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Approved by AICTE, PCI, New Delhi, Govt. of Andhra Pradesh & Accredited by NAAC with 'A' Grade
Affiliated to Krishna University, Machilipatnam & Recognized as **2(f)** under UGC Act 1956
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Academic Rules & Regulations for Pharma.D Programme

(As Approved by the Academic Council of
KVSR Siddhartha College of Pharmaceutical Sciences)
(Applicable to the students admitted into the First year Pharma.D from the Academic year 2024-2025 onwards)

[PUBLISHED IN THE GAZETTE OF INDIA, No.19, PART III, SECTION 4]
Ministry of Health and Family Welfare
(Pharmacy Council of India)

New Delhi, 10th May, 2008.

Pharm.D. Regulations 2008

Regulations framed under section 10 of the Pharmacy Act, 1948 (8 of 1948).

(As approved by the Government of India, Ministry of Health vide, letter No.V.13013/1/2007-PMS, dated the 13th March, 2008 and notified by the Pharmacy Council of India).

No.14-126/2007-PCI.— In exercise of the powers conferred by section 10 of the Pharmacy Act, 1948 (8 of 1948), the Pharmacy Council of India, with the approval of the Central Government, hereby makes the following regulations, namely:-

CHAPTER-I

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.

CHAPTER-II

3. Duration of the course. –

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

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

Phase II – consisting of internship or residency training during sixth year involving posting in 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 in the Tables below. The number of hours in a week, devoted to each subject for its teaching in theory, practical and tutorial shall not be less than that noted against it in columns (3), (4) and (5) below.

TABLES

First Year:

S.No.	Name of Subject	No. of hours of Theory	No. of hours of Practical	No. of hours of Tutorial
(1)	(2)	(3)	(4)	(5)
1.1	Human Anatomy and Physiology	3	3	1
1.2	Pharmaceutics	2	3	1
1.3	Medicinal Biochemistry	3	3	1
1.4	Pharmaceutical Organic Chemistry	3	3	1
1.5	Pharmaceutical Inorganic Chemistry	2	3	1
1.6	Remedial Mathematics/Biology	3	3*	1
1.7	Human values and Professional ethics	2	-	-
	Total hours	**18**	**18**	**6= (42)**

*For Biology

Second Year:

S.No.	Name of Subject	No. of hours of Theory	No. of hours of Practical	No. of hours of Tutorial
(1)	(2)	(3)	(4)	(5)
2.1	Pathophysiology	3	-	1
2.2	Pharmaceutical Microbiology	3	3	1
2.3	Pharmacognosy & Phytopharmaceuticals	3	3	1
2.4	Pharmacology-I	3	-	1
2.5	Community Pharmacy	2	-	1
2.6	Pharmacotherapeutics-I	3	3	1
	Total hours	**17**	**9**	**6 = (32)**

Third Year:

S.No.	Name of Subject	No. of hours of Theory	No. of hours of Practical	No. of hours of Tutorial
(1)	(2)	(3)	(4)	(5)
3.1	Pharmacology-II	3	3	1
3.2	Pharmaceutical Analysis	3	3	1
3.3	Pharmacotherapeutics-II	3	3	1
3.4	Pharmaceutical Jurisprudence	2	-	-
3.5	Medicinal Chemistry	3	3	1
3.6	Pharmaceutical Formulations	2	3	1
	Total hours	**16**	**15**	**5 = (36)**

Fourth Year:

S.No.	Name of Subject	No. of hours of Theory	No. of hours of Practical/ Hospital Posting	No. of hours of Tutorial
(1)	(2)	(3)	(4)	(5)
4.1	Pharmacotherapeutics-III	3	3	1
4.2	Hospital Pharmacy	2	3	1
4.3	Clinical Pharmacy	3	3	1
4.4	Biostatistics & Research Methodology	2	-	1
4.5	Biopharmaceutics & Pharmacokinetics	3	3	1
4.6	Clinical Toxicology	2	-	1
	Total hours	**15**	**12**	**6 = (33)**

Fifth Year:

S.No.	Name of Subject	No. of hours of Theory	No. of hours of Practical/ Hospital Posting*	No. of hours of Tutorial
(1)	(2)	(3)	(4)	(5)
5.1	Clinical Research	3	-	1
5.2	Pharmacoepidemiology and Pharmacoeconomics	3	-	1
5.3	Clinical Pharmacokinetics & Pharmacotherapeutic Drug Monitoring	2		1
5.4	Clerkship *	-	-	1
5.5	Project work (Six Months)	-	20	-
	Total hours	**8**	**20**	**4 = (32)**

* Attending ward rounds on daily basis.

Sixth Year:

Internship or residency training including postings in speciality units. Student should independently provide the clinical pharmacy services to the allotted wards.

(i) Six months in General Medicine department, and

(ii) Two months each in three other speciality departments

8. Syllabus. – The syllabus for each subject of study in the said Tables shall be as specified in Appendix -A to these 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, nonteaching 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 in Tables below:

TABLES

First Year Examination:

S.No.	Name of Subject	Maximum marks for Theory			Maximum marks for Practicals		
		Examination	Sessional	Total	Examination	Sessional	Total
1.1	Human Anatomyand Physiology	70	30	100	70	30	100
1.2	Pharmaceutics	70	30	100	70	30	100
1.3	Medicinal Biochemistry	70	30	100	70	30	100
1.4	PharmaceuticalOrganic Chemistry	70	30	100	70	30	100
1.5	Pharmaceutical Inorganic Chemistry	70	30	100	70	30	100
1.6	RemedialMathematics/ Biology	70	30	100	70*	30*	100*
1.7	Human values and Professional ethics	50	-	50	-	-	-
				650			600= 1250

*for Biology.

Second Year Examination:

S.No.	Name of Subject	Maximum marks for Theory			Maximum marks for Practical		
		Examination	Sessional	Total	Examination	Sessional	Total
2.1	Pathophysiology	70	30	100	-	-	-
2.2	Pharmaceutical Microbiology	70	30	100	70	30	100
2.3	Pharmacognosy & Phytopharmaceuticals	70	30	100	70	30	100
2.4	Pharmacology-I	70	30	100	-	-	-
2.5	Community Pharmacy	70	30	100	-	-	-
2.6	Pharmacotherapeutics-I	70	30	100	70	30	100
				600			**300= 900**

Third Year Examination:

S.No.	Name of Subject	Maximum marks for Theory			Maximum marks for Practical		
		Examination	Sessional	Total	Examination	Sessional	Total
3.1	Pharmacology-II	70	30	100	70	30	100
3.2	Pharmaceutical Analysis	70	30	100	70	30	100
3.3	Pharmacotherapeutics-II	70	30	100	70	30	100
3.4	Pharmaceutical Jurisprudence	70	30	100	-	-	-
3.5	Medicinal Chemistry	70	30	100	70	30	100
3.6	Pharmaceutical Formulations	70	30	100	70	30	100
				600			**500= 1100**

Fourth Year Examination:

S.No.	Name of Subject	Maximum marks for Theory			Maximum marks for Practical		
		Examination	Sessional	Total	Examination	Sessional	Total
4.1	Pharmacotherapeutics-III	70	30	100	70	30	100
4.2	Hospital Pharmacy	70	30	100	70	30	100
4.3	Clinical Pharmacy	70	30	100	70	30	100
4.4	Biostatistics & Research Methodology	70	30	100	-	-	-
4.5	Biopharmaceutics & Pharmacokinetics	70	30	100	70	30	100
4.6	Clinical Toxicology	70	30	100	-	-	-
				600			**400= 1000**

Fifth Year Examination:

S.No.	Name of Subject	Maximum marks for Theory			Maximum marks for Practical		
		Examination	Sessional	Total	Examination	Sessional	Total
5.1	Clinical Research	70	30	100	-	-	-
5.2	Pharmacoepidemiology and Pharmacoeconomics	70	30	100	-	-	-
5.3	Clinical Pharmacokinetics & Pharmacotherapeutic Drug Monitoring	70	30	100	-	-	-
5.4	Clerkship *	-	-	-	70	30	100
5.5	Project work (Six Months)	-	-	-	100**	-	100
				300			**200 = 500**

* Attending ward rounds on daily basis.

** 30 marks – viva-voce (oral)
70 marks – Thesis work

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

CHAPTER-III
Practical training

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)

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

PHD1.1T HUMAN ANATOMY & PHYSIOLOGY (THEORY)

Theory: 3 Hrs. /Week

1.Scope and Objectives:

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

2.Course Outcomes:

1. To recall and explain the basic structure and functions of cells, tissues, and organ systems and their role in homeostasis.
2. To identify and describe the structure and function of bones, joints, and the skeletal system, including the processes of bone formation and repair.
3. To explain the types of muscles, their functions, and analyze the physiological mechanisms of muscle contraction.
4. To analyze the structure and function of the cardiovascular and respiratory systems, and evaluate their interrelationship in oxygen delivery and homeostasis.
5. To know about the structure and function of urinary and Genital system, and emphasizing their distinct feature.
6. To evaluate the physiological processes of the nervous system and special senses, and create a comprehensive understanding of their role in sensory perception and response coordination.

3.Course materials:

Text books

a. Tortora Gerard J. and Nicholas, P. Principles of anatomy and physiology Publisher Harpercollins college New York.

b. Wilson, K.J.W. Ross and Wilson's foundations of anatomy and physiology. Publisher:Churchill Livingstone, Edinburg.

