hours: 120**

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO	BTL
CO1	To understand the importance of various documentation practices followed in pharmaceutical industry	1	2
CO2	To understand the knowledge about assay of pharmaceutical substance and product	1	2
CO3	To develop basic practical skills using instrumental techniques	1	2
CO4	To inculcate theoretical knowledge on various instrumental techniques adopted for analysis of pharmaceuticals	1	2
CO5	To understand various methodologies for assay of drugs and pharmaceuticals with the skills and knowledge gained	1	2
CO6	To understand and gain knowledge on trouble shooting in adopting various methodologies using instrumental techniques	1	2

Syllabus:

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.

Chromatography:

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

a. Column Chromatography: Adsorption column chromatography, Operational technique, frontal analysis and elution analysis. Factors affecting column efficiency, applications and partition chromatography.
b. TLC: Introduction, principle, techniques, Rf value and applications.
c. PC: Introduction, principle, types of paper chromatography, preparation techniques, development techniques, applications.
d. Ion-exchange chromatography: Introduction, principles, types of ion exchange synthetic resins, physical properties, factors affecting ion exchange, methodology and applications.

Chromatography:

a. **HPLC:** Introduction, theory, instrumentation, and applications.
b. **HPTLC:** Introduction, theory, instrumentation, and applications.
c. **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.
d. **Electrophoresis:** Principles of separation, equipment for paper and gel electrophoresis, and application.
e. **Gel filtration and affinity chromatography:** Introduction, technique, applications.

Electrometric Methods:

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

a. **Potentiometry:** Electrical potential, electrochemical cell, reference electrodes, indicator electrodes, measurement of potential and pH, construction and working of electrodes, Potentiometric titrations, methods of detecting end point, Karl Fischer titration.

b. **Conductometry:** Introduction, conductivity cell, conductometric titrations and applications.

c. **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.

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

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

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

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

b. **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.

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

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

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

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

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

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

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

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

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

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

Reference books

1. Text Book of Pharm. Analysis by Higuchi. T and Hasen. E. B., New York Inter Science Publishers.
2. Textbook of Pharm. Analysis by K.A. Connors, John Wiley & Sons, New York, Brisbane, Singapore.

3. Quantitative Pharma. Analysis by Jenkins, The Blakiston division, New York.
4. Quantitative Drug Analysis, by Garrot. D, Chapman & Hall Ltd., London.
5. Undergraduate Instrumental Analysis by James. E., CBS Publishers
6. Instrumental Analysis by Willard and Merritt, EWP, East West Press Ltd., Delhi/Madras.
7. Pharm Analysis by Skoog and West, Sounders Manipal College Publishing.
8. Textbook of Drug Analysis by P.D. Sethi., CBS Publishers, Delhi
9. Spectroscopy by Silverstein, John & Wiley & Sons. Inc., Canada & Singapore
10. The Science & Practice of Pharmacy by Remington Vol-I & II, Mack Publishing Co. Pennsylvania.
11. Text Book of Pharm. Chemistry by Chatten, CBS Publications

III Year Pharm D
22PY6302P: Pharmaceutical Analysis (Practical)

L-T-P-S: 0-0-3-0 **Contact Hours: 90**

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO	BTL
CO1	To separate and identification of compounds by chromatography	1	2
CO2	To separate and identification of compounds by UV	1	2
CO3	Conduction of experiments using titrimetric methods	1	2
CO4	Conduction of experiments using calorimetry and nephloturbidometry	1	2
CO5	Conduction of experiments using Flame Photometry and pH metre	1	2
CO6	To demonstrate the various analytical techniques	1	2

Syllabus:

a. Separation and identification of Amino Acids by Paper Chromatography.
b. Separation and identification of Sulpha drugs by TLC technique.
c. Effect of pH and solvent on the UV spectrum of given compound.
d. Comparison of the UV spectrum of a compound with that of its derivatives.
e. Determination of dissociation constant of indicators using UV-Visible spectroscopy.
a. Conductometric titration of mixture of acids with a strong base.
b. Potentiometric titration of a acid with a strong base.
c. Estimation of drugs by Fluorimetric technique.
d. Study of quenching effect in fluorimetry.
e. Colourimetric estimation of Supha drugs using BMR reagent.
a. Simultaneous estimation of two drugs present in given formulation.
b. Assay of Salicylic Acid by colourimetry.
c. Determination of Chlorides and Sulphates in Calcium gluconate by

Nepheloturbidimetric Method.

a. Determination of Na/K by Flame Photometry.
b. Determination of pKa using pH meter.
c. Determination of specific rotation.
a. Comparison of the IR spectrum of a compound with that of its derivatives.
b. Demonstration of HPLC.
c. Demonstration of HPTLC.
d. Demonstration of GC-MS.
e. Demonstration of DSC.
f. Interpretation of NMR spectra of any one compound.

III Year Pharm D

22PY6303T: Pharmacotherapeutics - II (Theory)

L-T-P-S: 3-1-0-0 **Contact Hours: 90**

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO	BTL
CO1	To understand the etiopathogenesis of selected infectious diseases	1	2
CO2	To understand the etiopathogenesis of Musculoskeletal disorders	1	2
CO3	To understand the etiopathogenesis of renal disorders	1	2
CO4	To understand the basic principles of cancer therapy by various chemotherapeutic agents	1	2
CO5	To develop clinical skills in the therapeutic management of cancer	1	2
CO6	To understand the etiopathogenesis of dermal disorders	1	2

Syllabus:

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

Musculoskeletal disorders: Rheumatoid arthritis, Osteoarthritis, Gout, Spondylitis, Systemic lupus erythematosus and Syphilis.