Reference books

a. Guyton arthur, C. Physiology of human body. Publisher: Holtsaunders.

b. Chatterjee,C.C. Human physiology. Volume 1&11. Publisher: medical allied agency, Calcutta.

c. Peter L. Williams, Roger Warwick, Mary Dyson and Lawrence, H.

d. Gray's anatomy. Publisher:Churchill Livingstone, London.

4.Lecture wise programme: Topics

Unit-I (15 Hrs)

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

Unit-II (20 Hrs)

1. Haemopoetic System
   a) Composition and functions of blood
   b) Haemopoesis and disorders of blood components (definition of disorder)
   c) Blood groups
   d) Clotting factors and mechanism
   e) Platelets and disorders of coagulation
2. Lymph
   a) Lymph and lymphatic system, composition, formation and circulation.
   b) Spleen: structure and functions, Disorders
   c) Disorders of lymphatic system (definition only)
3. Cardiovascular system
   a) Anatomy and functions of heart
   b) Blood vessels and circulation (Pulmonary, coronary and systemic circulation)
   c) Electrocardiogram (ECG)
   d) Cardiac cycle and heart sounds
   e) Blood pressure – its maintenance and regulation
   f) Definition of the following disorders
   Hypertension, Hypotension, Arteriosclerosis, Atherosclerosis, Angina, Myocardial infarction, Congestive heart failure, Cardiac arrhythmias

Unit-III (20 Hrs)

1. Respiratory system
   a) Anatomy of respiratory organs and functions
   b) Mechanism / physiology of respiration and regulation of respiration
   c) Transport of respiratory gases
   d) Respiratory volumes and capacities, and Definition of: Hypoxia, Asphyxia, Dybarism, Oxygen therapy and resuscitation.
2. Digestive system
   a) Anatomy and physiology of GIT
   b) Anatomy and functions of accessory glands of GIT
   c) Digestion and absorption
   d) Disorders of GIT (definitions only)
3. Urinary system
   a) Anatomy and physiology of urinary system
   b) Formation of urine
   c) Renin Angiotensin system – Juxtaglomerular apparatus - acid base Balance
   d) Clearance tests and micturition
4. Reproductive system
   a) Male and female reproductive system
   b) Their hormones – Physiology of menstruation
   c) Spermatogenesis & Oogenesis
   d) Sex determination (genetic basis)
   e) Pregnancy and maintenance and parturition
   f) Contraceptive devices

Unit-IV (20 Hrs)

1. 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
   h) ANS – Anatomy & functions of sympathetic & parasympathetic N.S.
2. Endocrine system
   a) Pituitary gland
   b) Adrenal gland
   c) Thyroid and Parathyroid glands
   d) Pancreas and gonads
3. Sense organs
   a) Eye
   b) Ear
   c) Skin
   d) Tongue & Nose

Unit-V (15 Hrs)

1. Osseous system - structure, composition and functions of the Skeleton. (done in practical classes - 6hrs)
2. Classification of joints, Types of movements of joints and disorders of joints (Definitions only)
3. Skeletal muscles
   a) Histology
   b) Physiology of Muscle contraction
   c) Physiological properties of skeletal muscle and their disorders (definitions)
4. Sports physiology
   a) Muscles in exercise, Effect of athletic training on muscles and muscle performance,
   b) Respiration in exercise, CVS in exercise, Body heat in exercise, Body fluids and salts in exercise,
   c) Drugs and athletic

PHD1.1P HUMAN ANATOMY & PHYSIOLOGY (PRACTICAL)

Practical: 3Hrs./Week

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

Course materials:

Text books

Goyal, R.K, Natvar M.P, and Shah S.A, Practical anatomy, physiology and biochemistry, latestedition, Publisher: B.SShahPrakashan, Ahmedabad.

Reference books

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

List of Experiments :

1. Study of tissues of human body
   (a) Epithelial tissue.
   (b) Muscular tissue.
2. Study of tissues of human body
   (a) Connective tissue.
   (b) Nervous tissue.
3. Study of appliances used in hematological experiments.
4. Determination of W.B.C.count of blood.
5. Determination of R.B.C.count of blood.
6. Determination of differential count of blood.
7. Determination of
   (a) Erythrocyte Sedimentation Rate.
   (b) Hemoglobin content of Blood.
   (c) Bleeding time & Clotting time.
8. Determination of
   (a) Blood Pressure.
   (b) Blood group.
9. Study of various systems with the help of charts, models & specimens
   (a) Skeleton system partI - axialskeleton.
   (b) Skeleton systempartII - appendicularskeleton.
   (c) Cardiovascular system.
   (d) Respiratory system.
   (e) Digestive system.
   (f) Urinary system.
   (g) Nervous system.
   (h) Specialsenses.
   (i) Reproductive system.

10. Study of different family planning appliances.
11. To perform pregnancy diagnosis test.
12. Study of appliances used in experimental physiology.
13. To record simple muscle curve using gastroenemius sciatic nerve preparation.
14. To record simple summation curve using gastroenemius sciatic nerve preparation.
15. To record simple effect of temperature using gastroenemius sciatic nerve preparation.
16. To record simple effect of load & after load using gastroenemius sciatic nerve preparation.
17. To record simple fatigue ecurve using gastroenemius sciatic nerve preparation.

Scheme of Practical Examination:

	Sessionals	**Annual**
Identification	04	10
Synopsis	04	10
MajorExperiment	07	20
MinorExperiment	03	15
Viva	02	15
Max Marks	**20**	**70**
Duration	**03hrs**	**04hrs**

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

PHD1.2T PHARMACEUTICS (THEORY)

Theory: 2 Hrs. /Week

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

2. Course Outcomes:

1. To define dosage forms and tell the basic concepts of Prescription, Posology and Pharmacopoeias
2. To understand the calculations, formulation and preparation of different Powders
3. To have basic knowledge on Monophasic dosage forms with excipients
4. To have fundamentals on Biphasic dosage forms, effectiveness of preparations
5. To justify the use of Suppositories as alternative dosage forms and appreciate the use of Galenicals
6. To elaborate the types of Incompatibilities and Surgical aids for best health care

3. Course materials:

Text books

a. Cooper and Gunns Dispensing for pharmacy students.

b. A text book Professional Pharmacy by N.K.Jain and S.N.Sharma.

Reference books

a. Introduction to Pharmaceutical dosage forms by Howard C. Ansel.

b. Remington's Pharmaceutical Sciences.

c. Register of General Pharmacy by Cooper and Gunn.

d. General Pharmacy by M.L.Schroff.

4. Lecture wise programme: Topics

Unit I (12 Hrs)

Historical background and development of profession of pharmacy and pharmaceutical industry in brief.

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

Unit II(12 Hrs)

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

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

Unit III(12 Hrs)

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 Dosage forms: Theoretical aspects of formulation including adjuvant likestabilizers, colorants, flavours with examples. Study of Monophasic liquids like gargles,mouthwashes,Throatpaint, Eardrops, Nasaldrops,Linimentsandlotions,Enemasand collodions.

Unit IV (12 Hrs)

Biphasicdosage 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 and extracts.

Unit V(12 Hrs)

Pharmaceuticalcalculations.

Surgicalaids : Surgical dressings, absorbable gelatin sponge, sutures, ligatures and Medicatedbandages.

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

PHD1.2P PHARMACEUTICS (PRACTICAL)

Practical: 3hr/Week

List of Experiments:

1. **Syrups**
   a. Simple SyrupI.P
   b. Syrup of Ephedrine Hcl NF
   c. Syrup VasakaIP
   d. Syrup of ferrous PhosphateIP
   e. Orange Syrup
2. **Elixir**
   a. Piperizine citrate elixirBP
   b. Cascara elixirBPC
   c. Paracetamol elixirBPC
3. **Linctus**
   a. Simple LinctusBPC
   b. Pediatric simple LinctusBPC
4. **Solutions**
   a. Solution of cresol with soapIP
   b. Strong solution of ferric chlorideBPC
   c. Aqueous Iodine SolutionIP
   d. Strong solution of IodineIP
   e. Strong solution of ammonium acetateIP
5. **Liniments**
   a. Liniment of turpentine IP*
   b. Liniment of camphor IP
6. **Suspensions***
   a. Calamine lotion
   b. Magnesium Hydroxide mixtureBP
7. **Emulsions***
   a. Cod liver oil emulsion
   b. Liquid paraffin emulsion
8. **Powders***
   a. Eutectic powder
   b. Explosive powder
   c. Dusting powder
   d. Insufflations
9. **Suppositories***
   a. Boric acid suppositories
   b. Chloral suppositories
10. **Incompatibilities**
    a. Mixtures with Physical
    b. Chemical & Therapeutic incompatibilities

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

Scheme of Practical Examination:

	Sessionals	**Annual**
Synopsis	05	15
MajorExperiment	10	25
MinorExperiment	03	15
Viva	02	15
MaxMarks	**20**	**70**
Duration	**03 hrs**	**04 hrs**

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

PHD1.3T MEDICINAL BIOCHEMISTRY (THEORY)

Theory: 3 Hrs. /Week

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

2. Course Outcomes:

1. To understand the importance of metabolism of substrates.
2. Will acquire chemistry and biological importance of biological macromolecules.
3. To acquire knowledge in qualitative and quantitative estimation of the biological macromolecules.
4. To know the interpretation of data emanating from a Clinical Test Lab.
5. To know how physiological conditions influence the structures and reactivity's of biomolecules.
6. To understand the basic principles of protein and polysaccharide structure

3.Course materials:

Text books (Theory)

a. Harpers review of biochemistry - Martin
b. Text book of biochemistry – D.Satyanarayana
c. Text book of clinical chemistry- Alex Kaplan &LaverveL.Szabo

Reference books (Theory)

a. Principles of biochemistry -- Lehn Inger
b. Text book of biochemistry – Rama Rao
c. Practical Biochemistry-David T.Plummer.
d. Practical Biochemistry-Pattabhiraman.

4. Lecture wise programme:

Topics

UNIT I (16 Hrs)

1. Introduction to biochemistry:

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

2. Enzymes:

a) Definition; Nomenclature; IUB classification
b) Factor affecting enzyme activity; Enzyme action; enzyme inhibition.
c) Isoenzymes and their therapeutic and diagnostic applications;
d) Coenzymes and their biochemical role and deficiency diseases.

UNIT II (19 Hrs)

1. Carbohydrate metabolism:

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

2. Lipid metabolism:

a) Oxidation of saturated (β-oxidation)

b) Ketogenesis and ketolysis

c) Biosynthesis of fatty acids, lipids ; metabolism of cholesterol

d) Hormonal regulation of lipid metabolism

e) Defective metabolism of lipids (Atherosclerosis, fatty liver, hypercholesterolmiea).

UNIT III (19 Hrs)

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

2. **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.

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

UNIT IV (19 Hrs)

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

2. **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)

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

a) Test for hepatic dysfunction-Bile pigments metabolism**.**

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

c) Dye tests of excretory function.

d) Tests based upon abnormalities of serum proteins.

e) Selected enzyme tests.

UNIT V (17 Hrs)

1. **Lipid profile tests**:

a) Lipoproteins, composition, functions.

b) Determination of serum lipids, total cholesterol, HDL cholesterol, LDL cholesterol and triglycerides

2. **Immunochemical techniques** for determination of hormone levels and protein levels in serum for endocrine diseases and infectious diseases. Radio immune assay (RIA) Enzyme Linked Immune Sorbent Assay (ELISA)

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

PHD1.3P MEDICINAL BIOCHEMISTRY (PRACTICAL)

Practical : 3hrs/Week

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

Assignments:

Format of the assignment

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

Scheme of Practical Examination:

	Sessionals	**Annual**
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
Max Marks	**20**	**70**
Duration	**03 hrs**	**04 hrs**

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

PHD1.4T PHARMACEUTICAL ORGANIC CHEMISTRY (THEORY)

Theory: 3 Hrs. /Week

1. Scope and objectives:

a. This course is designed to impart a very good knowledge about a. IUPAC/Common system of nomenclature of simple organic compounds belonging to different classes of organic compounds;
b. Some important physical properties of organic compounds;
c. Free radical/ nucleophilic [alkyl/ acyl/ aryl] /electrophilic substitution, free radical/ nucleophilic / electrophilic addition, elimination, oxidation andreduction reactions with mechanism, orientation of the reaction, order of reactivity, stability of compounds;
d. Some named organic reactions with mechanisms; and
e. Methods of preparation test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

2. Course Outcomes:

1. To be able to give systematic names to simple organic compounds and poly functional group.
2. To achieve an understanding of the behavior of organic compounds and to establish a foundation for studies into natural and synthetic products of pharmaceutical interest.
3. To acquire the knowledge and understanding of the basic experimental principles of pharmaceutical organic chemistry.
4. To draw the structures and synthesize simple pharmaceutically active organic compounds.
5. To describe detailed mechanisms for common reactions.
6. To be able to run experimental techniques, procedures and safe laboratory practices

3. Course materials:

Text books
a. T.R.Morrison and R. Boyd - Organic chemistry,
b. Bentley and Driver-Text book of Pharmaceutical chemistry
c. I.L.Finer- Organic chemistry, the fundamentals of chemistry

Reference books
a. Organic chemistry – J.M.Cram and D.J.Cram
b. Organic chemistry- Brown
c. Advanced organic chemistry- Jerry March, Wiley
d. Organic chemistry- Cram and Hammered, Pine Hendrickson

4. Lecture wise programme: **Topics**

Unit-I (20 Hrs)
Structures and Physical properties:
a. 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,
b. i) Acids and bases, Lowry bronsted and Lewis theories isomerism

ii) Nomenclature of organic compound belonging to the following classes Alkanes, Alkenes, Dienes, Alkynes, Alcohols, Aldehydes, Ketones, Amides, Amines, Phenols, Alkyl Halides, Carboxylic Acid, Esters, Acid Chlorides And Cycloalkanes.
iii) Free radicals chain reactions of alkane : Mechanism, relative reactivity and stability iv) Alicyclic compounds : Preparations of cyclo alkanes, Bayer strain theory and orbital picture of angle strain.

Unit-II (25 Hrs)

2. i) Nucleophilic 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.

ii) 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.

iii) Electrophilic and free radicals addition: Reactions at carbon-carbon, double bond, electrophile, hydrogenation, heat of hydrogenation and stability of alkenes,markownikoff rule, addition of hydrogen halides, addition of hydrogen bromides, peroxide effect, electrophillic addition, mechanism, rearrangement, absence ofhydrogen exchange, orientation and reactivity, addition of halogen, mechanism, halohydin formation, mechanism of free radicals addition, mechanism of peroxide initiated addition of hydrogen bromide, orientation of free addition, additions of carbine to alkene, cyclo addition reactions.

iv) Carbon-carbon double bond as substituents: Free radical halogenations ofalkenes, comparison of free radical substitution with free radical addition, free radical substitution in alkenes, orientation and reactivity, allylic rearrangements.

Unit-III (15 Hrs)

3. i) Theory of resonance:
Allyl radical as a resonance hybrid, stability, orbital picture, resonance stabilization of allyl radicals, hyper conjugation, allylcation asa resonance hybrid, nucleophilic substitution in allylic substrate, SN1 reactivity, allylic rearrangement, resonance stabilization of allylcation, hyper conjugation,nucleophilic substitution in allylic substrate, SN2 nucleophilic substitution in vinyl substrate, vinyliccation, 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. ii) Elecrophilic aromatic substitution: Effect of substituent groups, determination of orientation, determination of relative reactivity, classification of substituentgroup, mechanism of nitration, sulphonation, halogenation, friedel craft alkylation, friedel craft acylation, reactivity and orientation, activating anddeactivating O,P,M directing groups, electron release via resonance, effect of halogen on electrophilic aromatic substitution in alkyl benzene, side chain halogenation of alkyl benzene, resonance stabilization of benzyl radical.

Unit-IV (15 Hrs)

4. i) Nucleophilic addition reaction: Mechanism, ionization of carboxylic acids, acidity constants, acidity of acids, structure of carboxylate ions, effect of substituent on acidity, nucleophilic acyl substitution reaction, conversion of acidto acid chloride, esters, amide and anhydride. Role of carboxyl group, comparison of alkyl nucleophilic substitution with acyl nucleophilic substitution.

ii) 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.

iii) Hoffman rearrangement: Migration to electron deficient nitrogen, Sand Meyer's reaction, basicity of amines, diazotization and coupling, acidity of phenols, Williamson synthesis, Fries rearrangement, Kolbe reaction, Reimer tieman's reactions.

Unit-V (15 Hrs)

5. i) Nucleophilic aromatic substitution: Bimolecular displacement mechanisms,orientation, comparison of aliphatic nucleophilic substitution with that of aromatic

ii) Oxidation reduction reaction.

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

PHD1.4P PHARMACEUTICAL ORGANIC CHEMISTRY (PRACTICAL)

Practical : 3 Hrs./Week

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

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

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

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

III. Introduction to the use of stereo models:

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

Scheme of Practical Examination:

	Sessionals	**Annual**
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
Max Marks	**20**	**70**
Duration	**03 hrs**	**04 hrs**

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

PHD1.5T PHARMACEUTICAL INORGANIC CHEMISTRY (THEORY)

Theory: 2 Hrs. /Week

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

2. Course outcoms:
1. To be able to give systematic names to simple organic compounds and poly functional group.
2. To achieve an understanding of the behavior of organic compounds and to establish a foundation for studies into natural and synthetic products of pharmaceutical interest.
3.Describe To acquire the knowledge and understanding of the basic experimental principles of pharmaceutical organic chemistry.
4. To draw the structures and synthesize simple pharmaceutically active organic compounds.
5. To describe detailed mechanisms for common reactions.
6. To be able to run experimental techniques, procedures and safe laboratory practices.