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

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

Chemotherapy: Breast cancer, leukaemia. Management of chemotherapy nausea and emesis.

Dermatology: Psoriasis, Scabies, Eczema, Impetigo

Reference books

a. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al.

Appleton & Lange

b. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication
c. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA]

Text books

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

III Year Pharm D
22PY6303P: Pharmacotherapeutics - II (Practical)

L-T-P-S: 0-0-3-0 **Contact Hours: 90**

Mapping of Course Outcomes with PO:

CO#	Course Outcome	PO	BTL
CO1	To analyze and present the recorded cases in General medicine department	1	3
CO2	To analyze and present the recorded cases in Orthopedics department	1	3
CO3	To analyze and present the recorded cases in Dermatology department	1	3
CO4	To analyze and present the recorded cases in Nephrology	1	3
CO5	To analyze and present the recorded cases about infectious diseases	1	3
CO6	To analyze and present the recorded cases about cancer therapeutic regimens	1	3

Syllabus:

Hospital postings in various departments designed to complement the lectures by providing practical clinical discussion; attending ward rounds; follow up the progress andchanges 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 selectionof drug therapy including clinical discussion.

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

5 cases should be presented and recorded covering most common diseases

5 cases should be presented and recorded covering most common diseases

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5 cases should be presented and recorded covering most common diseases

5 cases should be presented and recorded covering most common diseases

III Year Pharm D

22PY6304T: Pharmaceutical Jurisprudence (Theory)

L-T-P-S: 2-1-0-0 **Contact Hours:90**

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO	BTL
CO1	To Understand the importance of code of pharmaceutical ethics	1	2
CO2	To understand in detail about various sections of Drugs and Cosmetics Act	1	2
CO3	To understand the various provisions of Pharmacy Act 1948	1	2
CO4	To understand the various provisions of Medicinal and Toilet Preparation Act 1955	1	2
CO5	To understand the various provisions of NDPS Act 1985	1	2
CO6	To understand the various Indian pharmaceutical Acts and Laws	1	2

Syllabus:

Pharmaceutical Legislations – A brief review. Principle and Significance of professional ethics. Critical study of the code of pharmaceutical ethics drafted by PCI.
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, labelling 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.
Pharmacy Act –1948: Objectives Legal Definitions, General Study, Constitution and Functions of State & Central Council, Registration & Procedure, ER.
Medicinal and Toilet Preparation Act –1955: Objectives, Legal Definitions, Licensing, Bonded and Non-Bonded Laboratory, Warehousing, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietory Preparations.
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.

1. Study of Salient Features of Drugs and magic remedies Act and its rules.
2. Study of essential Commodities Act Relevant to drugs price control Order.
3. Drug Price control Order & National Drug Policy (Current).
4. Prevention Of Cruelty to animals Act-1960.
5. Patents & design Act-1970.
6. Brief study of prescription and Non-prescription Products.

Reference books

a. Singh, KK, editor. Beotra's the Laws of Drugs, Medicines & cosmetics. Allahabad: Law Book House; 1984.

b. Jain, NK. A Textbook of forensic pharmacy. Delhi: Vallabh prakashan ; 1995.
c. Reports of the Pharmaceutical enquiry Committee
d. I.D.M.A., Mumbai. DPCO 1995
e. Various reports of Amendments.
f. Deshapande, S.W. The drugs and magic remedies act 1954 and rules 1955. Mumbai: Susmit Publications; 1998.
g. Eastern Book Company. The narcotic and psychotropic substances act 1985, Lucknow: Eastern; 1987.

Text books

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

III Year Pharm D
22PY6305T: Medicinal Chemistry (Theory)

L-T-P-S: 3-1-0-0 **Contact Hours: 120**

Mapping of Course Outcomes with PO:

CO#	Course Outcome	PO	BTL
CO1	To understand the different modern techniques of drug design.	1	2
CO2	To know the metabolism, adverse effect and therapeutic activity of anti-infective agents	1	2
CO3	To understand the concept of chemotherapy for cancer and microbial diseases and different anti-viral agents	1	2
CO4	To know the metabolism, adverse effect and therapeutic activity of cardiovascular	1	2
CO5	To understand the chemistry involved in anti-diabetic and thyroid drugs	1	2
CO6	To understand the chemistry involved in steroids and some diagnostic agents	1	2

Syllabus:

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.

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.

Anti-infective agents

a) Local anti-infective agents
b) Preservatives
c) Antifungal agents
d) Urinary tract anti-infectives
e) Antitubercular agents
f) Antiviral agents and Anti AIDS agents
g) Antiprotozoal agents

h) Anthelmentics
i) Antiscabies and Antipedicular agents

1. Sulphonamides and sulphones
2. Antimalarials
3. Antibiotics
4. Antineoplastic agents

Cardiovascular agents

a. Antihypertensive agents
b. Antianginal agents and vasodilators
c. Antiarrhythmic agents
d. Antihyperlipidemic agents
e. Coagulants and Anticoagulants
f. Endocrine
a. Hypoglycemic agents
b. Thyroid and Antithyroid agents

a. Diuretics
b. Diagnostic agents
c. Steroidal Hormones and Adrenocorticoids

Reference books

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

22PY6305P: Medicinal Chemistry (Practical)

L-T-P-S: 0-0-3-0 **Contact Hours: 30**

Mapping of Course Outcomes with PO:

CO#	Course Outcome	PO	BTL
CO1	Synthesis compounds of medicinal interest	1	3
CO2	Conduct monograph analysis of the pharmaceutical compounds	1	2
CO3	Determine the amount of drug present in an unknown solution	1	3
CO4	Estimate the purity of drugs by performing assays	1	3
CO5	Determine partition coefficient and dissociation constant of a given compound	1	3
CO6	Conduct planned experiments and prepare laboratory report in a standard format	1	3

Syllabus:

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

III Year Pharm D

22PY6306T: Pharmaceutical Formulations (Theory)

L-T-P-S: 3-1-0-0 **Contact Hours: 120**

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO	BTL
CO1	To understand the significance of formulation, preparation and evaluation of tablets	1	2
CO2	To understand the significance of formulation, preparation and evaluation of capsules	1	2
CO3	To understand the significance of formulation, preparation and evaluation of liquid orals	1	2
CO4	To understand the significance of formulation, preparation and evaluation of parenteral prperations	1	2
CO5	To understand the manufacturing methods of semisolid, and ophthalmic products	1	2
CO6	To understand the concepts of controlled drug delivery system	1	2

Syllabus:

Pharmaceutical dosage form- concept and classification

Tablets: Formulation of different types of tablets, tablet excipients, granulation techniques quality control and evaluation of tablets. Tablet coating, Type of coating, quality control tests for coated tablet.

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

Liquid orals: Formulation and evaluation of suspensions, emulsions and solutions.

Parenterals: Introduction Containers used for Parenterals (including official tests) Formulation of large and small volume Parenterals Sterilization Stability of these preparations

Ophthalmic preparations (Semi – Solids): Introduction and classification Factors affecting absorption and anatomy of skin Packaging storage and labeling, Ointments Types of Ointment Base Preparation of ointment, Jellies Types of jellies Formulation of jellies Suppositories, Method of preparation, Types Packaging

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

Reference books

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

Text books

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

III Year Pharm D

22PY6306P: Pharmaceutical Formulations (Practical)

L-T-P-S: 0-0-3-0 **Contact Hours: 90**

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO	BTL
CO1	Prepare formulations of tablets and capsules as per the batch formula	1	2
CO2	To prepare various parenteral products as per the batch formula	1	2
CO3	Evaluate different dosage forms by performing quality control tests	1	3
CO4	To prepare and evaluate various semi-solid preparations	1	3
CO5	Prepare and evaluate cosmetics such as lipstick, cold cream and shampoo	1	3
CO6	To acquire the knowledge on coating of the tablets	1	3

Syllabus:

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. Salicyclic 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.
1. Tablet coating (demonstration)

IV Year Pharm D

22PY6401T: Pharmacotherapeutics - III (Theory)

L-T-P-S: 3-1-0-0 **Contact Hours: 120**

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO	BTL
CO1	To understand the Etiopathogenesis and pharmacotherapy of diseases associated with gastrointestinal system	1	2
CO2	To understand the Etiopathogenesis and pharmacotherapy of diseases associated with haematological system	1	2
CO3	To understand the Etiopathogenesis and pharmacotherapy of diseases associated with nervous system	1	2
CO4	To understand the Etiopathogenesis and pharmacotherapy of Psychiatry disorders	1	2
CO5	To understand the Etiopathogenesis and pharmacotherapy of diseases associated with pain	1	2
CO6	To understand the concepts of evidence-based medicine	1	2

Syllabus:

Etiopathogenesis and pharmacotherapy of diseases associated with following systems/ diseases

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

Haematological system: Anaemias, Venous thromboembolism, Drug induced blood disorders.

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

Psychiatry disorders: Schizophrenia, Affective disorders, anxiety disorders, sleep disorders, obsessive compulsive disorders

Pain management including Pain pathways, neuralgias, headaches.

Evidence Based Medicine

Reference books

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

Text books

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

IV Year Pharm D

22PY6401P: Pharmacotherapeutics - III (Practical)

L-T-P-S: 0-0-3-0 **Contact Hours: 90**

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO	BTL
CO1	To analyze and present the recorded cases in Gastroenterology department	1.4	3
CO2	To analyze and present the recorded cases in Neurology department	1.4	3
CO3	To analyze and present the recorded cases in Psychiatry department	1.4	3
CO4	To analyze and present the recorded cases about Hematological disorders	1.4	3
CO5	To analyze and present the recorded cases in General Medicine	1.4	3
CO6	To analyse and present about prescribing patterns for any dosage regimen	1.4	3

Syllabus: 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.