3. Course materials:
Text books:
a. A text book Inorganic medicinal chemistry by Surendra N. Pandeya
b.A. H. Beckett and J. B. Stanlake's Practical Pharmaceutical chemistry Vol-I &Vol-II
c. Inorganic Pharmaceutical Chemistry III-Edition P.Gundu Rao

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

4. Lecture wise programme: **Topics**:

Unit 1 (10 Hrs)
A. Errors
B. Volumetric analysis
C. Acid-base titrations
D. Redox titrations

Unit 2 (15 Hrs)
A. Non aqueous titrations
B. Precipitation titrations
C. Complexometric titrations
D. Theory of indicators

Unit 3 (12 Hrs)
A. Gravimetry
B. Limit tests
C. Medicinal gases
D. Acidifiers

Unit 4 (13 Hrs)
A. Antacids
B. Cathartics
C. Electrolyte replenishers
D. Essential Trace elements

Unit 5 (10 Hrs)
A. Antimicrobials
B. Pharmaceutical aids
C. Dental Products
D .Miscellaneous compounds
E. Radio Pharmaceuticals

PHD1.5P PHARMACEUTICAL INORGANIC CHEMISTRY (PRACTICAL)

Practical: 3 Hrs./ Week

1) 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

2) Assays (10 exercises)

a) a. Ammonium chloride- Acid-base titration
b) Ferrous sulphate- Cerimetry
c) Copper sulpahte- Iodometry
d) Calcilugluconate- 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 tartarate

3) Estimation of mixture (Any two exercises)

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

4) Test for identity (Any three exercises)

a) Sodium bicorbonate
b) Barium sulphate
c) Ferrous sulphate
d) Potassium chloride

5) Test for purity (Any two exercises)

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

6) Preparations (Any two exercises)

a) Boric acids
b) Potash alum
c) Calcium lactate
d) Magnesium suphate

Scheme of Practical Examination:

	Sessionals	**Annual**
Synopsis	05	15
Major Experiment	10	25
Minor Experiment1&2	03	15
Viva	02	15
Max Marks	**20**	**70**
Duration	**03 hrs**	**04 hrs**

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

PHD1.6BBT BIOLOGY (THEORY)

Theory: 3 Hrs. /Week

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

2.Course Outcomes:

1. To explain the general organization of plants, including their inclusions, tissues, and classification within the plant kingdom.
2. To analyze the morphology and modifications of plant structures such as roots, stems, leaves, flowers, fruits, and seeds.
3. To compare and classify plant families (Leguminosae, Umbelliferae, Solanaceae, Liliaceae, Zingiberaceae, Rubiaceae) and study microbial organisms like fungi, yeast, and bacteria.
4. To describe the structure and function of animal cells and tissues, emphasizing their role in overall physiology.
5. To assess the anatomical features and adaptations of frogs, fish, reptiles in relation to their ecological niches.
6. To analyze, compare, and evaluate the anatomical features and adaptations of birds, mammals, and poisonous animals, and assess how these traits contribute to their survival and functioning within their ecological functions.

3.Course materials:
Text books
a. Text book of Biology by S.B.Gokhale
b. A Text book of Biology by Dr.Thulajappa and Dr. Seetaram.

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

4. Lecture wise programme: **Topics**

Unit-I (15 Hrs)
- Introduction
- General organization of plants and its inclusions
- Plant tissues
- Plant kingdom and its classification

Unit-II (20 Hrs)
- Morphology of plants
- Root, Stem, Leaf and Its modifications
- Inflorescence and Pollination of flowers
- Morphology of fruits and seeds

Unit-III (15 Hrs)

- Plant physiology
- Taxonomy of Leguminosae, umbelliferae, Solanaceae, Lilliaceae, Zinziberaceae, Rubiaceae
- Study of Fungi, Yeast, Penicillin and Bacteria

Unit-IV (15 Hrs)

- Study of Animal cell
- Study animal tissues

Unit-V (25 Hrs)

- Detailed study of frog
- Study of Pisces, Reptiles, Aves
- General organization of mammals
- Study of poisonous animals

PHD1.6BBP BIOLOGY (PRACTICAL)

Practical: 3 Hrs./ Week

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

Scheme of Practical Examination:

	Sessionals	**Annual**
Identification	04	10
Synopsis	04	10
Major Experiment	07	20
Minor Experiment	03	15
Viva	02	15
Max Marks	**20**	**70**
Duration	**03hrs**	**04hrs**

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

PHD1.6AMT REMEDIAL MATHEMATICS (THEORY)

Theory: 3 Hrs. /Week

1. **Scope and objectives**: This is an introductory course in mathematics. This subject deals with the introduction to matrices, determinants, trigonometry, analytical geometry, differential calculus, integral calculus, differential equations, laplace transform.

2. **Course Outcomes** : –
   a. Know Trignometry, Analytical geometry, Matrices, Determinant, Integration, Differential equation, Laplace transform and their applications;
   b. solve the problems of different types by applying theory; and
   c. appreciate the important applications of mathematics in pharmacy.

3. **Course materials**:

   Text books
   a. Differential calculus By Shantinarayan
   b. Text book of Mathematics for second year pre-university by Prof.B.M.Sreenivas

   Reference books
   a. Integral calculus By Shanthinarayan
   b. Engineering mathematics By B.S.Grewal
   c. Trigonometry Part-I By S.L.Loney

Lecture wise programme : Topics

1 **Algebra :** Determinants, Matrices (10hrs)
2 **Trigonometry:** Sides and angles of a triangle, solution of triangles(15hrs)
3 **Analytical Geometry:**Points, Straight line, circle, parabola(10hrs)
4 **Differential calculus:** Limit of a function, Differential calculus, Differentiation of a sum, Product, Quotient Composite, Parametric, exponential, trigonometric and Logarithmic function. Successive differentiation, Leibnitz's theorem, Partial differentiation, Euler's theorem on homogeneous functions of two variables(25hrs)

5 **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(30hrs)

PHD1.7T HUMAN VALUES AND PROFESSIONAL ETHICS (THEORY)

Theory: 2 Hrs. /Week

1. **Scope &Objectives:** To gain knowledge on human values and ethics. To facilitate the development of a Holistic perspective among students towards safety risk management, rights and responsibilities.To appreciate Holistic understanding of human conduct on professional ethics

2. Course Outcomes：–

Conceptual understanding:

1. Define and explain key human values like truth, non-violence, justice, and empathy.
2. Differentiate between personal values, societal values, and professional ethics.
3. Analyze the historical and philosophical context of human values.

3. Course Material:

Reference books:

1. R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2
2. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.
3. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Purblishers.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986,1991
5. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins,USA

Relevant websites

6. Value Education websites, http://uhv.ac.in, *http://www.uptu.ac.in*
7. IIT Delhi, Modern Technology – the Untold Story
8. *Gandhi A., Right Here Right Now, Cyclewala Productions.*
9. Value Education websites, http://uhv.ac.in, *http://www.uptu.ac.in*
10. Gandhi *A., Right Here Right Now, Cyclewala Productions*

4.Lecture wise programme: Topics

UNIT 1: 7 Hrs

Introduction - Need, Basic Guidelines, Content and Process for Value Education

Need, basic guidelines, content and process for Value Education, Self-Exploration, Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity, A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT 2: 8 Hrs

Understanding Harmony in the Human Being - Harmony in Myself!

Understanding human being as a co-existence of the sentient 'I' and the material'Body', Understanding the needs of Self ('I') and 'Body', Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correctappraisal of Physical needs, meaning of Prosperity in detail.

UNIT 3: 5 Hrs

Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

Understanding Harmony in the family – the basic unit of human interaction, Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj),* Universal Order (Sarvabhaum Vyawastha*)*- from family to world family!

UNIT 4: 5 Hrs

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

UNIT 5: 5 Hrs

Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics, Strategy for transition from the present state to Universal Human Order

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Academic Rules & Regulations for Pharma.D Programme

(Applicable to the students of Second year Pharma.D
Academic year 2025-26)

Pharm.D. Regulations 2008

Regulations framed under section 10 of the Pharmacy Act, 1948 (8 of 1948).

(As approved by the Government of India, Ministry of Health vide, letter No.V.13013/1/2007-PMS, dated the 13th March, 2008 and notified by the Pharmacy Council of India).

No.14-126/2007-PCI.— In exercise of the powers conferred by section 10 of the Pharmacy Act, 1948 (8 of 1948), the Pharmacy Council of India, with the approval of the Central Government, hereby makes the following regulations, namely:-

CHAPTER-I

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.

CHAPTER-II

3. Duration of the course. –

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

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

Phase II – consisting of internship or residency training during sixth year involving posting in 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 in the Tables below. The number of hours in a week, devoted to each subject for its teaching in theory, practical and tutorial shall not be less than that noted against it in columns (3), (4) and (5) below.