15 cases should be presented and recorded covering most common diseases

IV Year Pharm D

22PY6402T: Hospital Pharmacy (Theory)

L-T-P-S: 3-1-0-0 **Contact Hours: 120**

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO	BTL
CO1	To know the organizational structure and functions of a hospital	1,9	2
CO2	To gain the knowledge on hospital drug policy	1,9	2
CO3	To understand the hospital pharmacy services	1,9	2
CO4	To know the manufacturing practices of various formulations in hospital set up	1,9	2
CO5	To understand the professional development programs	1,9	2
CO6	To understand the practice-based research methods	1,9	2

Syllabus:

Hospital - its Organization and functions,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

The Budget – Preparation and implementation

Hospital drug policy

a. Pharmacy and Therapeutic committee (PTC)
b. Hospital formulary
c. Hospital committees
i. Infection committee
ii. Research and ethical committee
d. developing therapeutic guidelines
e. Hospital pharmacy communication – Newsletter

Hospital pharmacy services

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

c. Drug distribution in the hospital
    i. Individual prescription method
    ii. Floor stock method
    iii. Unit dose drug distribution method
d. Distribution of Narcotic and other controlled substances
e. Central sterile supply services – Role of pharmacist

Manufacture of Pharmaceutical preparations

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

Continuing professional development programs**,** Education and training**,**

Radio Pharmaceuticals – Handling and packaging

Professional Relations and practices of hospital pharmacist

Reference books

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

Text books

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

IV Year Pharm D

22PY6402P: Hospital Pharmacy (Practical)

L-T-P-S: 0-0-3-0 **Contact Hours: 90**

Mapping of Course Outcomes with PO:

CO#	Course Outcome	PO	BTL
CO1	To analyze and report different drug interactions in a given case study	1,9	3
CO2	To prepare various parenteral preparations	1,9	2
CO3	To prepare various pharmaceutical powders	1,9	2
CO4	To apply various methods to perform inventory analysis	1,9	3
CO5	To analyse the case and answer the related drug information queries posted by healthcare professionals	1,9	3
CO6	To analyse the case and answer the related drug information queries posted by patients	1,9	3

Syllabus:

Assessment of drug interactions in the given prescriptions

Manufacture of parenteral formulations, powders.
Drug information queries.
Inventory control

IV Year Pharm D

22PY6403T: Clinical Pharmacy (Theory)

L-T-P-S: 3-1-0-0 **Contact Hours: 120**

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO	BTL
CO1	To understand the role of a clinical pharmacist in a pharmacy	1,9	2
CO2	To understand the process of obtaining patients history and evaluation of drug therapy based on the history	1,9	2
CO3	To gain the knowledge about various clinical laboratory tests to diagnose diseases.	1,9	2
CO4	To understand the working of drug and poison information center.	1,9	2
CO5	To understand the role of pharmacovigilance in ADR monitoring	1,9	2
CO6	To gain the knowledge on communication skills for better interaction with patients	1,9	2

Syllabus:

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
e. Medication history
f. Patient counseling
g. Drug utilisation evaluation (DUE) and review (DUR)
h. Quality assurance of clinical pharmacy services

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

Drug & Poison information

a. Introduction to drug information resources available

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

Pharmacovigilance

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

1. Communication skills, including patient counselling techniques, medication history interview, presentation of cases.
2. Pharmaceutical care concepts
3. Critical evaluation of biomedical literature
4. Medication errors

Reference books

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

Text books

a. Practice Standards and Definitions - The Society of Hospital Pharmacists of Australia.

b. Basic skills in interpreting laboratory data - Scott LT, American Society of Health System Pharmacists Inc.

c. Biopharmaceutics and Applied Pharmacokinetics - Leon Shargel, Prentice Hall publication.

d. A text book of Clinical Pharmacy Practice; Essential concepts and skills, Dr.G.Parthasarathi etal, Orient Orient Langram Pvt.Ltd. ISSBN8125026

IV Year Pharm D

22PY6403P: Clinical Pharmacy (Practical)

L-T-P-S: 0-0-3-0 **Contact Hours: 90**

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO	BTL
CO1	To analyse the case and answer the related drug information queries posted by healthcare professionals	1,9	3
CO2	To analyse the case and answer the related drug information queries posted by patients	1,9	3
CO3	To understand and perform medication counselling for patients	1,9	3
CO4	To analyse and correlate the condition of the patient by using laboratory investigations.	1,9	3
CO5	To understand and conduct interview to elicit the patient past medication history	1,9	3
CO6	To identify and report ADRs in the specified database	1,9	3

Syllabus:

Answering drug information questions (4 Nos)
Patient medication counselling (4 Nos)
Case studies related to laboratory investigations (4 Nos)
Patient medication history interview (3 Nos)

IV Year Pharm D

22PY6404T: Biostatistics and Research Methodology (Theory)

L-T-P-S: 2-1-0-0 **Contact Hours: 90**

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO	BTL
CO1	To understand the concept of clinical study designs and case studies	1,2	2
CO2	To understand the methods used to determine the sample size for a study.	1,2	2
CO3	To understand the basic concepts of biostatistics	1,2	2
CO4	To understand the basics of hypothesis testing	1,2	2
CO5	To understand the statistical methods used in epidemiology	1,2	2
CO6	To understand the computer applications in pharmacy	1,2	2

Syllabus:

Research Methodology

a. Types of clinical study designs:
b. Case studies, observational studies, interventional studies,
c. Designing the methodology
d. Sample size determination and Power of a study
e. Determination of sample size for simple comparative experiments, determination of sample size to obtain a confidence interval of specified width, power of a study
f. Report writing and presentation of data

Biostatistics

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

Data graphics

a. Construction and labeling of graphs, histogram, pie charts, scatter plots, semilogarithmic plots

Basics of testing hypothesis

a. Null hypothesis, level of significance, power of test, P value, statistical estimation of confidence intervals.
b. Level of significance (Parametric data)- students t test (paired and unpaired), chi Square test, Analysis of Variance (one-way and two-way)
c. Level of significance (Non-parametric data)- Sign test, Wilcoxan's signed rank test,

Wilcoxan rank sum test, Mann Whitney U test, Kruskal-Wall is test (one way ANOVA)

Basics of testing hypothesis

a. Linear regression and correlation- Introduction, Pearsonn's and Spearmann's correlation and correlation co-efficient.
b. Introduction to statistical software: SPSS, Epi Info, SAS.