TABLES

First Year:

S.No.	Name of Subject	No. of hours of Theory	No. of hours of Practical	No. of hours of Tutorial
(1)	(2)	(3)	(4)	(5)
1.1	Human Anatomy and Physiology	3	3	1
1.2	Pharmaceutics	2	3	1
1.3	Medicinal Biochemistry	3	3	1
1.4	Pharmaceutical Organic Chemistry	3	3	1
1.5	Pharmaceutical Inorganic Chemistry	2	3	1
1.6	Remedial Mathematics/Biology	3	3*	1
1.7	Human values and Professional ethics	2	-	-
	Total hours	**18**	**18**	**6= (42)**

*For Biology

Second Year:

S.No.	Name of Subject	No. of hours of Theory	No. of hours of Practical	No. of hours of Tutorial
(1)	(2)	(3)	(4)	(5)
2.1	Pathophysiology	3	-	1
2.2	Pharmaceutical Microbiology	3	3	1
2.3	Pharmacognosy & Phytopharmaceuticals	3	3	1
2.4	Pharmacology-I	3	-	1
2.5	Community Pharmacy	2	-	1
2.6	Pharmacotherapeutics-I	3	3	1
	Total hours	**17**	**9**	**6 = (32)**

Third Year:

S.No.	Name of Subject	No. of hours of Theory	No. of hours of Practical	No. of hours of Tutorial
(1)	(2)	(3)	(4)	(5)
3.1	Pharmacology-II	3	3	1
3.2	Pharmaceutical Analysis	3	3	1
3.3	Pharmacotherapeutics-II	3	3	1
3.4	Pharmaceutical Jurisprudence	2	-	-
3.5	Medicinal Chemistry	3	3	1
3.6	Pharmaceutical Formulations	2	3	1
	Total hours	**16**	**15**	**5 = (36)**

Fourth Year:

S.No.	Name of Subject	No. of hours of Theory	No. of hours of Practical/ Hospital Posting	No. of hours of Tutorial
(1)	(2)	(3)	(4)	(5)
4.1	Pharmacotherapeutics-III	3	3	1
4.2	Hospital Pharmacy	2	3	1
4.3	Clinical Pharmacy	3	3	1
4.4	Biostatistics & Research Methodology	2	-	1
4.5	Biopharmaceutics & Pharmacokinetics	3	3	1
4.6	Clinical Toxicology	2	-	1
	Total hours	**15**	**12**	**6 = (33)**

Fifth Year:

S.No.	Name of Subject	No. of hours of Theory	No. of hours of Practical/ Hospital Posting*	No. of hours of Tutorial
(1)	(2)	(3)	(4)	(5)
5.1	Clinical Research	3	-	1
5.2	Pharmacoepidemiology and Pharmacoeconomics	3	-	1
5.3	Clinical Pharmacokinetics & Pharmacotherapeutic Drug Monitoring	2		1
5.4	Clerkship *	-	-	1
5.5	Project work (Six Months)	-	20	-
	Total hours	**8**	**20**	**4 = (32)**

* Attending ward rounds on daily basis.

Sixth Year:

Internship or residency training including postings in speciality units. Student should independently provide the clinical pharmacy services to the allotted wards.

(i) Six months in General Medicine department, and

(ii) Two months each in three other speciality departments

8. Syllabus. – The syllabus for each subject of study in the said Tables shall be as specified in Appendix -A to these 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, nonteaching 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 in Tables below:

TABLES

First Year Examination:

S.No.	Name of Subject	Maximum marks for Theory			Maximum marks for Practicals		
		Examination	Sessional	Total	Examination	Sessional	Total
1.1	Human Anatomyand Physiology	70	30	100	70	30	100
1.2	Pharmaceutics	70	30	100	70	30	100
1.3	Medicinal Biochemistry	70	30	100	70	30	100
1.4	PharmaceuticalOrganic Chemistry	70	30	100	70	30	100
1.5	Pharmaceutical Inorganic Chemistry	70	30	100	70	30	100
1.6	RemedialMathematics/ Biology	70	30	100	70*	30*	100*
1.7	Human values and Professional ethics	50	-	50	-	-	-
				650			600= 1250

*for Biology.

Second Year Examination:

S.No.	Name of Subject	Maximum marks for Theory			Maximum marks for Practical		
		Examination	Sessional	Total	Examination	Sessional	Total
2.1	Pathophysiology	70	30	100	-	-	-
2.2	Pharmaceutical Microbiology	70	30	100	70	30	100
2.3	Pharmacognosy & Phytopharmaceuticals	70	30	100	70	30	100
2.4	Pharmacology-I	70	30	100	-	-	-
2.5	Community Pharmacy	70	30	100	-	-	-
2.6	Pharmacotherapeutics-I	70	30	100	70	30	100
				600			**300= 900**

Third Year Examination:

S.No.	Name of Subject	Maximum marks for Theory			Maximum marks for Practical		
		Examination	Sessional	Total	Examination	Sessional	Total
3.1	Pharmacology-II	70	30	100	70	30	100
3.2	Pharmaceutical Analysis	70	30	100	70	30	100
3.3	Pharmacotherapeutics-II	70	30	100	70	30	100
3.4	Pharmaceutical Jurisprudence	70	30	100	-	-	-
3.5	Medicinal Chemistry	70	30	100	70	30	100
3.6	Pharmaceutical Formulations	70	30	100	70	30	100
				600			**500= 1100**

Fourth Year Examination:

S.No.	Name of Subject	Maximum marks for Theory			Maximum marks for Practical		
		Examination	Sessional	Total	Examination	Sessional	Total
4.1	Pharmacotherapeutics-III	70	30	100	70	30	100
4.2	Hospital Pharmacy	70	30	100	70	30	100
4.3	Clinical Pharmacy	70	30	100	70	30	100
4.4	Biostatistics & Research Methodology	70	30	100	-	-	-
4.5	Biopharmaceutics & Pharmacokinetics	70	30	100	70	30	100
4.6	Clinical Toxicology	70	30	100	-	-	-
				600			**400= 1000**

Fifth Year Examination:

S.No.	Name of Subject	Maximum marks for Theory			Maximum marks for Practical		
		Examination	Sessional	Total	Examination	Sessional	Total
5.1	Clinical Research	70	30	100	-	-	-
5.2	Pharmacoepidemiology and Pharmacoeconomics	70	30	100	-	-	-
5.3	Clinical Pharmacokinetics & Pharmacotherapeutic Drug Monitoring	70	30	100	-	-	-
5.4	Clerkship *	-	-	-	70	30	100
5.5	Project work (Six Months)	-	-	-	100**	-	100
				300			**200 = 500**

* Attending ward rounds on daily basis.

** 30 marks – viva-voce (oral)
70 marks – Thesis work

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

CHAPTER-III
Practical training

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)

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

PHD2.1T PATHOPHYSIOLOGY (THEORY)

Theory: 3 Hrs. /Week

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

2. Objectives of the Subject: Upon completion of the subject student shall be able to –

a. describe the etiology and pathogenesis of the selected disease states;

b. name the signs and symptoms of the diseases; and

c. mention the complications of the diseases.

Text books (Theory)

a. Pathologic basis of disease by- Cotran, Kumar, Robbins

b. Text book of Pathology- Harsh Mohan

c. Text book of Pathology- Y.M. Bhinde

Reference books (Theory)

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

3. Detailed syllabus and lecture wise schedule:

Chapter

1. Basic principles of cell injury and Adaptation

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

2. Inflammation

a) Pathogenesis of acute inflammation, Chemical mediators in inflammation, Types of chronic inflammation.

b) Repairs of wounds in the skin, factors influencing healing of wounds.

3. Diseases of Immunity

a) Introduction to T and B cells

b) MHC proteins or transplantation antigens

c) Immune tolerance

- Hypersensitivity: Hypersensitivity type I, II, III, IV, Biological significance, Allergy due to food, chemicals and drugs
- Autoimmunity: Criteria for autoimmunity, Classifications of autoimmune diseases in man, mechanism of autoimmunity, Transplantation and immunologic tolerance, allograft rejections, transplantation antigens, mechanism of rejection of allograft.
- Acquired immune deficiency syndrome (AIDS)
- Amylodosis

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

5. Types of shock, mechanisms, stages and management
6. Biological effects of radiation
7. Environmental and nutritional diseases
   i) Air pollution and smoking- SO2,NO, NO2, and CO
   ii) Protein calorie malnutrition, vitamins, obesity, pathogenesis of starvation.
8. Pathophysiology of common diseases
   a. Parkinsonism
   b. Schizophrenia
   c. Depression and mania
   d. Hypertension,
   e.Stroke (ischaemic and hemorrhage)
   f. Angina, CCF, Atherosclerosis, Myocardial infarction
   g. Diabetes Mellitus
   h. Peptic ulcer and inflammatory bowel diseases
   i. Cirrhosis and Alcoholic liver diseases
   j. Acute and chronic renal failure
   k. Asthma and chronic obstructive airway diseases

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

4. Assignments :

Title of the Experiment

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

Format of the assignment

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

PHD2.2T PHARMACEUTICAL MICROBIOLOGY (THEORY)

Theory : 3 Hrs. /Week

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

2. Objectives of the Subject :

Upon completion of the subject student shall be able to –

a. know the anatomy, identification, growth factors and sterilization of microorganisms;

b. know the mode of transmission of disease causing microorganism, symptoms of disease, and treatment aspect;

c. do estimation of RNA and DNA and there by identifying the source;

d. do cultivation and identification of the microorganisms in the laboratory;

e. do identification of diseases by performing the diagnostic tests; and

f. appreciate the behavior of motility and behavioral characteristics of microorganisms.

Text books (Theory)

a. Vanitha Kale and Kishor Bhusari ― Applied Microbiology ‖ Himalaya Publishing house Mumbai.

b. Mary Louis Turgeon ― Immunology and Serology in Laboratory Medicines‖ 2nd edition, 1996 Mosby- Year book inc St. Louis Missouri 63146.

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

Reference books (Theory)

a. 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.

3. Detailed syllabus and lecture wise schedule :

Title of the topic

1. Introduction to the science of microbiology. Major divisions of microbial world and Relationship among them.
2. Different methods of classification of microbes and study of Bacteria, Fungi, virus, Rickettsiae , Spirochetes.
3. Nutritional requirements, growth and cultivation of bacteria and virus. Study of different important media required for the growth of aerobic and anaerobic bacteria & fungi. Differential media, enriched media and selective media, maintenance of lab cultures.

4. Different methods used in isolation and identification of bacteria with emphasis to different staining techniques and biochemical reactions. Counting of bacteria -Total and Viable counting techniques.
5. Detailed study of different methods of sterilization including their merits and demerits. Sterilization methods for all pharmaceutical products. Detailed study of sterility testing of different pharmaceutical preparations . Brief information on Validation.
6. Disinfectants- Study of disinfectants, antiseptics, fungicidal and virucidal agents factors affecting their activation and mechanism of action. Evaluation of bactericidal, bacteristatic, , virucidal activities, evaluation of preservatives in pharmaceutical preparations.
7. Immunology- Immunity, Definition, Classification, General principles of natural immunity, Phagocytosis, acquired immunity(active and passive) . Antigens, chemical nature of antigens structure and formation of Antibodies, Antigen-Antibody reactions. Bacterial exotoxins and endotoxins. Significance of toxoids in active immunity, Immunization programme, and importance of booster dose.
8. Diagnostic tests : Schick's Test, Elisa test, Western Blot test, Southern Blot PCR Widal, QBC, Mantaux Peripheral smear. Study of malarial parasite.
9. Microbial culture sensitivity Testing: Interpretation of results Principles and methods of different microbiological assays, microbiological assay of Penicillin, Streptomycin and vitamin B2 and B12. Standardisation of vaccines and sera.
10. Study of infectious diseases: Typhoid, Tuberculosis, Malaria, Cholera, Hepatitis, Meningitis, Syphilis & Gonorrhea and HIV.

PHD2.2P PHARMACEUTICAL MICROBIOLOGY (PRACTICAL)

Practical : 3 Hrs./Week

Title of the Experiment:

1. Study of apparatus used in experimental microbiology*.

2. Sterilisation of glass ware's. Preparation of media and sterilisation.*

3. Staining techniques – Simple staining ; Gram's staining ; Negative staining**

4. Study of motility characters*.

5. Enumeration of micro-organisms (Total and Viable)*

6. Study of the methods of isolation of pure culture.*

7. Bio chemical testing for the identification of micro*-organisms.

8 Cultural sensitivity testing for some micro-organisms.*

9 Sterility testing for powders and liquids.*

10 Determination of minimum inhibitory concentration.*

11 Microbiological assay of antibiotics by cup plate method.*

12 Microbiological assay of vitamins by Turbidometric method**

13 Determination of RWC.**

14 Diagnostic tests for some common diseases, Widal, malarial parasite.** * Indicate minor experiment & ** indicate major experiment

Assignments:

1 Visit to some pathological laboratories & study the activities and equipment/instruments used and reporting the same.

2. Visit to milk dairies (Pasturization) and microbial laboratories(other sterization methods) & study the activities and equipment/instruments used and reporting the same.

3. Library assignments

a. Report of recent microbial techniques developed in diagnosing some common diseases.

b. Latest advancement developed in identifying, cultivating & handling of microorganisms.

Format of the assignment:

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

Scheme of Practical Examination:

	Sessionals	**Annunal**
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
Max Marks	20	70
Duration	**03 Hrs**	**04 Hrs**

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

PHD2.3T PHARMACOGNOSY & PHYTOPHARMACEUTICALS (THEORY)

Theory : 3 Hrs. /Week

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

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

a. understand the basic principles of cultivation, collection and storage of crude drugs;

b. know the source, active constituents and uses of crude drugs; and

c. appreciate the applications of primary and secondary metabolites of the plant.

3. Course materials:

Text books

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

Reference books

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

4. Lecture wise programme:

Topics

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

PHD2.3P PHARMACOGNOSY & PHYTOPHARMACEUTICALS (PRACTICAL)

Practical : 3 Hrs./Week

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

List of experiments:

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

Scheme of Practical Examination:

	Sessionals	**Annunal**
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
Max Marks	20	70
Duration	**03 Hrs**	**04 Hrs**

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

PHD2.4T PHARMACOLOGY – I (THEORY)

Theory : 3 Hrs. /Week

1. Scope of the Subject: This subject will provide an opportunity for the student to learn about the drug with regard to classification, pharmacodynamic and pharmacokinetic aspects, adverse effects, uses, dose, route of administration, precautions, contraindications and interaction with other drugs. In this subject, apart from general pharmacology, drugs acting on autonomic nervous system, cardiovascular system, central nervous system, blood and blood forming agents and renal system will be taught. In addition to theoretical

2. Objectives of the Subject : Upon completion of the subject student shall be able to (Know, do, appreciate) –

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

Text books (Theory) (Author, Title, Edition, Publication Place, Publisher, Year of Publication)

a. Tripathi, K. D. Essentials of medical pharmacology. 4th 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.

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

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 (Practical) :

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

Reference books (Practical)

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

3. Detailed syllabus and lecture wise schedule :

Title of the topic

1.General Pharmacology

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

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

2.Pharmacology of drugs acting on ANS

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

3.Pharmacology of drugs acting on cardiovascular system

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

4.Pharmacology of drugs acting on Central Nervous System

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

5.Pharmacology of Drugs acting on Respiratory tract

a) Bronchodilators
b) Mucolytics
c) Expectorants
d) Antitussives
e) NasalDecongestants

6.Pharmacology of Hormones and Hormone antagonists

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

7.Pharmacology of autocoids and their antagonists

a) Histamines and Antihistaminics

b) 5-Hydroxytryptamine and its antagonists

c) Lipid derived autocoids and platelet activating factor

PHD2.5T COMMUNITY PHARMACY (THEORY)

Theory : 2 Hrs. /Week

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

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

a. know pharmaceutical care services;

b. know the business and professional practice management skills in community pharmacies;

c. do patient counselling & provide health screening services to public in community pharmacy;

d. respond to minor ailments and provide appropriate medication;

e. show empathy and sympathy to patients; and

f. appreciate the concept of Rational drug therapy.

Text Books:

a. Health Education and Community Pharmacy by N.S.Parmar.

b. WHO consultative group report. c. Drug store & Business management by Mohammed Ali & Jyoti.

Reference books:

a. Handbook of pharmacy – health care.Edt. Robin J Harman. The Pharmaceutical press.

b. Comprehensive Pharmacy Review – Edt. Leon Shargel. Lippincott Williams & Wilkins.a. Health Education and Community Pharmacy by N.S.Parmar.

Special requirements:

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

3. Scheme of evaluation (80 Marks)

1. Synopsis
   10
2. Major Experiment
   30
   (Counselling of patients with specific diseases – emphasis should be given on Counselling introduction, content, process and conclusion)
3. Minor Experiment
   Ability to measure B.P/ CBG / Lung function)
   15
4. Prescription Analysis (Analyzing the prescriptions for probable drug interaction and ability to tell the management)
   15
5. Viva – Voce
   10

4. Lecture wise programme :

Topics

1.Definition, scope, of community pharmacy

Roles and responsibilities of Community pharmacist

2.Community Pharmacy Management

a) Selection of site, Space layout, and design

b) Staff, Materials- coding, stocking

c) Legal requirements

d) Maintenance of various registers

e) Use of Computers: Business and health care soft wares

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

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

ABC, VED, EOQ, Lead time, safety stock

5.Pharmaceutical care Definition and Principles of Pharmaceutical care.

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

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

8.Health screening services

Definition, importance, methods for screening

Blood pressure/ blood sugar/ lung function and

Cholesterol testing

9.OTC Medication- Definition, OTC medication list & Counselling

10.Health Education

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

Commonly occurring Communicable Diseases, causative agents,

Clinical presentations and prevention of communicable diseases – Tuberculosis, Hepatitis, Typhoid, Amoebiasis, Malaria, Leprosy, Syphilis, Gonorrhea and AIDS

Balance diet, and treatment & prevention of deficiency disorders Family planning – role of pharmacist

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

12. Essential Drugs concept and Rational Drug Therapy

Role of community pharmacist

13. Code of ethics for community pharmacists

PHD2.6T PHARMACOTHERAPEUTICS - I (THEORY)

Theory : 3 Hrs. /Week

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

2. Objectives: At completion of this subject it is expected that students will be able to understand –

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

Text Books

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

Reference Books

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

3. Detailed syllabus and lecture wise schedule :

Etiopathogenesis and pharmacotherapy of diseases associated with following systems/ diseases

Title of the topic

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

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

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

3.General prescribing guidelines for

a. Paediatric patients

b. Geriatric patients

c. Pregnancy and breast feeding

4.Ophthalmology: Glaucoma, Conjunctivitis- viral & bacterial

5.Introduction to rational drug use

Definition, Role of pharmacist Essential drug concept Rational drug formulations

PHD2.6P PHARMACOTHERAPEUTICS - I (PRACTICAL)

Practical : 3 Hrs./Week

Practicals:

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

Assignments :

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

Format of the assignment:

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

Scheme of Practical Examination:

	Sessionals	**Annunal**
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
Max Marks	20	70
Duration	**03 Hrs**	**04 Hrs**

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

III Pharm.D Syllabus

AUTONOMOUS BATCH

WEF – A.Y. 2026-27

PHD3.1T PHARMACOLOGY – II (THEORY) 3 Hrs. /Week

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

2. Objectives of the Subject Upon completion of the subject student shall be able to:
a. Understand the pharmacological aspects of drugs falling under the abovementioned chapters, b. carry out the animal experiments confidently, c. appreciate the importance of pharmacology subject as a basis of therapeutics, and d. correlate and apply the knowledge therapeutically.
Text books (Theory)
a. Tripathi, K. D. Essentials of medical pharmacology. 4th edition, 1999. Publisher: Jaypee, Delhi.
b. Satoskar, R.S. and Bhadarkar, S.D. Pharmacology and pharmacotherapeutics. 16th edition (single volume), 1999. Publisher: Popular, Dubai. c. Rang, H.P. and Dale, M.M. Pharmacology. 4th edition, 1999. Publisher: Churchill Living stone.