Statistical methods in epidemiology

a. Incidence and prevalence, relative risk, attributable risk

Computer applications in pharmacy

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

Computer In Community Pharmacy Computerizing the Prescription Dispensing process

Use of Computers for Pharmaceutical Care in community pharmacy Accounting and General ledger system

Drug Information Retrieval & Storage: Introduction – Advantages of Computerized Literature Retrieval Use of Computerized Retrieval

Reference books

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

IV Year Pharm D

22PY6405T: Biopharmaceutics and Pharmacokinetics (Theory)

L-T-P-S: 3-1-0-0 **Contact Hours: 120**

Mapping of Course Outcomes with PO/PSO:

CO#	Course Outcome	PO	BTL
CO1	Understand the concepts of biopharmaceutics	1,2	2
CO2	Understand the process of metabolism and excretion	1,2	2
CO3	Understand the concept of pharmacokinetics with the use of one compartment open model.	1,2	2
CO4	Understand the concept of pharmacokinetics with the use of multi compartment analysis	1,2	2
CO5	To understand the Non-linear and non-compartmental kinetics	1,2	2
CO6	Understand the concepts of bioavailability and bioequivalence	1,2	2

Syllabus:

Biopharmaceutics

a. Introduction to Biopharmaceutics
b. Absorption
c. Distribution
a. Metabolism
b. Elimination

Pharmacokinetics: Introduction to Pharmacokinetics.

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

One compartment open model.

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

Multicompartment models.

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

Multiple – Dosage Regimens.

a. Repititive Intravenous injections – One Compartment Open Model
b. Repititive Extravascular dosing – One Compartment Open model
c. Multiple Dose Regimen – Two Compartment Open Model

Nonlinear Pharmacokinetics.

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

Noncompartmental Pharmacokinetics.

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

Bioavailability and Bioequivalence.

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

Reference books

a. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi
b. Remington's Pharmaceutical Sciences, By Mack Publishing Company, Pennsylvnia.
c. Pharmacokinetics: By Milo Glbaldi Donald, R. Mercel Dekker Inc.
d. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.
e. Biopharmaceutics and Pharmacokinetics; By Robert F Notari
f. Biopharmaceutics; By Swarbrick
g. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B.Jaiswal, Vallabh Prakashan Pitampura, Delhi
h. Cilincal Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and Thomas, N. Tozen, Lea and Febrger, Philadelphia, 1995.
i. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company, Pennsylvania 1989.
j. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Rebort F Notari Marcel Dekker Inn, New York and Basel, 1987.
k. Encyclopedia of Pharmaceutical Technology, Vol 13, James Swarbrick, James, C. Roylan, Marcel Dekker Inc, New York 1996.

IV Year Pharm D

22PY6405P: Biopharmaceutics and Pharmacokinetics (Practical)

L-T-P-S: 0-0-3-0 **Contact Hours: 90**

Mapping of Course Outcomes with PO:

CO#	Course Outcome	PO	BTL
CO1	Compare the *in-vitro* drug release profile of different marketed products	1,2	3
CO2	Perform the solubility enhancement techniques for improvement of drug release of poorly water soluble drugs	1,2	3
CO3	Estimate the bioavailability (absolute and relative) and bioequivalence from the given clinical data	1,2	3
CO4	Calculate the drug content in blood sample using Area Under Curve approach	1,2	3
CO5	Calculate and interpret various pharmacokinetic parameters from the given clinical data	1,2	3
CO6	Conduct planned experiments and prepare laboratory report in a standard format	1,2	3

Syllabus:

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 Ka, Ke, t1/2, Cmax, 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.

IV Year Pharm D
22PY6406T: Clinical Toxicology (Theory)

L-T-P-S: 2-1-0-0 **Contact Hours:90**

Mapping of Course Outcomes with PO:

CO#	Course Outcome	PO	BTL
CO1	Understand the mechanism of action of common poisons and antidotes	1,2	2
CO2	Understand the concepts of Toxicokinetics	1,2	2
CO3	To understand the etiology of acute poisoning and its management by various therapeutic agents	1,2	2
CO4	To understand the etiology of chronic poisoning and its management by various therapeutic agents	1,2	2
CO5	To understand the poisoning caused by plant and animal sources	1,2	2
CO6	To understand the etiology and management of substance abuse	1,2	2

Syllabus:

a. General principles involved in the management of poisoning
b. Antidotes and the clinical applications.
c. Supportive care in clinical Toxicology.
a. Gut Decontamination.
b. Elimination Enhancement.
c. Toxicokinetics

Clinical symptoms and management of acute poisoning with the following agents –Pesticide poisoning: organophosphorus compounds, carbamates, organochlorines, pyrethroids.

a. Opiates overdose.
b. Antidepressants
c. Barbiturates and benzodiazepines.
d. Alcohol: ethanol, methanol.
e. Paracetamol and salicylates.
f. Non-steroidal anti-inflammatory drugs.
g. Hydrocarbons: Petroleum products and PEG.
h. Caustics: inorganic acids and alkali.
i. Radiation poisoning

a. Clinical symptoms and management of chronic poisoning with the following agents – Heavy metals: Arsenic, lead, mercury, iron, copper
b. Venomous snake bites: Families of venomous snakes, clinical effects of venoms, general management as first aid, early manifestations, complications and snake bite injuries.

a. Plants poisoning. Mushrooms, Mycotoxins.
b. Food poisonings

c. Envenomations – Arthropod bites and stings.