Reference books (Theory)
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 (Practical)
Kulkarni, S. K. and Dandia, P. C. Hand book of experimental pharmacology. Latest edition, Publisher: Vallab, Delhi.

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

3. Detailed syllabus and lecture wise schedule:
Title of the topic

1. Pharmacology of Drugs Acting on Blood, Hematinic and the Renal System. 15hrs

a) Anticoagulants.
b) Thrombolytics and antiplatelet agents
c) Haemopoietic and plasma expanders
d) Diuretics
e) Antidiuretics

2. Chemotherapy 25hrs

a) Introduction
b) Sulfonamides and co-trimoxazole
c) Penicillin's and Cephalosporins
d) Tetra cyclins 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)

3. Immunopharmacology 10hrs

a). Pharmacology of immunosuppressants and stimulants
b) Principles of Animal toxicology: subacute and chronic toxicity

4. The dynamic cell: The structures and functions of the components of the cell 15hrs

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

5. The Gene: Genome structure and function: 20hrs

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.

d) RNA processing: rRNA, tRNA and mRNA processing. Protein synthesis: Mechanisms of protein synthesis, initiation in eukaryotes, translation control and post-translation events.
e) Altered gene functions: Mutations, deletions, amplifications, LOH, translocations, trinucleotide repeats and other genetic abnormalities. Oncogenes and tumor suppressor genes.
f) 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

PHD3.1P PHARMACOLOGY – II (PRACTICAL) 3 Hrs./Week

List of Experiments:

1. Study of laboratory animals and their handling (a. Frogs, b. Mice, c. Rats, d. Guinea pigs, e. Rabbits).
2. Study of physiological salt solutions used in experimental pharmacology.
3. Study of laboratory appliances used in experimental pharmacology.
4. Study of use of anesthetics in laboratory animals.
5. To record the dose response curve of Ach using isolated ileum/rectus abdominis muscle preparation.
6. To carry out bioassay of Ach using isolated ileum/rectus abdominis muscle preparation by interpolation 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 algesimeter.
b) Anti-inflammatory effect of drugs using rat-paw edema method.
c) Anticonvulsant activity of drugs using maximal electroshock and pentalene tetrazole methods.
d) Antidepressant activity of drugs using pole climbing apparatus and pentobarbitone induced sleeping time methods.
e) Locomotor activity evaluation of drugs using astrophotometer and rotarod.

Scheme of Practical Examination:

	Sessional	**Annual**
Identification	02	10
Synopsis	04	10
Major Experiment (Bioassay)	08	30
Minor Experiment (Interpretation of given Graph or simulated experiment)	04	10
Viva	02	10
Max Marks	20	70
Duration	3hrs	4hrs

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

PHD3.2T PHARMACEUTICAL ANALYSIS (THEORY)

Theory : 3 Hrs. /Week

1. **Quality Assurance:** **12hrs**

Introduction, sources of quality variation, control of quality variation.
Concept of statistical quality control.
Validation methods- quality of equipment, validation of equipment and validation of analytical instruments and calibration.
GLP, ISO 9000.
Total quality management, quality review and documentation.
ICH- international conference for harmonization-guidelines.
Regulatory control.

2. Chromatography: **23hrs**

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.
Column Chromatography: Adsorption column chromatography, Operational technique, frontal analysis and elution analysis. Factors affecting column efficiency, applications and partition chromatography.
TLC: Introduction, principle, techniques, Rf value and applications.
PC: Introduction, principle, types of paper chromatography, preparation techniques, development techniques, applications.
Ion-exchange chromatography: Introduction, principles, types of ion exchange synthetic resins, physical properties, factors affecting ion exchange, methodology and applications.
HPLC: Introduction, theory, instrumentation, and applications.
HPTLC: Introduction, theory, instrumentation, and applications.
Gas Chromatography: Introduction, theory, instrumentation-carrier gases, types of columns, stationary phases in GLC & GSC. DetectorsFlame ionization detectors, electron capture detector, thermal conductivity detector. Typical gas chromatogram, derivatisation techniques, programmed temperature gas chromatography, applications.
Electrophoresis: Principles of separation, equipment for paper and gel electrophoresis, and application.
Gel filtration and affinity chromatography: Introduction, technique, applications.

3. Electrometric Methods: **10hrs**

Theoretical aspects, instrumentation, interpretation of data/spectra and analytical applications be discussed on the following topics.
Potentiometry: Electrical potential, electrochemical cell, reference electrodes, indicator electrodes, measurement of potential and pH, construction and working of electrodes, Potentiometric titrations, methods of detecting end point, Karl Fischer titration.
Conductometry: Introduction, conductivity cell, conductometric titrations and

applications.

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

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

4. Molecular Spectroscopy: **25hrs**

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

Absorption Spectroscopy:

- Theory of electronic, atomic and molecular spectra. Fundamental lawsof photometry, Beer-Lambert's Law, application and its deviation,limitation of Beer law, application of the law to single and multiplecomponent analysis, measurement of equilibrium constant and rateconstant 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.-Visiblespectroscopy in pharmacy and spectrophotometric titrations.

Infrared Spectroscopy: Vibrational transitions, frequency – structure correlations, Infrared absorption bands, Instrumentation–IR spectrometer – sources of IR, Collimating systems, monochromators, samplecells, sample handling in IR spectroscopy and detectors–Thermocouple, Golay Cells, Thermistor, Bolometer, Pyroelectricdetector, Applications of IR in pharmacy.

Emission spectroscopy

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

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

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

5. Atomic spectroscopy **20hrs**

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

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

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

Miscelleneous

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

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

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

PHD3.2P PHARMACEUTICAL ANALYSIS (PRACTICAL)

Practical : 3 Hrs./Week

List of Experiments:

1. Separation and identification of Amino Acids by Paper Chromatography.
2. Separation and identification of Sulpha drugs by TLC technique.
3. Demonstration of HPLC.
4. Demonstration of HPTLC.
5. Determination of pKa using pH meter.
6. Conductometric titration of mixture of acids with a strong base.
7. Potentiometric titration of a acid with a strong base.
8. Determination of λmax of different drugs and the Effect of pH and solvent on the UV spectrum of given compound.
9. Comparison of the UV spectrum of a compound with that of its derivatives.
10. Determination of dissociation constant of indicators (Phenolphthalein, methyl orange) using UV-Visible spectroscopy.
11. Estimation of drug in the formulation by UV visible spectrophotometry.
12. Simultaneous estimation of two drugs present in given formulation. (paracetamol and diclofenac)
13. Colorimetric estimation of Supha drugs using BMR reagent.
14. Assay of Salicylic Acid by colourimetry.
15. Comparison of the IR spectrum of a compound with that of its derivatives.
16. Estimation of drugs by Fluorimetrictechnique. (quinine sulphate, riboflavin)
17. Study of quenching effect in fluorimetry. (Iodine effect)
18. Determination of Chlorides and Sulphates in Calcium gluconate by Nepheloturbidimetric Method.
19. Determination of Na/K by Flame Photometry.
20. Interpretation of NMR spectra of any one compound.
21. Demonstration of GC-MS.
22. Demonstration of DSC.
23. Determination of specific rotation. (Sucrose using Polarimeter)

Reference Books:

1. Text Book of Pharm. Analysis by Higuchi. T and Hasen. E. B., New York Inter Science Publishers.
2. Quantitative Pharma. Analysis by Jenkins, The Blakiston division, NewYork.
3. Quantitative Drug Analysis, by Garrot. D, Chapman & Hall Ltd., London.
4. Undergraduate Instrumental Analysis by James. E., CBS Publishers.
5. Instrumental Analysis by Willard and Merritt, EWP, East West Press Ltd., Delhi/Madras.
6. Pharm Analysis by Skoog and West, Sounders Manipal College Publishing.
7. Text Book of Chemical Analysis, by A.I.Vogel, ELBS with Macmillan press, Hampshire.
8. Textbook of Pharm. Analysis by K.A.Connors, John Wiley & Sons, New York, Brisbane, Singapore.
9. Textbook of Pharm. Analysis (Practical) by Beckett &Stenlake, CBS Publishers, Delhi.

10. Textbook of Drug Analysis by P.D. Sethi., CBS Publishers, Delhi.
11. Spectroscopy by Silverstein, John & Wiley & Sons. Inc., Canada & Singapore.
12. How to practise GMP-A Plan for total quality control by P.P. Sharma, Vandana Publications, Agra.
13. The Science & Practice of Pharmacy by Remington Vol-I & II, Mack Publishing Co. Pennsylvania.
14. TLC by Stahl, Spring Verlay.
15. Text Book of Pharm. Chemistry by Chatten, CBS Publications.
16. Spectroscopy by William Kemp, ELBS with Macmillan Press, Hampshire.
17. I.P.-1996, The Controller of Publications, New Delhi.
18. BPC- Dept. of Health, U.K. for HMSO.
19. USP - Mack Publishing Co., Easton, PA.
20. The Extra Pharmacopoeia – The Pharm. Press, London.