Substance abuse:

Signs and symptoms of substance abuse and treatment of dependence

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

Reference books

a. Matthew J Ellenhorn. Ellenhorns Medical Toxicology – Diagnosis And Treatment of Poisoning. Second edition. Williams and Willkins publication, London
b. V V Pillay. Handbook of Forensic Medicine and Toxicology. Thirteenth edition 2003 Paras Publication, Hyderabad

V Year Pharm D
22PY6501T: Clinical Research (Theory)

L-T-P-S: 3-1-0-0 **Contact Hours: 120**

Mapping of Course Outcomes with PO:

CO#	Course Outcome	PO	BTL
CO1	To understand the various approaches for a new drug discovery	1,2	2
CO2	To understand the principles and phases in clinical trial of drug	1,2	2
CO3	To understand the various guidelines associated with clinical trials	1,2	2
CO4	To understand the various regulatory requirements in India and other countries to conduct clinical trials	1,2	2
CO5	Recognise differing roles and obligations of the Investigator, Sponsor and Institutional Review Board	1,2	2
CO6	To understand the various documents associated with clinical trials	1,2	2

CO 1:

Drug development process: Introduction Various Approaches to drug discovery

i. Pharmacological
ii. Toxicological
iii. IND Application
iv. Drug characterization
v. Dosage form

1. Introduction to Clinical trials
2. Various phases of clinical trial.
3. Methods of post marketing surveillance

4. Abbreviated New Drug Application submission.
5. Good Clinical Practice – ICH, GCP, Central drug standard control organisation (CDSCO) guidelines
6. Challenges in the implementation of guidelines
7. Ethical guidelines in Clinical Research
8. Composition, responsibilities, procedures of IRB / IEC
9. Overview of regulatory environment in USA, Europe and India.

Role and responsibilities of clinical trial personnel as per ICH GCP

i. Sponsor
ii. Investigators
iii. Clinical research associate
iv. Auditors
v. Contract research coordinators
vi. Regulatory authority

Designing of clinical study documents (protocol, CRF, ICF, PIC with assignment)

Informed consent Process

Data management and its components

Safety monitoring in clinical trials.

Reference books:

1. Central Drugs Standard Control Organization. Good Clinical Practices-Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health; 2001.
2. International Conference on Harmonisation of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonised Tripartite Guideline. Guideline for Good Clinical Practice.E6; May 1996.
3. Ethical Guidelines for Biomedical Research on Human Subjects 2000. Indian Council of Medical Research, New Delhi
4. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March 2005, John Wiley and Sons.
5. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.
6. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.
7. Goodman & Gilman: JG Hardman, LE Limbard, 10th Edn. McGraw Hill Publications, 2001.

V Year Pharm D

22PY6502T: Pharmacoepidemiology and Pharmacoeconomics

(Theory)

L-T-P-S: 3-1-0-0 **Contact Hours: 120**

Mapping of Course Outcomes with PO:

CO#	Course Outcome	PO	BTL
CO1	Understand the scope, need, origin and evaluation of Pharmacoepidemiology	1,2	2
CO2	To understand the importance of Measurement of outcomes in Pharmacoepidemiology	1,2	2
CO3	Recommend suitable method for measuring the outcome of Pharmacoepidemiology for a disease	1,2	2
CO4	Suggest an appropriate Pharmacoepidemiological method for a given drug and address the risks associated with Pharmacoepidemiological study	1,2	2
CO5	Understand the basic principles, role and relevance of Pharmacoeconomics in the development of a new drug	1,2	2
CO6	Identify and justify an appropriate evaluation method for Pharmacoeconomics study of a disease	1,2	2

Syllabus:

Pharmacoepidemiology: Definition and scope, Origin and evaluation of pharmacoepidemiology need for pharmacoepidemiology, aims and applications. Measurement of outcomes in Pharmacoepidemiology: Outcome measure and drug use measures, Prevalence, incidence and incidence rate. Monetary units, number of prescriptions, units of drugs dispensed, defined daily doses and prescribed daily doses, medication adherence measurement.

Concept of risk in Pharmacoepidemiology: Measurement of risk, attributable risk and relative risk, time-risk relationship and odds ratio.

Pharmacoepidemiological methods: Includes theoretical aspects of various methods and practical study of various methods with the help of case studies for individual methods, Drug utilization review, case reports, case series, surveys of drug use, cross – sectional studies, cohort studies, case control studies, case –cohort studies, meta – analysis studies, spontaneous reporting, prescription event monitoring and record linkage system.

Sources of data for pharmacoepidemiological studies, Ad Hoc data sources and automated data systems. bSelected special applications of Pharmacoepidemiology, Studies of vaccine safety, hospital pharmacoepidemiology, pharmacoepidemiology and risk management, drug induced birth defects.

Phrmacoeconomics: Definition, history, needs of pharmacoeconomic evaluations, Role in formulary management decisions, 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. Applications of Pharmacoeconomics: Software and case studies

V Year Pharm D

22PY6504T: Clinical Pharmacokinetics &Pharmacotherapeutic Drug Monitoring (Theory)

L-T-P-S: 2-1-0-0 **Contact Hours: 60**

Mapping of Course Outcomes with PO:

CO#	Course Outcome	PO	BTL
CO1	Discuss the pharmacokinetic principles to individualize drug therapy in patient care situ ations	1,2	2
CO2	To understand the methods to calculate various dosage regimens	1,2	2
CO3	To understand the principles of pharmacokinetics to analyse and predict drug interactions	1,2	2
CO4	To understand the concepts of therapeutic drug monitoring	1,2	2
CO5	To understand the dose adjustment in renal and hepatic disorders	1,2	2
CO6	To understand the concepts of population pharmacokinetics	1,2	2

Syllabus:

1. Introduction to Clinical pharmacokinetics.
2. Design of dosage regimens: Nomograms and Tabulations in designing dosage regimen, Conversion from intravenous to oral dosing, Determination of dose and dosing intervals, Drug dosing in the elderly and pediatrics and obese patients.
3. Pharmacokinetics of Drug Interaction:

a. Pharmacokinetic drug interactions
b. Inhibition and Induction of Drug metabolism
c. Inhibition of Biliary Excretion.

4. Therapeutic Drug monitoring:

a. Introduction
b. Individualization of drug dosage regimen (Variability – Genetic, Age and Weight , disease, Interacting drugs).
c. Indications for TDM. Protocol for TDM.
d. Pharmacokinetic/Pharmacodynamic Correlation in drug therapy.
e. TDM of drugs used in the following disease conditions: cardiovascular disease, Seizure disorders, Psychiatric conditions, and Organ transplantations.

5. Dosage adjustment in Renal and hepatic Disease.

a. Renal impairment
b. Pharmacokinetic considerations

c. General approach for dosage adjustment in Renal disease.
d. Measurement of Glomerular Filtration rate and creatinine clearance.
e. Dosage adjustment for uremic patients.
f. Extracorporeal removal of drugs.
g. Effect of Hepatic disease on pharmacokinetics.
6. Population Pharmacokinetics.
a. Introduction to Bayesian Theory.
b. Adaptive method or Dosing with feed back.
c. Analysis of Population pharmacokinetic Data.
7. Pharmacogenetics
a. Genetic polymorphism in Drug metabolism: Cytochrome P-450 Isoenzymes.
b. Genetic Polymorphism in Drug Transport and Drug Targets.
c. Pharmacogenetics and Pharmacokinetics/Pharmacodynamic considerations

V Year Pharm D
22PY650N4: Clerkship

L-T-P-S: 0-0-0-1 **Contact Hours: 30**

Mapping of Course Outcomes with PO:

CO#	Course Outcome	PO	BTL
CO1	Understand the role of Pharmacist in clinical pharmacy services	1,2	2
CO2	Demonstrate the skills of a clinical Pharmacist	1,2	2
CO3	Understand the available therapeutic options in the management of diseases	1,2	2
CO4	Prepare a pharmaceutical care plan for a given case	1,2	2
CO5	Detect, Interpret and report medication errors	1,2	2
CO6	Detect, Interpret and report drug interactions	1,2	2

VI Year Pharm D

22PY660N1: Internship

L-T-P-S: 0-0-40-0 **Contact Hours: 40hrs/ week**

Mapping of Course Outcomes with PO:

CO#	Course Outcome	PO	BTL
CO1	Understand the pathophysiology of disease states and the rationale for drug therapy	1,2	2
CO2	Acquire the knowledge on available therapeutic options to provide patient care in co-operation with patients, prescribers, and other members of an interprofessional health care team	1,2	2
CO3	Identify, manage and use resources of the health care system, in cooperation with patients, prescribers, other health care providers	1,2	2
CO4	Analyse the therapeutic approaches to promote health improvement, wellness, and disease prevention	1,2	3
CO5	Develop leadership qualities to function effectively as a member of the health care team	1,2	3
CO6	Communicate effectively with patients and the community	1,2	3

PW

V Year Pharm D
22PY650E5: Project (Six months)

L-T-P-S: 0-0-20-0 **Contact Hours: 20hrs/ week**

Mapping of Course Outcomes with PO:

CO#	Course Outcome	PO	BTL
CO1	Address a problem related to Pharmacy practice in hospital, community service or clinical set up with a wider perspective and generality	1	3
CO2	address and translate the problem into a statement of aim, objectives, scope and plan for the project	1	3
CO3	Preparation of report an information survey and take account of findings in executing project	1	3
CO4	Evaluate, select and apply relevant theories and techniques from the full range of courses studied using conceptual models and frameworks to enhance depth of understanding	1	3
CO5	Select appropriate methodology for investigative work, taking into account the pros and cons of the alternatives available and develop solution proposals based on reasoned judgement	1	3
CO6	Present a coherent, logically argued, fully referenced report and engage in a professional manner in a viva-voce discussion about the project	1	3