PHD3.3T PHARMACOTHERAPEUTICS – II (THEORY)

Theory : 3 Hrs. /week

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

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

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

Text books (Theory)

Clinical Pharmacy and Therapeutics Roger and Walker, Churchill Livingstonepublication

Reference books (Theory)

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

b. Clinical Pharmacy and Therapeutics Eric T. Herfindal, Williams and Wilkins Publication

c. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA]

Detailed syllabus and lecture wise schedule:

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

Title of the topic

UNIT 1 – General Infectious Diseases (22 hours)

Guidelines for the rational use of antibiotics and surgical prophylaxis , respiratory tract infections, gastroenteritis, endocarditis, septicemia, Urinary tract infections

UNIT 2 – Complex & Opportunistic Infections (22 hours)

Tuberculosis, Meningitis, Protozoal infection – Malaria, HIV &Oppotunistic infections, fungal infections, viral infections, Gonorrhoea and syphilis

UNIT 3 – Musculoskeletal Disorders (16 hours)

Rheumatoid arthritis, Osteoarthritis, Gout, Spondylitis, Systemic lupus erythematous

UNIT 4 – Renal Disorders (18 hours)

Acute Renal failure, chronic renal failure, Renal Dialysis, Drug induced renal disorders

UNIT 5 – Oncology & Dermatology **(12 hours)**

Basic principles of cancer therapy, general introduction to cancer chemotherapeutic agents, chemotherapy of breast cancer, leukaemia, management of chemotherapy nausea and emesis, Psoriasis, Scabies, Eczema, Impetigo

PHD 3.3P. PHARMACOTHERAPEUTICS II (PRACTICAL)

Practical: 3 Hrs./ Week

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

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

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

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

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

Scheme of Practical Examination:

	Sessional	**Annual**
Synopsis	05	15
Major Experiment (Bioassay)	10	25
Minor Experiment (Interpretation of given Graph or simulated experiment)	03	15
Viva	02	15
Max Marks	20	70
Duration	3hrs	4hrs

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

PHD3.4T PHARMACEUTICAL JURISPRUDENCE

Theory: 2 Hrs. /Week

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

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

Text books (Theory)

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

Reference books (Theory)

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.

3. Detailed syllabus and lecture wise schedule:

Title of the topic

Unit I: **15 Hours**

Drugs and Cosmetics act,1940 and its rules 1945, Import of drugs-Classes of drugs and cosmetics prohibited from import, Import under license or permit, Offences and Penalties, Manufacture- Manufacture of Schedule drugs, Patent and Proprietary medicines, New drugs, Offences and Penalties, Grant of Licenses, Objectives, Legal definitions

Unit II: **15 Hours**

Drugs and Cosmetics act,1940 and its rules 1945, 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, Labeling and Packaging of Drugs and cosmetics provisions relating to Indigenous systems, Constitution and Functions of DTAB, DCC, CDL, Qualification and Duties - Government Analyst and Drug Inspector

Unit III: **10 Hours**

Pharmacy act 1948, Objectives, legal definitions, general study, constitution and functions of state and central council registration and procedure, ER,

Brief study of Prescription and Non Prescription products,

Study of salient features of Drugs and Magic remedies 1954 act and its rules,

Unit IV: **10 Hours**

Narcotic Drugs and Psychotropic Substances act - 1985 and rules, objectives, legal definitions, general study, constitution and functions of Narcotic and Psychotropic consultative committee, national fund for controlling the drug abuse, prohibition, control and regulations, schedules to the act

Study of essential commodities 1955 relevant to drugs price control order, Drug price control order and National drug policy (current) 1995,
Prevention of cruelty to animals act 1960,

Unit V: **10 Hours**

Pharmaceutical Legislations, Principle and significance of professional ethics, critical study of the code of pharmaceutical ethics drafted by PCI, Patents and Design act 1970,

Medicinal and Toilet preparation act - 1955, Objectives, legal definitions, licensing, bonded and non bonded laboratory, ware housing, manufacture of ayurvedic, homeopathic, patent and proprietary preparations,

PHD3.5T MEDICINAL CHEMISTRY (THEORY)

Theory :3 Hrs. /Week

UNIT 1: (**18 HRS**)

A) Modern concept of rational drug design
B) Anti- infective agents:
a) Local anti-infective agents:
b) Antifungal agents:
c) Urinary tract anti-infectives:
d) Antitubercular agents:
e) Antiviral agents and Anti AIDS agents:
f) Antiprotozoal agents:
g) Anthelmentics:

UNIT 2: (**18 HRS**)

A) Antibiotics
B) Antineoplastic agents

UNIT 3: (**18 HRS**)

A) Antimalarials
B) Sulphonamides and sulphones
C) Hypoglycemic agents

UNIT 4: (**18 HRS**)

A) Cardiovascular agents:
a)Antianginal agents and vasodilators
b)Antiarrhythmic agents:
c) Antihypertensive agents:
d) Antihyperlipidemic agents
e)Anticoagulants:
B) Diureties

UNIT 5: (**18 HRS**)

A) Steroidal Hormones and Adrenocorticoids
B) Thyroid and Antithyroid agents
C) Diagnostic agents

PHD3.5P MEDICINAL CHEMISTRY (PRACTICAL)

Practical : 3 Hrs./Week

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

Reference Books:

a. Wilson and Gisvold's Text book of Organic, Medicinal and Pharmaceutical Chemistry, Lippincott-Raven Publishers-New York, Philadelphia.
b. William.O.Foye, Principles of Medicinal Chemistry, B.I. Waverly Pvt. Ltd., New Delhi.
c. Burgers, Medicinal Chemistry, M.E.,Welly Med.Chemistry M.E. 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, 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. 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.

PHD3.6T PHARMACEUTICAL FORMULATIONS (THEORY) (60 Hrs.)

Theory: 2 Hrs. /Week

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

2. Objectives of the Subject: Upon completion of the subject student shall be able to (Know, do, appreciate) –

a. understand the principle involved in formulation of various pharmaceutical dosage forms;
b. prepare various pharmaceutical formulation;
c. perform evaluation of pharmaceutical dosage forms; and
d. understand and appreciate the concept of bioavailability and bioequivalence, their role in clinical situations.

Text books (Theory)

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

Reference books (Theory)

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

3. Detailed syllabus and lecture wise schedule:

Title of the topic

1. Pharmaceutical dosage form- concept and classification. (**15Hrs**)

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 tablets

2. Capsules: (**10Hrs**)

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

3. Liquid orals: (**15Hrs**)

Formulation and evaluation of suspensions, emulsions and solutions. Stability of these preparations

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

4. Ophthalmic preparations (Semi – Solids): (**10Hrs**)

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

5. Definition and concept of Controlled and novel drug delivery systems with available examples, viz. parenteral, transdermal, buccal, rectal, nasal, implants, ocular DDS. (**10Hrs**)

PHD3.6P PHARMACEUTICAL FORMULATIONS (PRACTICAL)

Practical: 3 Hrs./Week

List of Experiments:

1. Manufacture of Tablets
a. Ordinary compressed tablet-wet granulation
b. Tablets prepared by direct compression
c. Soluble tablet
d. Chewable tablet
2. Formulation and filling of hard gelatin capsules
3. Manufacture of parenterals
a. Ascorbic acid injection
b. Calcium gluconate injection
c. Sodium chloride infusion
d. Dextrose and Sodium chloride injection / infusion
4. Evaluation of Pharmaceutical formulations (QC tests)
a. Tablets
b. Capsules
c. Injections
5. Formulation of two liquid oral preparations and evaluation by assay
a. Solution: Paracetamol syrup
b. Antacid suspensions: Aluminium 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
8. Tablet coating (demonstration)

Scheme of Practical Examination:

	Sessional	**Annual**
Synopsis	05	15
Major Experiment (Bioassay)	10	25
Minor Experiment (Interpretation of given Graph or simulated experiment)	03	15
Viva	02	15
Max Marks	20	70
Duration	3hrs	4hrs

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

Changes to the Syllabus

Subject Name with Code	Section & Page	Change Area	Revised Regulation/ Change Made
PHD 3.2T PHARMACEUTICAL ANALYSIS (THEORY)	-	-	-
PHD3.2P PHARMACEUTICAL ANALYSIS	PRACTICAL	8^{th} experiment Added	Determination of λmax of different drugs and the
		11^{th} experiment Added	Estimation of drug in the formulation by UV visible spectrophotometry.

Proposal For Modification/ Re-Alignment in the Syllabus (2026-27)

Subject Name with Code	Section & Page	Change Area	Revised Regulation/ Change Made
Pharmaceutical Jurisprudence PHD3.4 (Theory)	-	**Unit – I** **Unit – III** **Unit – V**	It was resolved to redistribute the III Pharm.D Jurisprudence syllabus for the academic year 2026–27 across all units to ensure balanced content coverage. The Board also recommended a logical sequencing of topics to improve the continuity of learning and enhance students' understanding. **Unit – I** It was resolved to expand the content on the Drugs and Cosmetics Act to ensure a more detailed understanding of the legislation. **Unit - III** It was resolved to relocate the topic on prescription and non-prescription products from Unit V to Unit III for better curriculum organization and continuity. **Unit – V** It was resolved to shift the Medicinal and Toilet Preparations Act from Unit III to Unit V to ensure a more logical sequence of topics.