YEARWISE STRUCTURE

I YEAR								
Sl No	**Course Code**	**Course Title**	**Type**	**L**	**T**	**P**	**S**	**CH**
1	22PY6101T	Human Anatomy and Physiology	PC	3	1	0	0	4
2	22PY6101P	Human Anatomy and Physiology	PC	0	0	3	0	3
3	22PY6102T	Pharmaceutics	PC	2	1	0	0	3
4	22PY6102P	Pharmaceutics	PC	0	0	3	0	3
5	22PY6103T	Medicinal Biochemistry	PC	3	1	0	0	4
6	22PY6103P	Medicinal Biochemistry	PC	0	0	3	0	3
7	22PY6104T	Pharmaceutical Organic Chemistry	PC	3	1	0	0	4
8	22PY6104P	Pharmaceutical Organic chemistry	PC	0	0	3	0	3
9	22PY6105T	Pharmaceutical Inorganic Chemistry	PC	2	1	0	0	3
10	22PY6105P	Pharmaceutical Inorganic Chemistry	PC	0	0	3	0	3
11 12	22PY610B6T/ 22PY610M6T	Remedial Biology/Remedial Mathematics	BS	3	1	0	0	4
13	22PY610B6P	Remedial Biology	BS	0	0	3	0	3
Total				**16**	**6**	**18**	**0**	**40**

II YEAR								
Sl No	**Course Code**	**Course Title**		**L**	**T**	**P**	**S**	**CH**
1	22PY6201T	Pathophysiology	PC	3	1	0	0	4
2	22PY6202T	Pharmaceutical Microbiology	PC	3	1	0	0	4
3	22PY6202P	Pharmaceutical Microbiology	PC	0	0	3	0	3
4	22PY6203T	Pharmacognosy & Phytopharmaceuticals	PC	3	1	0	0	4
5	22PY6203P	Pharmacognosy & Phytopharmaceuticals	PC	0	0	3	0	3
6	22PY6204T	Pharmacology-I	PC	3	1	0	0	4
7	22PY6205T	Community Pharmacy	PC	2	1	0	0	3
8	22PY6206T	Pharmacotherapeutics-I	PC	3	1	0	0	4
9	22PY6206P	Pharmacotherapeutics-I	PC	0	0	3	0	3
Total				**17**	**6**	**9**	**0**	**32**

III YEAR								
Sl No	**Course Code**	**Course Title**		**L**	**T**	**P**	**S**	**CH**
1	22PY6301T	Pharmacology-II	PC	3	1	0	0	4
2	22PY6301P	Pharmacology-II	PC	0	0	3	0	3
3	22PY6302T	Pharmaceutical Analysis	PC	3	1	0	0	4
4	22PY6302P	Pharmaceutical Analysis	PC	0	0	3	0	3
5	22PY6303T	Pharmacotherapeutics-II	PC	3	1	0	0	4
6	22PY6303P	Pharmacotherapeutics-II	PC	0	0	3	0	3
7	22PY6304T	Pharmaceutical Jurisprudence	PC	2	0	0	0	2
8	22PY6305T	Medicinal Chemistry	PC	3	1	0	0	4
9	22PY6305P	Medicinal Chemistry	PC	0	0	3	0	3
10	22PY6306T	Pharmaceutical Formulations	PC	2	1	0	0	3
11	22PY6306P	Pharmaceutical Formulations	PC	0	0	3	0	3
Total				**16**	**5**	**15**	**0**	**36**

IV YEAR								
Sl No	**Course Code**	**Course Title**		**L**	**T**	**P**	**S**	**CH**
1	22PY6401T	Pharmacotherapeutics-III	PC	3	1	0	0	4
2	22PY6401P	Pharmacotherapeutics-III	PC	0	0	3	0	3
3	22PY6402T	Hospital Pharmacy	PC	2	1	0	0	3
4	22PY6402P	Hospital Pharmacy	PC	0	0	3	0	3
5	22PY6403T	Clinical Pharmacy	PC	3	1	0	0	4
6	22PY6403P	Clinical Pharmacy	PC	0	0	3	0	3
7	22PY6404T	Biostatistics & Research Methodology	PC	2	1	0	0	3

8	22PY6405T	Biopharmaceutics & Pharmacokinetics	PC	3	1	0	0	4
9	22PY6405P	Biopharmaceutics & Pharmacokinetics	PC	0	0	3	0	3
10	22PY6406T	Clinical Toxicology	PC	2	1	0	0	3
Total				15	6	12	0	33

V YEAR								
Sl No	**Course Code**	**Course Title**		**L**	**T**	**P**	**S**	**CH**
1	22PY6501T	Clinical Research	PC	3	1	0	0	4
2	22PY6502T	Pharmacoepidemiology and Pharmacoeconomics	PC	3	1	0	0	4
3	22PY6503T	Clinical Pharmacokinetics &Pharmacotherapeutic Drug Monitoring	PC	2	1	0	0	3
4	22PY650N4	Clerkship	PC	0	1	0	0	1
5	22PY650E5	Project work (Six Months)	PW	0	0	20	0	20
Total				**8**	**4**	**20**	**0**	**32**

VI YEAR								
Sl No	**Course Code**	**Course Title**		**L**	**T**	**P**	**S**	**CH**
1	22PY660N1	Internship	PC	0	0	40	0	40
Total				**0**	**0**	**40**	**0**	**40**